



Whitepaper



Time to reinvent your future

Introducing CGI's Transportation
& Logistics Digitization Framework

Hans Moonen, Thijs Jan Noomen and Eltjo Poort



Contents

- 1 Introduction** p. 3
Explore why you should read this whitepaper.
- 2 Our world is changing rapidly** p. 4
Today is different from yesterday, tomorrow will be different from today - as digital urges companies to transform.
- 3 Framework for Digitization** p. 7
The CGI Transport & Logistics Digitization framework, its six elements, linked to relevant client cases.
- 4 Turning vision into reality** p. 21
Words of advice how to accelerate digitization.
- 5 References** p. 23
Sources used.

Introduction

Most Transport and Logistics leaders will recognize the paradoxical situation they are in. On the one hand many of us are still feeling the immediate, crippling, effects of the COVID-19 pandemic, which has severely impacted companies in the transport and logistics sector. On the other hand we are aware of the large uncertainty about the future of your organization.

Will there still be a role for your company in your industry in ten years' time? Or is everything going to be organized by algorithms designed in Hyderabad or Palo Alto, and will your company's role be reduced to just moving goods or people around? To complicate matters further, there is the loudening societal scream for sustainability, which requires companies to do things differently. No small questions. At the same time, we still need to focus heavily on today's operations: customer expectations are still rising, faults and disruptions still occur too frequently, and sub-optimality is around to a (too) large extent. The aftermath of the COVID-19 pandemic is not yet fully clear, however, for most companies decreasing cost will a major theme the coming years, as well as a drive for more agility.

The forces of digitization and COVID-19 drive many companies to changes their businesses drastically. On the one hand, companies such as airlines and public transport operator have seen a dramatic decrease in passenger numbers and are looking for cost reductions and flexibility. On the other hand, parcel delivery companies have seen a huge increase in business and need to scale up their processes at short notice. In addition, a large number of companies have experienced the capabilities of today's technologies when they had to shift to a "working from home" production process and want to take even more advantage of the capabilities of modern technology. It is evident that change is needed and that companies need to reinvent themselves to stay competitive in the new marketplace in a world where the usual ways of doing business have been disrupted.

Due to the scale and complexity of the change there is no off-the-shelve approach that is valid for all organizations. Each company will need to develop its own unique approach to the current challenges. The approach will likely be a combination of both tried and tested, as well as emerging technologies.

In order to cope with the challenges above CGI has created the Transportation & Logistics Digitization Framework. This framework will help you to develop your own unique approach to cope with the challenges above. The framework builds upon insights gathered throughout the past years and consists of both tried-and tested as well as new elements to tackle today's challenges. It provides the levers for making digitization a reality in your organization.

Our world is changing rapidly

Today's reality

When COVID-19 overflowed the world and shocked our societies, several things became clear. The lockdowns and other preventive measures illustrated the hyper-interconnectedness of our world and empty supermarket shelves demonstrated the importance of properly functioning logistical systems. Within the world of logistics, some segments were facing rapidly rising demands – among others the parcel and the fast moving consumer goods (FMCG) domains. Other segments however, were facing large declines in both demand and supply, as people stopped traveling, and global supply chains were impacted due to demand and supply disruptions. The crisis showed us the downside of our globalized system where synchronized and lean transport flows around the world are lacking resilience. This led to an increase in local-for-local discussions, a topic also motivated by the world's next big challenge: sustainability. Although the aftermath of the pandemic is not yet clear, transport and logistics should prepare for the post-COVID-19 reality, in which it is important to operate smarter, more agile, against lower cost, and where sustainability is not an option but a necessity.

It is important to realize that the world of logistics was already in a dramatic change before the Corona outbreak, triggered by digitization. Underway two decades in the new millennium, we see the impact of a global marketplace everywhere. Not only do people and products move across the world, digital empowered businesses do as well, changing markets rapidly and globally – think Alibaba, Amazon and Uber. This goes hand-in-hand with rising consumer expectations. Nowadays it is completely normal to order something just before midnight, and to have it home delivered the next morning. At the same time, the challenges coming with climate-change and sustainability in general triggers many companies to transform into a truly sustainable business.

The combined impact of COVID-19, digitization and sustainability leads to a paradoxical and complex situation. Companies must divide their attention between reacting to the massive impact of the COVID-19 pandemic on their running business and react to the industry-changing effects of digitization and the drive for more sustainability at the same time. This is clearly reflected in the latest round of CGI's Client Global Insights program as shown in the next section.

What clients tell us

As part of CGI's yearly Client Global Insights program, CGI leaders around the world meet face-to-face with business and IT executives from our most important clients to gather their perspectives on the trends affecting their enterprises. This includes business and IT priorities, budgets, and investment plans. Findings from these conversations provide a global antenna that informs continuous practical innovation for both CGI and our clients, and motivates actions. By doing this on an annual basis, across a range of sectors – 1447 interviews in total in 2020 – it is possible to discover trends across industries. The main conclusions from these interviews are visualized in the figure on the next page.



The future will be digital
(according to business execs)



Optimization of operations
remains long-time favorite



Difficult to express
business needs to IT



COVID-19 reality urges immediate
cost savings and fast ROI

The first observation is that clients perceive their future, more than in previous years, as a digital one.

Especially business executives have strategic concerns regarding their long term future. Clients recognize the need for change, as they wonder what their future role and position in their industry will and should be – in five or ten years’ time. Many interviewees point at the threat of new digital native companies to their business. The power of data and analytics is changing logistical businesses, as the rapid rise of tech giants like Alibaba, Amazon, and Uber (Freight) demonstrates. An executive at a large logistics service provider stated: *“Will we, by 2030, only be a provider of wheels and vessels, while everything is going to be organized from Silicon Valley?”*. Despite this awareness, the interviews revealed that many companies are not yet strategically prepared for this future reality. Only two out of five have a clear strategy on digitization. There still is a lot of work to be done.

The second observation is that the optimization of operations, in terms of cost and agility, remains the number one business priority for our clients, just like previous years.

This was stressed more extensively in the interviews held after the pandemic declaration. This also relates to a steady climber in business priorities: the “need to collaborate across the boundaries of our organization”. Companies are part of larger ecosystems and thus need to collaborate. More and more, it is about (entire) supply chains/networks competing with other chains/networks. Therefore optimization of operations does not stop at the boundaries of the organization.

Client executives understand how difficult it is to express business needs to IT – our third takeaway.

Questioning clients about their IT satisfaction the “Line of Business ability to provide IT with clear and sufficient information on their needs” factor gets low scores – a 6,0 on average (on a scale from 1 till 10) – from all interviewees. Traditionally a large gap existed between business and IT executives. IT executives were stating that the line of business could not specify their needs, whereas the business side had the perspective that they specified well, but that IT was not delivering what was requested (another criteria asked for). However, this year, in line with a year-over-year trend that showed a closing gap, the gap between business and IT is almost gone. This does mean that the business side is now articulating that it falls short in getting their message across to IT. An important message in times of increased digitization, to both the internal organization as well as to external suppliers like CGI.

The fourth observation is that the COVID-19 reality within Transportation & Logistics stresses the need for immediate cost savings and fast ROI of new investments.

The sector has been impacted hard. The immediate response was slowing down operations and immediate cost cutting, due to vanishing demand. In the rebound phase costs remain as important, in order to survive in the long run. New investments – sometimes urged by social distancing measures – have to provide fast return-on-investments as many companies are strapped for cash.

These observations do not stand alone.

These observations do not stand alone. A study by Bughin et al. (2018) from the McKinsey Global Institute stated that “only 8% of all companies believes that their business model will remain economically viable through digitization”. That same shift can be recognized in the scientific community. Two decades ago, the “IT doesn’t matter” article by Nicholas Carr in the Harvard Business Review (Carr, 2003) suggested to “follow, don’t lead”, with the main motivation that “Moore’s Law guarantees that the longer you wait to make an IT purchase, the more you’ll get for your money (...) In some cases, being on the cutting edge makes sense. But those cases are becoming rarer and rarer as IT capabilities become more homogenized.” His lens was clearly focused on IT as a technical commodity, to support (standard) processes.

However, the past twenty years have shown a rather different side of IT – see also the figure below. IT can be a competitive differentiator, creating new and transforming existing businesses. The article “The problem with legacy ecosystems – They separate you from your customer” (Wessel et al, 2016) illustrates this clearly. This article was also published in the Harvard Business Magazine and represents a view that diametrically opposes Carr’s view in his 2003 HBR article. They start-off by stating that every company that is around for more than ten years is in fact legacy: an organization that tends to



work with traditional processes and systems, not prepared for the digital future. They illustrate that new digital native companies reap the benefits from incredible improvements in the price and flexibility of IT infrastructure compared to twenty years ago – the effect of Moore’s Law if you wish – but also that these innovators seek to displace rather than support legacy organizations. They state that taking a “wait and see approach can be disastrous, because businesses that make data a core asset can build early and insurmountable leads.” A clear call-to-action to focus on data and become (more) data driven.

Guidance for existing companies whose success was built in the pre-digital economy, perhaps stuck in old ways of working can be found in the article “How big old companies navigate digital transformation”. A team of researchers from MIT Sloan Center for Information Systems (Sebastian et al, 2017) analyzed the digitization journeys of 25 “big old”, legacy organizations. They identified two technology-enabled assets that are essential: an operational backbone and a digital services platform. “The operational backbone supports efficiency and operational excellence”, they state, while “the digital services platform supports business agility and rapid innovation.” They conclude that one should not go without the other.

What makes digitization complex, is the fact that “digital technology is no longer in the cordoned-off domain of IT; it is everywhere, (...)” as INSEAD Business School researchers Furr and Shipilov (2019) formulate it. They state that “digital transformation is not usually about a root-and-branch reimagining of the value proposition or the business model. Rather, it is about both transforming the core using digital tools and discovering and capturing new opportunities enabled by digital.” Therefore organizations will need to involve large parts of their organizations in their digital journey.



Today’s challenges require reinvention As demonstrated above, COVID-19 (and sustainability) are speeding up digital transformation even further as digitization leads to much needed cost reductions, more agility and higher customer satisfaction. It is no longer sufficient to focus on one of these elements (cost leader vs differentiator). The most successful companies are doing all at once. Therefore CGI is using a Framework that visualizes a holistic approach to digitization whereby all important elements are covered.

Framework for Digitization

Transport & Logistics Digitization Framework

CGI has developed a digitization framework that enables our clients to handle the disruption of COVID-19, digitization and the drive for more sustainability. It consists of six elements that form a holistic overview of the levers that companies can pull to thrive in today's digital age.

The Transport & Logistics Digitization Framework combines today's top business priorities with key enabling action lines. The three top priorities are:

-  Optimize operations in terms of cost and increasing agility to react faster to changes in demand, faults and disruptions (or even avoid them)
-  Intensify the interaction with customers, to ensure that customers enjoy a seamless omnichannel experience that reflects current customer expectations
-  Collaborate in the wider eco-system to further optimize the customer experience and drive down cost levels

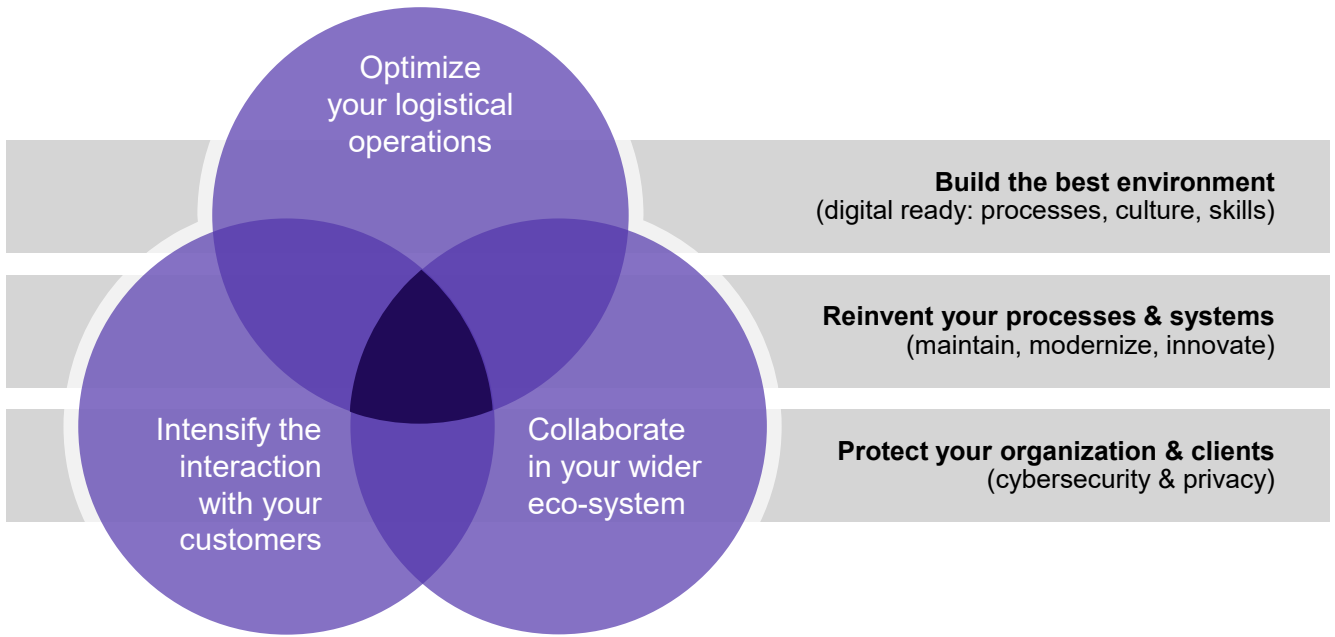
As discussed before these priorities require organization-wide efforts whereby legacy issues and cyber security concerns can hinder progress substantially. Therefore the framework also includes three enabling elements:

- 1)** The need to create an environment within the organization where digitization can flourish. This includes new ways of working such as Agile/Safe, a data-driven decision making process and a culture where innovation and experimenting is the norm.
- 2)** An approach to reinvent processes and systems (legacy) that are currently hindering progress and agility.
- 3)** Protection of your organization and clients. Unfortunately digitization also comes with the threat of cyber security. When organization are become more digitized the vulnerabilities to cyberattacks increase. Therefore, organization need to protect themselves and their clients in a professional manner against these type of threats.

Again, it is stressed that this is not a one-size-fits all solution. Each company should aim to develop a mix of the six elements from the framework that fits their particular situation. However, we firmly believe that all six elements should be part of a mature digitization strategy. Although companies can put different weights on specific elements of the framework, no elements should be left out completely. This is clearly shown by the most successful companies of this era that excel in delivering the business priorities while ensuring that the key enablers are in place.

Business Priorities

Key Enablers



Business priority #1: optimize your operations

The main business priority within logistics is the optimization of operations. The core of logistical processes is physical, made up of a combination of moving and fixed assets and people. Good quality operational data is an essential enabler to optimize operations; to reduce costs and increase agility.

Optimization aims to achieve a real-time insight in what is actually happening in the operation. What capacity is available where? What is known about the demand side? Is it possible to identify why things are in fact happening? How do actuals compare to plans and forecast? Where can processes be improved? And, what in fact is considered to be part of your operations?

Knowing all this, it is possible to establish data-driven decision making processes? Processes that might for example be powered by simulators and solvers – to study what-if scenarios, and see the effect of certain decisions, but also operational decision support in control towers on how to best adjust disturbances and flaws in the operation.

Digitization is providing an increasing number of technologies to understand what is happening in your processes and even what can or will happen in your processes in the near future (predictive analytics). In order to make decisions that will improve operations companies often need to combine several technologies. Today's toolbox is mostly digital as shown in the table below.

Why	How	What
Empower a range of smart applications	Digitize the physical world through the application of IoT devices and Digital Twins	Digital Twins are a digital replica of a living or non-living physical entity. Digital Twins make it possible to bridge the physical and virtual world, where the physical entity is replicated in a virtual entity that can be used in a range of smart applications. Digital Twins allow an easy deployment of smart applications due to the fact that the Digital Twin knows virtually everything: consider advanced track & trace functionality, instant payments, and reduction of idle times .
Understand what is happening	Measure your organization's performance with a great business intelligence environment	Measuring what is currently happening is crucial in understanding and improving operations. Look at your processes, flows and activities and start measuring timestamps, quantities and qualities – of both demand and supply. How do actual values compare with planned and perhaps also expected values (based on real-time updates, for example from IoT devices such as GPS sensors)?
Understand why and how things happen	The application of Artificial Intelligence and Machine Learning	Artificial Intelligence and Machine Learning are more advanced forms of analytics, which are of enormous value to optimize logistical processes. By analyzing transactional data one can learn the patterns that explain (future) execution: moving towards predictive and prescriptive forms of analytics.
Detect the things that matter	Combine data to deduce events that matter	Some events cannot be measured by a system directly. That is where complex events, and complex event handling, comes in. Complex events are called complex because one cannot directly detect that situation. One has to infer or deduce that an event has occurred from a combination of other events.
Simulate different situations	Simulate different process designs to understand the mechanics	Simulation is a powerful tool to show the eventual effects of alternative conditions and courses of action. In the field of logistics discrete event simulation is most used, sometimes extended by a form of (agent-based) pedestrian simulation. Another method sometimes applicable is the Monte Carlo simulation, which provides numerical results.
Optimize planning decisions	Deploy advanced planning systems (APS) and solvers to optimize operations	APS are powerful technology, that might result in smarter schedules and plans, squeezing out inefficiencies. However, misapplication is easy: make sure to define the business drivers upfront; not just optimize existing processes, redesign them; prepare for different futures and usage scenario's.
Automate processes	New forms of automation such as RPA	RPA (Robotic Process Automation) and more advanced forms of intelligent automation make it possible to automate processes that could not be automated before.

A Digital Twin for each NS passenger-Train

Nederlandse Spoorwegen (Dutch Railways, NS) is a Dutch state-owned company, the principal passenger railway operator in the Netherlands. Founded in 1938, NS provides rail services on the Dutch main rail network. It runs 4,800 scheduled domestic trains a day, daily serving 1.1 million passengers.

Client Challenges

- From the 00's onwards, NS was rolling out an increasing amount of IT systems and services on its trains - all requiring their own hardware, connectivity, wallside systems, and software maintenance cycles. The complexity of the landscape exploded.
- A decade ago, NS struggled to provide consistent travel information to passengers. The number of channels had been growing, but not all systems used the same (real-time) data and passengers could receive conflicting messages through the different channels. The Virtual Train / Intelligent Train (VT/IT) application was initially developed to assure real-time journey information aboard the trains to guarantee consistency across information channels.
- In more recent years additional functionality has been added to VT/IT outside the original passenger information domain.

CGI Solution

- CGI created the VT/IT application for NS which over the years evolved into a digital twin of the majority of the trains within the NS fleet (summing up to more than 700 individual trains currently). The virtual train is utilized for analysis, monitoring/alerting, and easy interfacing. The cloud solution includes Complex Event Processing and consists of two parts:
 - 1) Intelligent Train (IT): an on-train (on each train) application that receives sensor information from the train and delivers passenger travel to the train.
 - 2) Virtual Train (VT): an on-shore part that exchanges information with all trains that are fitted with this system.
- Although the VT/IT application was initially created to provide real-time passenger information, it evolved and became the basis for a digital twin infrastructure that empowered more and more functionality. This ranges from additional information streams for Real Time Monitoring and location services to more safety critical systems such as a driver warning system that alerts the driver when he/she approaches a signal at a speed that is considered too high.

Benefits & Outcomes Delivered

- Usage of the Virtual Train has strengthened customer facing applications such as crowding levels on trains and real time travel information on-board of the train and this had a major effect on the customer satisfaction with passenger information.
- Virtual Train contributed to a record-beating KPI performance in 2020 and subsequently NS is in a good position to be awarded a renewed 10-year contract for running the core train services in the Netherlands. Additionally NS has achieved substantial cost savings in train maintenance and less downtime of technical equipment due to the Digital Twin solution.

Business priority #2: intensify the interaction with your customer

Intensifying the interaction with customers, especially when that customer is the (end-)consumer, is a growing priority for companies within the Transportation & Logistics domain. Consumers become more-and-more demanding year after year: they expect to be kept digitally informed and in control of the entire (cargo or passenger) journey. Not investing in customer interaction capabilities worsens your competitive position.

Digitization cannot go without proper customer interaction design of the full client journey. Research by Rawson et al. (2013) proves that companies that deliver perfect customer journeys reap enormous rewards, including enhanced customer and employee satisfaction, reduced churn, increased revenues, lowered costs, and improved collaboration across the organization – as such positively influencing priorities #1 and #3 as well.

Increased customer orientation can have a huge impact on processes and systems, as Giannikas et al. (2019) illustrate in their study on a redesigned customer journey for consumers from the perspective of a third-party logistics provider. Providing customers more flexibility throughout the journey can be at odds with the emerging trend of shortened delivery times, which leaves less flexibility to adjust.

Demand management puts a different angle on customer interaction, directly linked to priority #1. It is an interesting instrument to deploy in logistics as it enables organizations to better balance demand with available supply, and so to reduce inefficiencies.

Differentiated pricing instruments have proven to work – for instance by applying differentiated prices in related areas such as plane tickets and hotel rooms (revenue management). Within logistics examples of differentiated pricing for home delivery turn out to produce great results, as was proven by Agatz et al. (2011) already a decade ago. Offering clients options for smaller or larger delivery windows, rebating less popular slots, utilizing information on nearby deliveries to rebate particular time windows – all these strategies turn out to work well. Good information regarding different options – for example from an environmental impact perspective – might do the same trick. Hence, this requires good insight in your operations and demand, and insight in how clients react upon differentiated prices or information. Properly deployed, it is a powerful instrument to both improve operations, raise customer satisfaction, and strengthened client relations.



Happier customers, higher quality & lower costs (DB Netz)

Deutsche Bahn (DB) Group is one of the world's leading mobility and logistics companies. The DB employs some 338,000 people around the globe, including roughly 211,000 in Germany.

International Activities are DB Schenker (one of the largest logistics companies, operating in >120 countries), DB Arriva (passenger transport via bus and train in 14 countries in Europe outside of Germany) and DB Cargo (cargo rail transport in 13 countries in Europe including Germany). Within Germany DB Netz is responsible for 33.400 km of railway tracks, with its 42.000 employees, it is Europe's largest infrastructure operator.

Client Challenges

- Central task of DB Netz is to provide railway path's for more than 420 train operating companies (TOC) – most of them are cargo railway companies. The railway path's are planned in a complex timetable twice a year.
- Based on the existing timetable, adhoc train paths for cargo trains have to be planned in addition, to handle short term traffic requests. This always was a manual process. Constructing an ad-hoc request for a cargo train path needs about a week of planning time.
- Manual planning is not optimized, leading to inefficient use of the rail network. The clients of DB Netz (the cargo TOC's) expect a quick and easy scheduling process via mobile booking and tracking.

CGI Solution

- CGI was heavily involved in DB Netz' project "Digital Capacity Increase". The project started in 2016 and lasted 3 years. During high times CGI provided more than 50 consultants within a program team of 200 people (largely own DB personnel). The solution is productive since 2019. CGI is still an important partner with a team of currently 12 CGI consultants that further develop the solution.
- The project aimed to improve the customer experience and operational efficiency by digitizing and automating their process of devising train schedules.
- CGI automated the timetable construction process with an individual developed IT solution based on mathematical algorithms which are able to provide not only the standard planning steps but also an important change of the principles along the planning steps. By standardization and harmonization we reach a network optimized assignment of train paths according to customer order.

Benefits & Outcomes Delivered

- The new system leads to 3% more rail cargo train paths capacity on the rail cargo core network and to -5% average transport time. The virtual capacity increase saved costly investments in new (physical) infrastructure, and improved the quality of the rail cargo offerings, therewith strengthening its competitive position against other modalities.
- Via the Click & Ride app the cargo TOC can request a train path for a cargo transport from A to B within a maximum of 3 minutes the TOC can choose from an offer of up to 3 different paths the one of its preference. Before the application, this could take up to a week.

Business priority #3: collaborate beyond your organizational boundaries

As logistical companies are part of a network of other parties, optimizing one's own operations is not always sufficient anymore: it might in fact result in sub-optimality. Therefore, it is important to consider to redesign (a focal company's) processes together with its ecosystem partners. Furthermore, customers, especially consumers, expect digital interaction capabilities: they would like to be informed and in control.

As competition no longer just comes from your good old competitors, but rather converges into a battlefield of ecosystems, it is essential to collaborate with suppliers, clients and competitors in your ecosystem. Frequently, this implies (new) joint processes, requiring the exchange of information, synchronization of decisions, and gain sharing with ecosystem partners.

It is recommended to involve ecosystem partners in the design and execution of planning and optimization processes in order to reach improved solutions. Since the late 1990s, large retailers have experimented with their FMCG providers on Collaborative Planning, Forecasting and Replenishment (CPFR), a GS1 concept. CPFR aims to enhance supply chain integration by supporting and assisting joint practice like cooperative management of inventory through joint visibility and replenishment of products throughout the supply chain. In simple terms: supermarkets coordinate their action periods with their suppliers. In physical distribution however, this is not yet the case. Parcel distributors do know the amount of parcels to

be shipped, but not the physical dimensions of these parcels – what is in the box defines the size; diapers or toothbrushes do make a large difference. It is not that this information isn't known anywhere, it is that it isn't shared. Why not introduce incentives to improve data sharing among parties?

Recent initiatives such as (the Dutch government funded) iShare and the Industrial Data Space (IDS) - one of the off springs of the Industry 4.0 initiative in Germany – aim to keep data at the source, by implementing a uniform set of agreements/schemes that enable organizations to give each other access to their data. Organizations that have implemented these schemes, all work with the same identification, authentication and authorization methods. As such they do not need to keep making new agreements every time they want to share data and can share data effortlessly. Effortlessly, as they do not need costly and time-consuming integrations in order to share data; they can share data with new and previously unknown partners; and they can maintain full control over their own data at all times. They have the final say about the terms under which what part of their data will be shared, why, with whom, for how long and under what conditions. In summary, collaboration beyond the organization can and should lead to lower cost, faster delivery, and increased customer intimacy. This will in turn lead to higher customer satisfaction and profit levels.



Designing and establishing important parts of Nextlogic

Nextlogic is a neutral third party in the Port of Rotterdam, aimed at orchestrating the handling of calls of container-barges at terminals and depots in the port.

Client Challenges

- Back in 2012 the Port of Rotterdam realized that barge shipping as a hinterland modality is not just a domain where barge-operators are in strong competition with each other. Competition increasingly comes from the other modalities – trucking and rail cargo – and nearby ports that might attract current and future cargo streams, due to cheaper or more reliable hinterland connections. As Rotterdam is ideally located for barge shipping it was important to strengthen this offering to remain competitive.
- Together with a group of frontrunners from terminals, depots and barge-operators decided to start the initiative that now has converged into Nextlogic.

CGI Solution

- CGI had helped Nextlogic from its first conception in 2012 onwards with several business consultants, architects and technical specialists to define its processes, information flows, and optimization mechanisms (including the inner-workings of the BRAIN planning system, which is based on Quintiq).
- Most recently CGI established the performance measure environment that monitors the performance of the neutral integral planning as well as potential misuse.

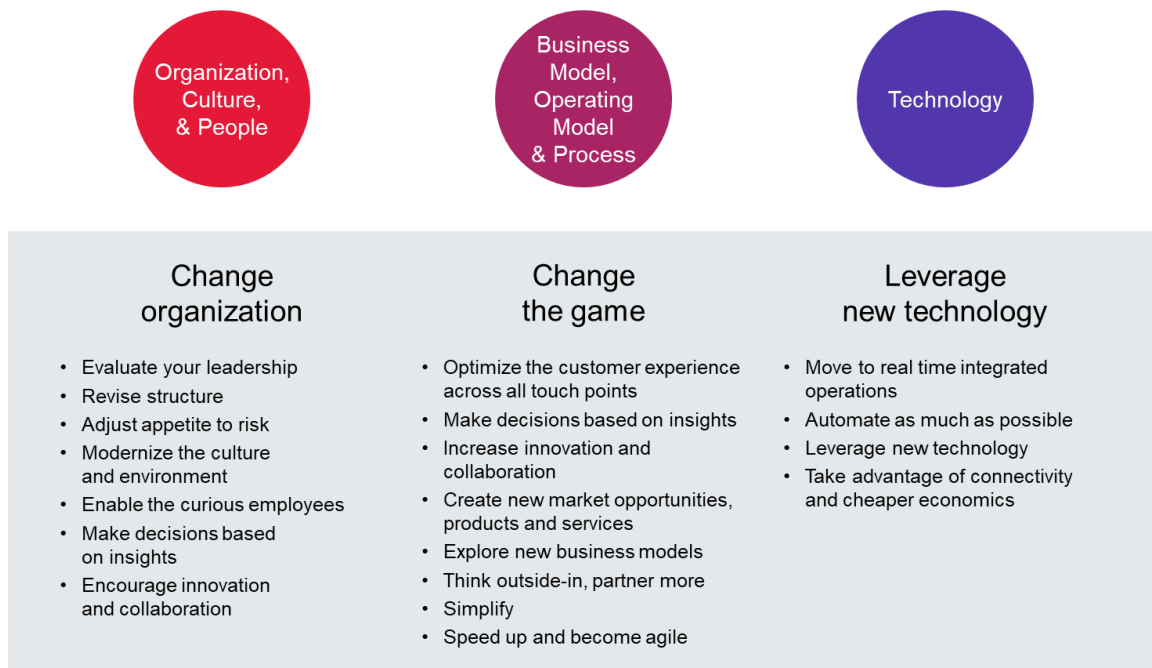
Benefits & Outcomes Delivered

- The neutral integral chain-wide planning system – supported by extensive information exchange and performance monitoring – that has improved reliability of the container barging product, decreased the cost of operations, and has as such strengthened the competitive position of barging as one of Rotterdam's key hinterland modalities.
- The system will become fully operational in 2021. The first pilots and largescale simulations show largely reduced port-stays for barges, and increased efficiencies at terminals and depots.

Key enabler #1: build the environment

Digitization is much more than just new technology. Strategy, organizational culture, new skills, an agile operating model: all these aspects have to be considered and designed with great care.

Digital transformation is far more reaching than just the traditional IT department. IT is no longer IT as we used to know it – a function to support the business – but has become the core of the business itself for many organizations. This requires a major effort for many organizations, involving large parts of organizations – see also the figure below. Digital innovation is not just something to drop at the desk of the CIO. In order to get the maximum result out of digital innovations, the entire organization needs to be aligned and involved and the gap between business and IT needs to be closed further. For instance by running an IT awareness program for non-IT staff.



Digital transformation starts with ambition and strategy. As the Voice of Our Clients surveys illustrate, nearly all clients articulate an ambition to become a digital enterprise. However, only 45% have a digital strategy across their enterprise, 22% have a digital strategy which includes their eco-system partners (largely overlapping with the aforementioned 45%), and 18% report that the digital strategy they have is paying-off. These same interviewees were asked about the agility of their organization, from the perspective on their ability to address digital transformation. Only 17% score themselves a 8 or higher, on a scale from 1-10. And 95% of the business and IT leaders interviewed point at cultural change and change management as the main obstacle hindering digital transformation in their organization.

This all means that digitization goes much further than just the application of new technology. Strategy, organizational culture, newly needed skills: all these aspects have to be considered and designed for carefully. Strong portfolio management needs to be in place to ensure that business goals are seamlessly translated into digital initiatives and to ensure that these initiatives produce the best value for the organization. Learn by doing, and recognize what works elsewhere. And do it fast.

Royal Flora Holland (RFH): Operational Excellence and digital transformation

Royal Flora Holland is a cooperative of growers of plants and flowers. The cooperative forms the largest marketplace for floriculture for one of the most important export sectors in the Netherlands. RFH brings together supply and demand to derive optimal prices at minimal costs through its digital platform. To enable this it offers a range of ordering, payment and delivery services. In this way, RFH create a solid foundation on which their growers and buyers can build their business and work together towards sustainable success in the global floriculture market.

Client Challenges

- Growers and buyers inherently seek the most efficient ways to meet the demand for ornamental plants or flowers. They are increasingly doing business directly. Which puts pressure on our objective of 'optimal pricing at minimal cost'.
- It's also abundantly clear that the market is changing. Differences between growers and buyers are increasing, the role of retail is growing and new international markets are emerging.
- Furthermore, everything has to be faster, fresher and more sustainable. The opportunities offered by digitization allow us to respond to these developments.

CGI Solution

- A CGI team works side-by-side with an internal department (Transformation and continuous improvement) to develop and implement an Operational Excellence Framework to make the RFH organization and teams continuously improve to meet the (current and changing) expectations/needs of growers and buyers.
- This framework offers managers training, guidelines, methods and standards in five areas: strategy, management, organization, process and people based on the Lean philosophy and Agile way of working.
- The CGI team furthermore offers advice and experts in developing the digital transformation of the marketplace and the ordering, payment and delivery services.

Benefits & Outcomes Delivered

- Improved interaction between the different locations and supportive teams.
- Better in control of the performance of the delivery services and able to adapt faster on changing situations (like COVID19) and eliminating risks.
- More standardization in business processes result in a better performance and making steps in digital transformation.

Key enabler #2: reinvent your processes & systems

Transforming into a digital organization takes more than the deployment of new digital systems. Digital leaders have also changed the way they work when acquiring, delivering and operating their systems – towards business agility. Many existing organizations within Transport & Logistics, however, tend to be stuck in (relatively) traditional processes and old (legacy) system landscapes, with hundreds of applications, data sources, and internal/external integrations that have grown over time. These landscapes of old processes and complex systems frequently come with serious technical debt – and the interest on that debt drains resources urgently needed for innovation.

Acquiring business agility entails much more than software development teams to use scrum. CGI's annual Global Insights research program confirms that organizations see the need for agile transformation, but many also report an increase in cultural and organizational resistance (83%), legacy and agility challenges (70%), and a lack of funding to transform (43%). Most organizations report a substantial gap between strategy and agile delivery. We see that 91% of organizations have a digital strategy in place, but only 12% are producing results at the enterprise level.

It won't be a surprise that clients articulate that they foresee larger investments in their operational backbones. Both the IT landscape and the processes to evolve that landscape and the systems in it need to be modernized. Several clients mention new investments in ERP (upgrades, replacement or even entire renewal), others speak about IT modernization and application rationalization, and/or process

redesign. In more technical terms, low-coding or no-coding applications (citizen development), containerization and the deployment of micro services can all help to reduce cost and improve agility of the IT stack.

One of the ways CGI is helping clients towards business agility is by modernizing the way they do architectural design. Our research highlights the importance of balancing collaboration and autonomy in design practices – key principles in the way of working CGI's architects have adopted to be more responsive and collaborative in an agile context. CGI's agile architecture approach is called RCDA: Responsive, Collaborative Digital Architecture. Traditional architecture frameworks like TOGAF tend to focus on governance and control from a central CIO office. While a certain level of governance will always be necessary to for risk and cost control (the other meaning of RCDA is "Risk and Cost Driven Architecture"), an agile architecture function creates a balance between central and decentral design decisions. It combines small up-front design with evolutionary architecture, using quick feedback cycles to pivot when the world changes or we gain new insights (Poort, 2019).



Implementing agile architecture at a major airline

Client Challenges

- Major airlines are complex international organizations with many diverse domains.
- This airline had a traditional strong central enterprise architecture board to manage the dependencies between these domains. After implementing an agile corporate way of working, this centralized architecture governance was no longer aligned with how the domains worked.

CGI Solution

- CGI's RCDA Agile Architecture Maturity Radar was used to establish a baseline and pinpoint the most urgent areas for improvement.
- The organization instituted 7 decentral architecture teams to bridge the gap between central governance and self-organizing teams. Architects and stakeholders were trained in agile architecture using RCDA workshops.

Benefits & Outcomes Delivered

- Business results: shorter architecture feedback cycles, faster learning, quicker adaptation to change, better technical debt control
- Improved focus and governance of architectural decision making
- Improved awareness of architecture runway and technical debt by business stakeholders



Key enabler #3: protect your organization & clients

Cybersecurity, privacy compliance (e.g. GDPR), and safety are necessary must-haves that too often do not get enough attention – it is bolted on, rather than baked in. As reflected in the CGI Client Global Insights the past years, there is a strong link between digital transformation and the urge to protect the organization. Protecting the enterprise – including cybersecurity, privacy, and knowledge about goods/people moved by your organization – has board-level accountability. The more digitized your organization becomes, the higher the need to protect from the adverse effects of cybercrime.

To start with knowledge on what is moving: anonymity/keeping a distance is no longer the safe choice for organizations, as organizations can increasingly be held responsible for the goods or persons they move around. See for example the recent discussions around global hard drug trade that utilize the global parcel networks, with shipments originating from The Netherlands impacting and delaying all parcel shipments originating from The Netherlands. Insight about goods and people moved by your organization asks for non-repudiation and measures around authentication and authorization. In a world utilizing cloud solutions working with numerous external parties, this turns out to be a challenge.

Cybersecurity has become a core business and IT theme within the Transportation & Logistics domain ever since the massive ransomware attacks in summer 2017 Organizations have taken action to protect themselves against attacks like these. However, this should not be a one-off activity, but a continuous cycle in which new and existing risks are assessed, protective actions are taken and operations are to be monitored. Risk assessments can help identify the business impact, threat actors and organization vulnerabilities. The continuous cycle also requires integration in everything you, and the organizations in your ecosystem, do.



It is therefore recommended to periodically conduct a comprehensive assessment to identify, quantify and prioritize cyber risks – see also the figure above. A logical follow up step is to perform a cybersecurity information classification assessment, to conduct comprehensive data/information discovery and classification activities. The assessment phase is typically followed by a phase in which the focus is on protecting the business as a whole. Within transportation and logistics organizations depend on IT-systems, but, to a large extent, mostly on their operational technology (OT). With the convergence of the IT and OT world and the move toward the cloud, an integrated cybersecurity strategy is needed. Once one has a strategy, it is time to implement policies, standards and governance frameworks to ensure compliance (including regulatory) and to turn this into action by implementing practices for secure systems engineering and design, secure software life cycle, security by design, secure digital labs, etc. Even when organizations integrate security during design, monitoring of threat actors and vulnerabilities and the use of a security operations center with a focus on both IT and OT remains important. Cybersecurity as well as privacy should no longer be bolted on, they should be baked in.

GDPR Compliance (DHL Parcel, The Netherlands)

Back in 1969 three pioneers founded DHL: the first international delivery service. Over the years DHL evolved into the largest logistics company in the world. Within The Netherlands, DHL Parcel NL is one of the Netherlands largest players in the parcel domain. Active in both Business-to-Consumer and Business-to-Business parcels.

Client Challenges

- In May 2018, the new General Data Protection Regulation (GDPR) became applicable.
- GDPR requires organizations to review their processing of personal data and take the measures necessary to restrict and secure the information use.
- Non-compliance could result in serious fines and damage to a company's reputation.
- DHL faced a paradoxical situation: although its primary business process processes vast amounts of personal data, it did not have the required specialist resourcing to take the necessary steps towards GDPR compliancy.

CGI Solution

- CGI assisted DHL in their efforts to become GDPR compliant.
- In the timeframe from February 2018 to October 2018, two CGI consultants drafted data processing records for +/- 50 key applications and – in case of expected high risk – performed data privacy impact assessment (DPIAs).
- In order to achieve these goals, CGI worked with technical experts and business owners to help understand how personal data was being processed by DHL and to determine the exact GDPR requirements for each application.

Benefits & Outcomes Delivered

- The data processing records allowed DHL to understand the data processed by their applications. This knowledge is needed to comply with GDPR demands such as data subject rights. The processing records helped determine which applications should comply with baseline privacy measures and which applications needed additional safeguards.
- The DPIAs enabled DHL to perform more detailed risk analyses and to develop tailored requirements for each application.
- Additionally, CGI plotted all personal data exchanges into a map. This allowed DHL to gain a more comprehensible understanding of their data processing activities.
- By delivering these products in time and within budget, CGI helped DHL to achieve GDPR compliancy.

Turning vision into reality

Develop your digital organization

The last couple of years companies have approached digital in different manners. Some clearly separated old and new technologies; new organizational units with names like “digital solutions” or “innovation lab” concentrated purely on experimentation with new technologies, often working as/ with start-ups and external funding, and staffed with youngsters. Too often these groups turned out to be rather disconnected from the rest of the organization, its processes and (existing) systems. Other organizations choose to make digital the new theme for the IT department, requiring a new mindset and way of working from an existing department too often stuck in existing processes, systems and ways of working. Many of these organizations face traditional business-IT alignment challenges, as they tend to be too far removed from the core business itself.

In their article “Digital transformation strategy making in pre-digital organizations”, Chanis, Myers and Hess (2019) provide several recommendations how to handle digital transformation, the most important being: “Involve the entire organization in digitization: don’t make it driven out of silos (chances are big that internal politics hinder success)” and “The (traditional) IT-department should not be in the driver seat of digital transformation, since digitization should be business-oriented, customer-centric and involves the entire organization.”

From our experience with digital transformation we like to add the following lessons learned:

Start with the overall business goals. What are your companies’ goals in terms of costs/revenue, agility, customer satisfaction.

1. Start with BHAGs (Big Hairy Audacious Goals) but don’t let the scale of the reinvention scare you. It is ok to start with pilots and experiments, but do it fast, and learn from them. Work in short-iteratively cycles, as depicted in Figure 6, starting with strategy, but quickly evolving into processes to shape, change and deliver functionality and services needed for the future.
2. Use your overall business goals to re-evaluate your current project portfolio and focus on the value that these project produce to achieve these goals.
3. Stay up-to-date with technology, but don’t go at it alone. The speed of new developments is fast and full of opportunities. Stay in touch with peers, suppliers and knowledge organizations to reap the benefits of new technologies in an efficient manner.
4. Assess and renew your strategies on a regular basis. Develop and maintain your digital, cloud, data, AI strategies and most of all, communicate them.
5. Assess and renew your (digital) assets on a regular basis. Are your processes and applications up-to-par or are they entering the legacy zone and need renewal.
6. Train and develop your workforce in digitization and make them digital aware.



The journey to digital is to a large part a (steep) learning experience. Experiment and learn fast. Failure is an option, but make sure to learn from it. See what works elsewhere, and understand why it works.

Wrapping up

This whitepaper introduced the CGI Transportation & Logistics Digitization Framework, and showed the six elements that form this framework. It shows the six levers organizations can pull in their digitization journeys. The framework is not just a framework, it is backed up by published practical and scholarly research, and strengthened by insights and experience from our own experts active in the field, serving our clients on a daily basis.

We started with the need for reinvention. Digital-native newcomers are transforming industries, as they have the data, the algorithms and scale quickly. However, that does not mean that there is no room for existing players anymore. They have served their clients successfully for decades, and possess knowledge new entrants don't have yet. Existing parties should become smarter. Smarter by using digital tools to better serve their clients' needs, leverage their wider ecosystem, and optimize their operations. The post-pandemic reality urges most companies to reconsider their current way of working, client interactions, and longer term future. From that perspective, we do believe that the six elements encapsulated in the framework presented here are the key levers to pull.

We hope that this whitepaper has been helpful to support your understanding of the levers for digital transformation and we look forward to discuss your digital future. Now is the time to reinvent your future!

For more information or to set up a meeting, please contact:

<p>Joost van der Burg Sector VP - Transport & Logistics joost.vander.burg@cgi.com</p>	<p>Hans Moonen VP Expert - Logistics h.moonen@cgi.com</p>	<p>Thijs Jan Noomen VP Expert - Public Transport thijsjan.noomen@cgi.com</p>	<p>Eltjo Poort VP Expert - Architecture eltjo.poort@cgi.com</p>
--	--	---	--

REFERENCES

- Agatz, N.A.H.; A.M. Campbell, M. Fleischmann & M.W.P. Savelsbergh (2011). Time Slot Management in Attended Home Delivery. *Transportation Science*, 45 (3), 435-449
- Bughin, J.; T. Catlin, M. Hirt, P. Willmott (2018), “Why digital strategies fail”, *McKinsey Quarterly*, January 2018
- Carr, N.G. (2003) “IT Doesn’t Matter”, *Harvard Business Review*, 81, 41-49
- CGI | Client Global Insights | webpage: <https://www.cgi.com/en/client-global-insights>
- Chanis, S.; M.D. Myers, T. Hess (2019) “Digital transformation strategy making in pre-digital organizations”, *Journal of Strategic Information Systems*, 28 (1), 17-33
- Furr, N.; A. Shipilov (2019) “Digital doesn’t have to be disruptive”, *Harvard Business Review*, 97, 94-103
- Giannikas, V., D. McFarlane, J. Strachan (2019), “Towards the deployment of customer orientation: A case study in third-party logistics”, *Computers in Industry*, 104, 2019, pp 75-87
- IDS | International Data Spaces Association | webpage: <https://www.internationaldataspaces.org/>
- iShare | webpage: <https://www.ishareworks.org/>
- McKinnon, A. & Edwards, J. (2010) “Opportunities for improving vehicle utilization” in McKinnon, A., Cullinane, S., Browne, M. & Whiteing, A. *Green Logistics: Improving the environmental sustainability of logistics*. London: Kogan Page Limited. pp.195-213.
- Poort, Eltjo (2019), “Between the Waterfall Wasteland and the Agile Outback”, *IEEE Software*, January/February 2020, 92-97
- Rawson, A.; E. Duncan, C. Jones (2013) “The truth about customer experience”, *Harvard Business Review*, 91
- Sebastian, I.M; J.W. Ross, C. Beath, M. Mocker, K.G. Moloney, N.O. Fonstad (2017) “How big old companies navigate digital transformation”, *MIS Quarterly Executive*, 16 (3), 197-213
- Wessel, M. Wessel , A. Levie, R. Siegel (2016) “The problem with legacy ecosystems”, *Harvard Business Review*, 94, 68-75



About CGI

Founded in 1976, CGI is among the largest IT and business consulting services firms in the world.

We are insights-driven and outcomes-based to help accelerate returns on your investments. Across 17 industries in 400 locations worldwide, our 76,000 professionals provide comprehensive, scalable and sustainable IT and business consulting services that are informed globally and delivered locally.

Our commitment: Insights you can act on.

cginederland.nl

