The DX Journey in the Enterprise and its Leadership

20211118

Author:
Bassam Zarkout
Founder, IGnPower
Chair, IIC Digital Transformation Working Group
bzarkout@ignpower.com

CONTENTS

FIGURES

1 EXECUTIVE SUMMARY

This article provides an overview of Digital Transformation (DX) and focuses on the transformation of environments that comprise Industry IoT systems or IIoT.

In many organizations, the DX initiatives are targeted at specific processes, example production lines. Some organizations take a more strategic view of DX with the primary aim of transforming the organization's business model, value proposition (and ROI) and the way it delivers value to the market, potentially leading to the disruption of existing markets, the leapfrogging of competition, and the creation of new markets and fresh revenue opportunities. This article is focused on these types of organizations (strategic view of DX) and highlights the considerations and challenges that must be addressed during their DX journey.

By its very nature, DX at the enterprise touches multiple facets and areas[1] in the organization. For such efforts to be successful, the different stakeholders must be aligned with the overall objectives of the DX strategy and must be committed and involved to its execution. This can be quite challenging in organizations that have enterprise scale IIoT systems with all the complex IT-OT technical and organizational considerations that come with such systems.

DX at the enterprise also tends to span and spawn multiple projects that must be carried-out over prolonged periods of time. Such DX efforts should be broken down into manageable phases that are aimed at transforming individual processes. These processes must be carefully selected based on their proximity to profits, and their ability to rapidly generate measurable outcomes, and where the transformation efforts can yield valuable insight about the challenges and issues involved in the overall transformation effort.

To achieve all this, organizations should look at DX at the enterprise as a journey. This journey must be driven by a sustained program (section 3) which is sponsored at the highest levels in the organization. Like all enterprise programs, the DX program must feature a well-defined mandate, a clear mission statement, an operational structure, a communication strategy, and a governance structure. The program must also be led by a "DX Tsar" who is *mandated* and *empowered* by an executive sponsor to execute it and deliver on its objectives. Finally, the DX program team must represent the stakeholders involved in the DX effort.

Before embarking on a DX journey, organizations should explore important questions, the answers to which will greatly impact the DX vision, mission, and objectives, for example *what are the main challenges facing the organization*, *what changes are needed to address them*, *can these changes be limited to specific processes or should they be more encompassing touching the whole*

---

[1]   Business model, functional, operational, and organizational.

enterprise, which technologies should be considered, and *what does success look like*? Section 3.1 features a more comprehensive list of these questions.

DX at the enterprise is not a Business-as-Usual project. For many organizations, DX is a do-or-die proposition that must be taken seriously and embraced at the highest levels.

2 DIGITAL TRANSFORMATION

Digital Transformation is a high-level catch-all term that refers to efforts by organizations to leverage digital technologies in order to optimize and transform the way they operate and deliver value to their customers and shareholders. DX is not a new topic. Early efforts in the 70s to transition from paper-based financial systems to IT-based financial systems would be called today Digital Transformation.

The DX trend remains strong in the market and has taken on heightened importance during the COVID-19 pandemic[2]. Many enterprises in many types of industries are leveraging emerging and emergent technologies to transform themselves into digital enterprises with the aim of delivering better value to their markets, more effectively, more competitively, and with better ROI.

What is new and different is that the transformation is increasingly taking place in environments that comprise IIoT solutions which, by definition, span the digital-physical divide. This introduces new considerations and complexities for enterprises at multiple levels, business, technological, organizational, cultural, and risk related.

In the *Digital Transformation in Industry* whitepaper[3], the Industry IoT Consortium (IIC) defined DX as *the innovative and principled application of digital technologies, and the strategic realignment of the organization's resources for the purpose of creating better outcomes, in terms of improving existing business and industrial models and processes, and in many cases, creating entirely new ones*.

Thomas Siebel (the father of CRM) summed it up nicely in his book *Digital Transformation, Survive and Strive in an Era of Mass Extinction*, where he said that DX is essentially a caterpillar-to-butterfly transformation and a do-or-die proposition. He, like many others, used the Netflix-Blockbuster story to illustrate this notion.

> Example
>
> In the 90s, *Blockbuster* had a successful brick-and-mortar business model based on renting entertainment content to consumers using video tapes and DVDs. Blockbuster did not grasp the seriousness of the threat that emerging and disruptive technologies (e.g. cloud and high communication bandwidth) were posing to their business model. Upstart *Netflix* used these technologies and redefined the way

---

[2]   *https://www.cio.com/article/3211428/what-is-digital-transformation-a-necessary-disruption.html*

[3]   Refer to the IIC *Digital Transformation in Industry* whitepaper

> digital content is delivered to consumers using a competitively priced, all-you-can-eat, and convenient to use online model. Customers flocked to Netflix "en masse", costing Blockbuster their business in few short years, and leading them to file for bankruptcy protection in 2010. AI-based recommendation engines came later and turbocharged Netflix' business model even further.

As mentioned earlier, what is new DX in Industry is that the transformation encompasses physical and digital environments.

2.1 DX IN THE ENTERPRISE

Figure 2-1 illustrates the notion that Digital Transformation is not a one-size-fits-all proposition. The transformation may be targeted at a specific process, example a factory production line, for the purpose of improving the effectiveness of this process, its efficiency, and ROI. Here, the term process is used generically to refer to a collection of related and structured activities that produce an output of value (service or product). Alternatively, the transformation may strategically target the enterprise which can impact the whole enterprise including its business, operational, and service models, as well as its overall value proposition.
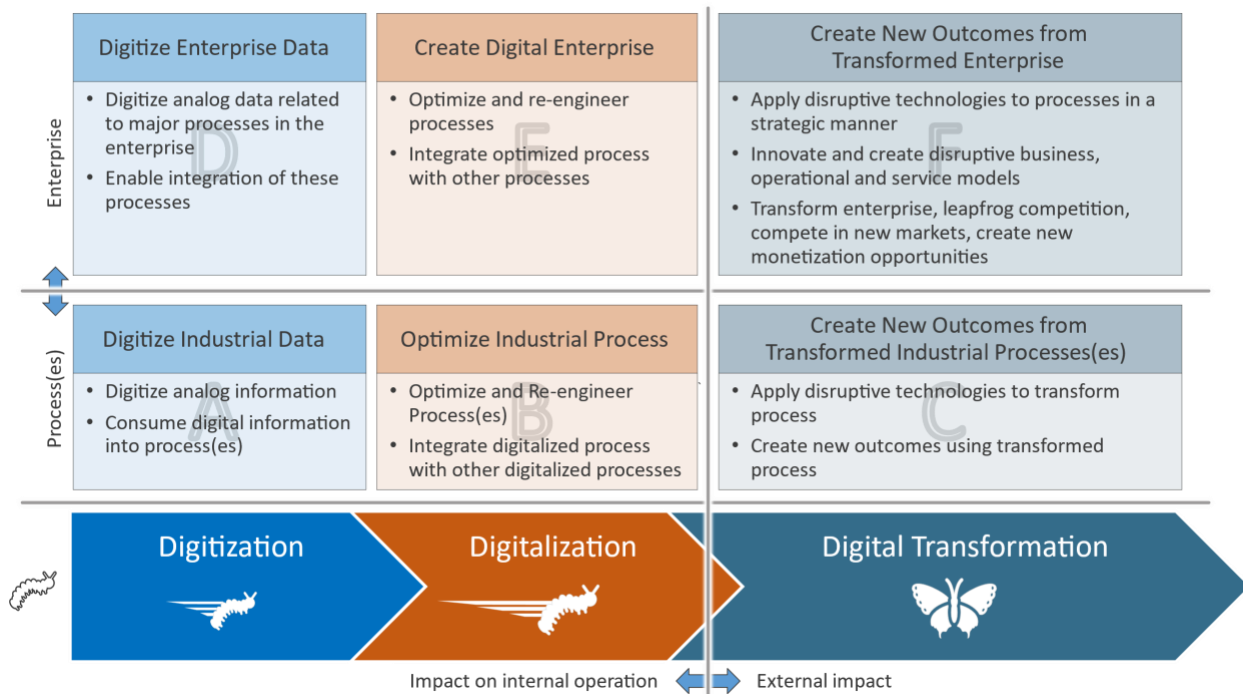

Figure 2-1: Different scopes for Digital Transformation. *Source: IGnPower.*

We should note that the term "Digital Transformation" can refer to a wide spectrum of initiatives and activities[4]. Some organizations use the term to actually and literally mean *digital*

---

[4]   *https://www.forbes.com/sites/jasonbloomberg/2018/04/29/digitization-digitalization-and-digital-transformation-confuse-them-at-your-peril/?sh=4ee9c9322f2c*

transformation. Others use it more broadly to refer to a mix *digitization*, *digitalization*, or *digital transformation*. These three terms overlap of course, but they are not identical.

- *Digitization* consists of converting analog[5] data into digital form in order to ease the consumption of this data within processes and improve operation,
- *Digitalization* uses the above and consists of optimizing and in certain cases re-engineering these processes and integrating them, producing process efficiencies,
- *Digital transformation* builds on the above even further in order to create new models for business, operation and service, uncovering new revenue opportunities.

Figure 2-1 also indicates that the impact of *digitization* and *digitalization* is most often internal to the organization, example cost reduction, better process efficiencies, faster execution, etc. Occasionally, the impact may be customer facing with external impact, example improving customer experience. On the other hand, the impact of *digital transformation* tends to be more external and market facing, example create new market opportunities, generate new revenues, leapfrog the competition, etc. This affects the enterprise value propositions and efficiency.

Based on the above, it is clear that organizations contemplating starting strategic DX initiatives should first establish clarity about the outcomes they seek, and the nature of the transformation(s) needed to achieve them. They should also implement process-centric tactical transformation projects and use the knowledge and insight they gain from these projects to refine and further develop their enterprise-scale transformation strategies.

2.2   DX JOURNEY

DX at the enterprise level (the focus of this article) starts with a business strategy and gradually evolves into a journey that takes the organization from the *fundamental challenges and threats* to the *better and transformative outcomes*, to the actual transformation of the organization and its business model and value proposition.

---

[5]   Information in non-digital form, example paper-based information (documents, drawings, etc.)
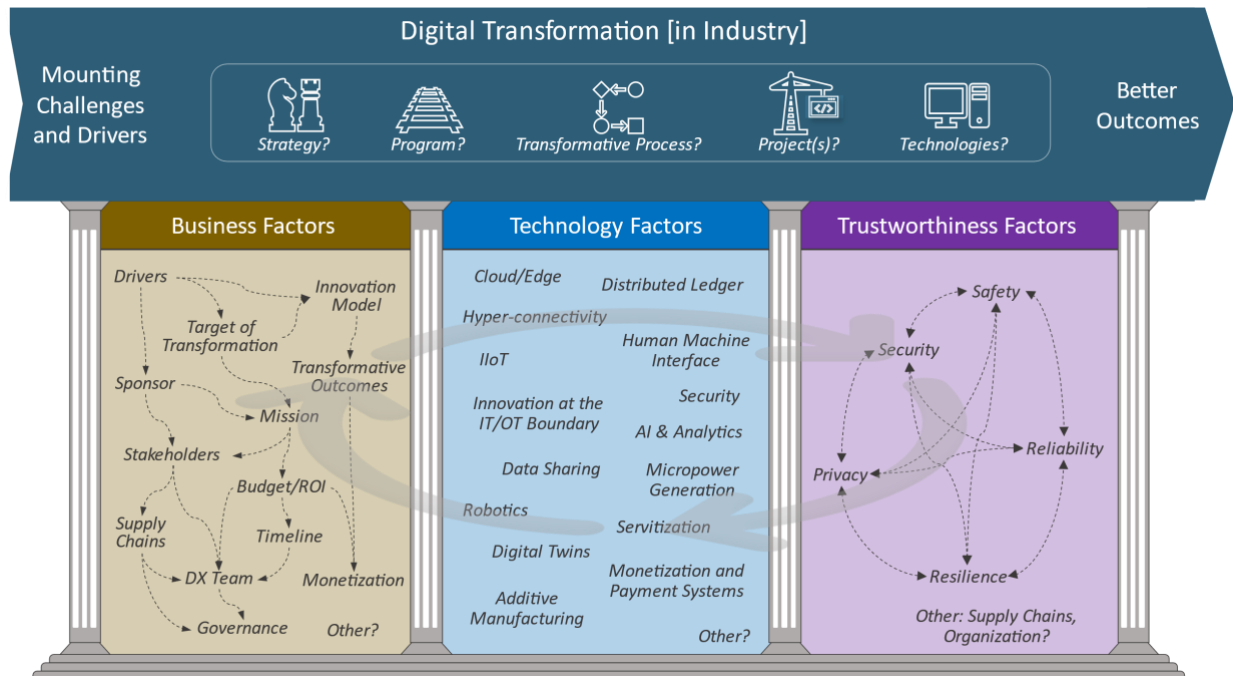
Figure 2-2: The Digital Transformation Journey. *Source: IIC.*

Figure 2-2 illustrates the DX journey along with the business, technological and trustworthiness factors that underpin it. This article provides a highlight about the various aspects of the DX journey. Please refer to current[6] and future[7] publications from the IIC for further details.

Mounting Challenges and Drivers: The motivations for deploying transformative solutions are diverse, but they share a need to do business in new and better ways. Market pressures such as increased competition can, if not addressed, lead to loss of market share. Regulatory pressures can also be drivers for transformation (the COVID-19 crisis is already increasing these pressures). Innovative technologies may enable (and compel) organizations to transform their businesses in ways that would have not been possible before.

Forces that may prompt enterprises to transform their business may also be indirect, for example an aging population may force a healthcare insurance provider to rethink how their services are provided to older clients.

Better Outcomes: The desired outcomes may take a wide range of forms. This includes new and innovative business models that offer substantially changed services to end users. This is often associated with new ways of charging for services. For example, a vendor of hardware assets offering those same assets as a service.

The outcomes can be new partnership models or new operational models, for example, an airline may change the way it buys spare parts to provide additional transparency of stock levels

---

6   Refer to the IIC *Digital Transformation in Industry* whitepaper
7   Digital Transformation Framework currently under development by the *IIC DX Working Group*

throughout the supply chain and increase efficiency. Finally, the outcomes can be changes to the customer experience to provide new and monetizable service revenues.

Business Factors: The transformation may not be limited to the application of innovative technology (or even require it). Organizational and process changes may be needed, such as the creation of innovative business and monetization models, the determination of the investment levels and ROI, the implementation of innovative processes that address the complexities and challenges of the IT and OT convergence[8], the establishment of a DX Program that has a clear mission, a governance structure with engaged stakeholders[9]. The DX program must also have an executive sponsor who defines the vision, and mandates and empowers the DX effort.

Technology Factors: The innovative application of emerging technologies (and some well-established) is one of the key factors that enable digital transformation. Figure 2-2 shows a sampling of these technologies, for example Digital Twins, AI and Analytics, Hyper-connectivity (including 5G), Distributed Ledgers, Edge Computing, etc. This list is not complete, and considering the unrelenting advances technology, it is certainly not final.

The transformation may also involve the application of more than one technology. The Steel Manufacturing Testing as-a-Service solution example provided in section 3 uses technologies such as AI/Analytics and Edge/Cloud.

Trustworthiness Factors: This is the degree of confidence that the system will perform as expected with characteristics including safety, security, privacy, reliability, and resilience in the face of internal and external threats and disturbances. Systems must remain compliant with requirements[10] throughout the DX journey. "Acting badly" can lead to loss of human life and equipment destruction. It can also raise the risks for the DX journey itself, significantly.

3 DIGITAL TRANSFORMATION PROGRAM

DX at the enterprise level is an endeavor that requires sustained and phased efforts which may span multiple projects, themselves requiring alignment and coordination. This is best achieved within the context of a DX program, which just like any other program, must include a number of important elements:

- Senior executive sponsor: defines the vision and the strategy, empowers and mandates a DX leader and team to define the mission statement and execute it,
- Program governance structure: mission, tracking reporting, communicating, etc.
- Program team: must be cross-functional due to the nature of DX at the enterprise, and

---

[8]   Refer to the IIC *BizOps for Digital Transformation in Industries* whitepaper by Dr. Chaisung Lim
[9]   Refer to definition in the *ISO/IEC/IEEE 42010:2011* standard
[10]   Refer to IIC's *IIoT Trustworthiness Framework Foundations:* regulatory, legal, industry best practices, etc., example OSHA 29 CFR 1910, IEC 61508, EU GDPR, GDPR, CCPA, etc.

- Program leader (DX Tsar) to drive and steer the program execution

Before an organization can embark on a DX initiative, it must assess the nature and scale of the challenges it is facing and find the optimal way forward. The organization must also understand that DX is not about technology[11]. Furthermore, the organization keep a balance between having a bold vision and maintaining a pragmatic and realistic perspective about its ability to execute it, with consideration of the resources, expertise and time available.

3.1 BEFORE YOU START

When starting a DX journey, organizations should go through a reflection period and deliberate on a number of important DX-related questions and analyze their impact on business, value proposition, operation, and bottom-line, for example:

- How will the markets that the organization is servicing look like in 5 years? and what is needed to succeed in these new markets?
- What are the main challenges and pain points facing the organization? disruptive technologies, growing competition, pressure to adopt new business models, etc.?
- What are the "better outcomes" that can best address the challenges?
- What changes are needed to address these challenges? Are these changes needed at the enterprise level (i.e. strategic) or are they focused on particular processes (business unit, production line, etc.)?
- Who will sponsor and drive the DX initiative at the executive level? a CxO level person?
- What is the level of investment and how will the transformation affect the ROI?
- What is the definition of success? can it be measured? What are the KPIs?[12]
- What are the execution priorities? organization, process, supply chains, etc.
- What is the timeframe for starting DX efforts and what are the milestones along the way?
- Which transformation-enabling technologies should be considered?
- Besides technology, what other changes are needed for the organization structure and human resources? expertise, structure, re-skilling, etc.
- Which business processes need to be changed to best capitalize on DX and its underlying changes?
- How has the pandemic impacted the urgency of transitioning to digital?[13]
- What risks and friction points are likely to be encountered during the DX journey? see the Risk Management sub-section
- What is the cost of inaction or late action?
- Who are the stakeholders in the DX journey? their perspectives, roles, win positions

---

[11] *https://hbr.org/2019/03/digital-transformation-is-not-about-technology*
[12] *https://www.forbes.com/sites/forbestechcouncil/2020/06/25/14-important-kpis-to-help-you-track-your-digital-transformation/?sh=187542f99342*
[13] *https://tecknoworks.com/digital-transformation-risks-and-mistakes/*

- Will the DX initiative be business-led or IT-led?

3.2 RISKS TO THE DX JOURNEY

The subject of risk (and risk management) during the DX journey is well covered in the market by the likes of industry analysts and major consulting firms. In its paper titled "Managing Risk in Digital Transformation" [14], Deloitte suggests that "the building blocks of the digital risk strategy is crucial to its success. An immediate step by organizations is to have robust measures around cybersecurity. The questions which need to be addressed are, 'Is this enough? Is cybersecurity the only risk to a digitally enabled organization?'" Deloitte then tells us that it is critical to consider risk areas beyond traditional risk. Deloitte then describes a "Digital Risk Framework" that covers a wide range of areas, including technology, cyber, strategic, operations, data leakage, third-party, privacy, forensics, regulatory, and resilience.

In its article "Mitigating the hidden risks of digital transformation"[15], CIO Magazine states that "Companies are looking to grab any technology-driven advantage they can as they adapt to new ways of working, managing employees, and serving customers. They are making bigger moves toward the cloud, e-commerce, digital supply chains, AI, data analytics, and other areas that can deliver efficiency and innovation. Enterprises are also trying to manage risk — and the same digital initiatives that create new opportunities can also lead to risks such as security breaches, regulatory compliance failures, and other setbacks. The result is an ongoing conflict between the need to innovate and the need to mitigate risk. New, cross-discipline risk management techniques are necessary to securely reap the benefits of transformative technologies."

When IIoT systems are implicated in DX effort, the risks to the journey and the organization itself are made more complex due to the digital-physical divide in these systems and the significant differences that exist between the IT and OT worlds in terms of technology, culture, organizations, and best practices.

The table below provides highlights about some of these risks:

Risks	Description
Technical[16]	Unwise choices may lead to serious functional, architectural, and operational issues. This is particularly significant with brown-field OT systems where it may be challenging to integrate them and align them the overall DX objectives.

---

[14]   *https://www2.deloitte.com/content/dam/Deloitte/in/Documents/risk/in-ra-managing-risk-in-digital-transformation-1-noexp.pdf*

[15]   *https://www.cio.com/article/3609831/mitigating-the-hidden-risks-of-digital-transformation.html*

[16]   Refer to the IIC *Industrial Internet Reference Architecture*

Risks	Description
Organizational	The cross-functional nature of DX, especially the IT-OT divide can lead to friction and lack of alignment between the perspectives and goals of stakeholders. This can result in a lack of commitment and "herding cats" challenges. The organizational risks may be also related to a shortage in staff expertise needed for the digitally transformed systems.
Financial	For digitally transformed environments that comprise IIoT systems, there may be a lack of clarity about the ROI or insufficient visibility about the value that DX can now deliver to the organization. This can lead to under-funding or over-funding situations, both unwelcome.
Trustworthiness[17]	Insufficient trustworthiness of IIoT systems during or after the transformation may negatively affect the DX Journey or derail it. The transformation may for example affect the compliance of a system, leading to certifiability issues.
Security[18]	Although it is part of trustworthiness, security merits to be discussed separately. OT systems that were originally designed to be isolated are now exposed to attacks of ever-increasing sophistication. This can lead to serious industrial accidents, which can have serious direct impact on the IIoT system itself, the DX journey and possibly the organization as a whole.

Such risks can lead to lost investments and squandered opportunities in the market. If left unmitigated, these risks can also deny the organization the fruits of transformation.

In addition to these tangible risks, there are also risks to the intangible side of the organization, such as brand and the organization's reputation. If these risks are not assessed and understood, the organization could suffer long damage to its business and bottom-line.[19]

3.3 ENTERPRISE IIoT SYSTEMS AND DX JOURNEYS

An IIoT system that performs a key role in the organization's ability to deliver value to its customers may be considered as an "Enterprise System" that garners the same considerations as other "Enterprise Systems" (example ERP systems). The IIoT system may perform that "enterprise" role on its own or as part of an integrated suite of enterprise systems.

Large enterprises have well-defined yet slow-to-evolve enterprise standards and best practices for enterprise systems covering a wide range of aspects, such as:

- Technical: architecture, technology, cloud usage
- Operational: uptime, disaster recovery
- Data protection, including security (system, data, software)
- Data: data architecture, lifecycle

---

[17]   Refer to the IIC *Industrial IoT Trustworthiness Framework Foundations*
[18]   Refer to the IIC *Industrial Internet Security Framework*
[19]   *https://www.forbes.com/sites/danielnewman/2019/07/09/every-digital-transformation-needs-risk-management/?sh=79998bf27141*

- Compliance: legal and regulatory compliance, defensibility, auditability, traceability

IIoT systems deemed as "enterprise systems" must follow these enterprise standards and best practices throughout their design, implementation and operational stages. When such systems are involved or even touched by DX initiatives, their adherence to these enterprise standards must be maintained throughout the DX journey. Organizations must also be prepared to adjust and evolve their enterprise standards to meet unexpected changes in market conditions.

An example of such an "enterprise IIoT system" is the IIoT system at Colonial Pipeline which manages the actual operation of the pipeline infrastructure and is integrated with business systems on the on the IT side. Risks to either side of this IT-OT integrated solution portfolio can affect the whole enterprise, as demonstrated by the recent security events there[20]. This means that in such enterprises, IT-OT considerations play a major role in the DX journey.

3.4   DX PROGRAM STRUCTURE

The organization must consider setting up a program to drive the DX initiative and execute on its vision. This program must embody the executive vision and strategy and transform them into a mission and a realistic and practical roadmap. The program must also be driven by a cross-functional team (dotted-line) that represents the various stakeholders, who must remain committed and engaged throughout their involvement in the DX journey.

The DX program leadership must also understand that the answer to the basic question "what is DX" can vary depending on the stakeholder and whether the DX effort will be business-led or IT-led. *Business* may be more interested in developing innovative and transformative models, *Management* may be focused on restructuring the organization and re-skilling its staff, *IT* may be mainly interested in what is involved to apply the transformative technologies, and finally *Operations* may be focused on implementing projects that can help them optimize production and operations and augment the trustworthiness of their IIoT systems.

The organization must also adopt a middle-out approach that takes into consideration the top-down and bottom-up perspectives of stakeholders and harmonizes the local DX activities with the overall vision and aligns them.

Perspective	Description
Top-down	A senior executive should take on the responsibility of DX Executive Sponsor. This Executive CxO should define the DX vision, and mandate and empower a "DX Tsar" with authority and resources to execute and deliver on that vision.

---

[20]   *https://www.bloomberg.com/news/articles/2021-06-04/hackers-breached-colonial-pipeline-using-compromised-password*

Perspective	Description
Bottom-up	Stakeholder groups may have their own and siloed perspectives about how to optimize and transform their local operations (e.g. digitize factory production lines or implement AI to optimize preventive maintenance).

This is easier said than done. The scope and timeline of individual DX activities may contradict with each other. The DX activities in one silo may be interdependent with DX activities in another silo. Furthermore, some local DX initiatives may not align with the executive DX vision and timeline. Where possible, projects should be realigned with the overall DX strategy. Projects that are mismatched with the overall DX strategy in a fundamental way (scope, timeline, etc.) may need to be restructured or perhaps opted out of the enterprise DX effort.

Creating an alignment between divergent bottom-up perspectives and top-down vision is hard. Sustaining that alignment is harder. There are too many moving parts, too many friction points, too many egos, etc. At the same time, the digital world requires foresight, agility, and speed. There is little room for error.

In order to mitigate these challenges, organizations must "innovate by rapid experimentation" (Rogers 2016) and "test fast, learn fast, scale fast" (Kane et al. 2019). The way the DX program and its related projects are designed and implemented must be adjusted to allow fast experimentation and allow pivots, even fast cancellation, when the implementation results reveal negative signs. Conventional work processes, existing organization structures and funding models may not allow such "innovate and fail fast" culture.

For these reasons, the DX journey should start with a clear roadmap and framework for changing work processes in an innovative way. This must be closely followed with actual efforts to implement these process changes.

The significance of the above for IIoT is that due to the complexities of IT-OT convergence, the processes involved in integrating IT and OT are substantially different from existing processes, often conflicting with them. These differences can be organizational, technical, financial (funding, budgeting, etc.), and operational. Ideally, the DX Program should foster fast bottom-up feedback about conflicts, while at the same time top management should be agile in responding to the feedback and mitigate the elements of the management system causing the conflict.

For further details about the above, please refer to the "Designing new innovation process as a key challenge to firms undergoing digital transformation in industry" article in this JoI issue and to the IIC "BizOps for Digital Transformation in Industry" whitepaper[21].

---

[21] Refer to the IIC *BizOps for Digital Transformation in Industries* whitepaper by Dr. Chaisung Lim et al

Figure 3-1 describes the structure of the DX program and the activities involved in it:
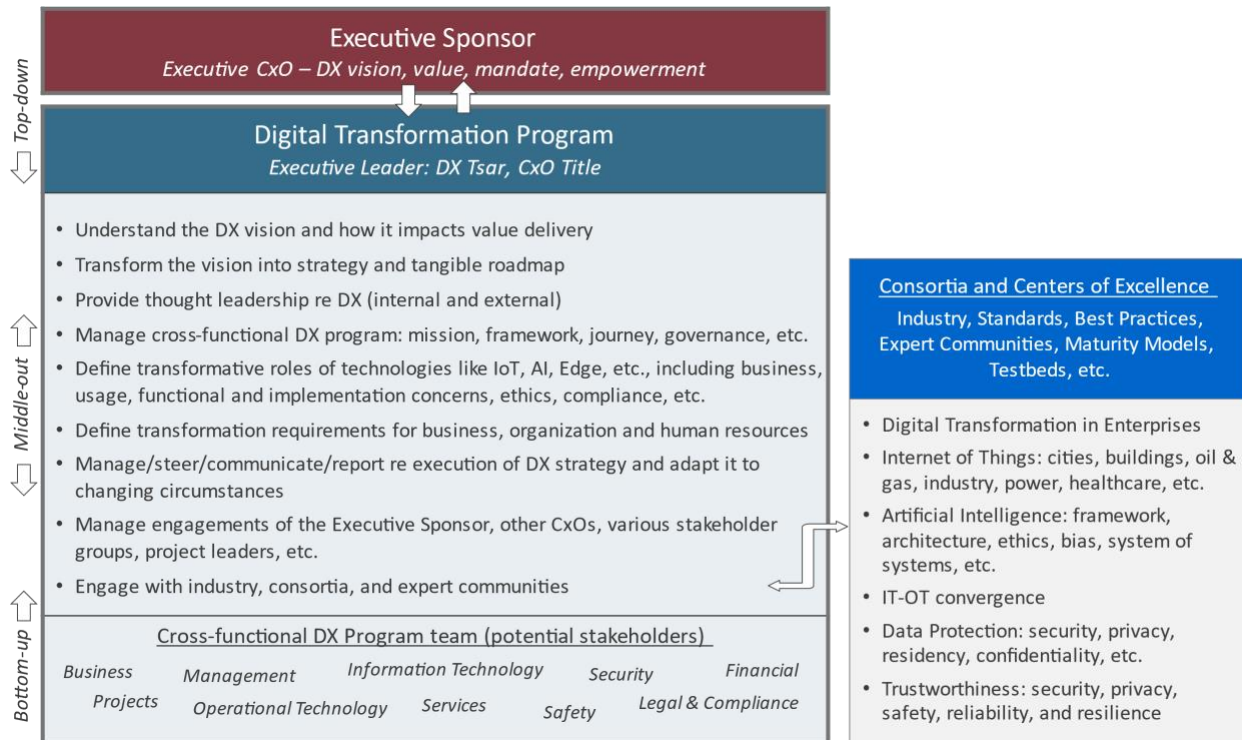

Figure 3-1: The Digital Transformation Program. *Source: IGnPower.*

3.5   DX PROGRAM LEADERSHIP

The individual assigned to lead the DX program in the enterprise, the "DX Tsar," will play a crucial role in the success of the DX strategy within the organization.

Ideally, this individual should be an experienced CxO caliber person who is mandated and empowered by the Executive Sponsor to execute and deliver on the DX strategy. The "DX Tsar" must a versatile individual with a diverse range of knowhow and servant leadership skills, including the following:

- Understanding of the challenges facing the organization, from business, technical, risk, and operational points of view,
- Understanding of how and how far the organization should transform the way it delivers value to the market,
- How the innovative use of technologies can enable such transformation,
- Be involved and possibly lead the pre-DX self-reflection efforts described in sections 3.1, 3.2, and 3.3,
- Understand the diversity of culture of various functional stakeholders,
- Communicate the value of DX Program internally within the organization to the stakeholders and the executive sponsor in language that they understand and relate to, this includes the executive, operational, financial, risk and legal stakeholders, and

- Communicate externally about the DX vision and strategy, or support the executive sponsor in performing that function

The title (and reporting structure) of the "DX Tsar" may vary depending on the organization, example Chief Digital Transformation Officer (CDxO), Chief Digital Officer, etc. The DX Tsar can also be the CIO or a direct report of him or her. Alternatively, this individual can be an external resource with the knowhow and skill sets described above.

4 EXAMPLES OF DIGITAL TRANSFORMATION

There is a wealth of publications on Digital Transformation in a wide range of industries. Below are a few examples. It is worth noting that in some of the examples, especially Domino's, the use of IoT technology was not the main transformative factor but was significantly nevertheless involved in the overall DX strategy and contributed to its dramatic success.

4.1 DIGITAL TWINS FOR PRESSURE VESSELS IN OIL AND GAS

Use Case	Digital Twins for Pressure Vessels in Oil & Gas Industry
Description	Shell is advancing the structural integrity of pressure vessels in its offshore facilities using the engineering simulation solution from Akselos, which uses a structural digital twin and cloud-based big data analytics. The system captures real-world sensor data from rigs (information on corrosion, hull damage, strain, wind and sea states, etc.) and performs thousands of structural simulations on the Digital Twin. The intent it to help Shell achieve the following: • Create detailed and physics-based replica of physical assets • Measure real world asset loading and condition • Perform continual prediction of structural integrity • Guide optimization of inspection, maintenance, and repair processes • Perform operational scenario planning support
Drivers for DX	• Improve industry practice for inspection and maintenance • Unlock full potential of robotic inspection • Increase accuracy and speed and reduce cost of assessment • Produce highly predictive framework
DX-enabling Technologies	• Structural Digital Twin by Akselos Lausanne
Transformative Value	• 45% reduction in downtime • 25% reduction in maintenance • Improve overall asset efficiency

Use Case	Digital Twins for Pressure Vessels in Oil & Gas Industry
DX in the Enterprise	• Digital Twin based offering is key for transforming the maintenance function at offshore operations at Shell by reducing downtime and improving asset utilization and efficiency • Digital Twins and Engineering simulation technology is being applied in the transformation of other functions in offshore operations at Shell, example life extension through predictive maintenance[22]. • These digitalization efforts are focused on specific functions and processes within Shell's offshore operations. They are also prime examples of how "local" transformation efforts can be used as stepping-stones for more strategic enterprise DX efforts.[23,24]
Sources	• Akselos[25] • Deloitte

4.2 STEEL MANUFACTURING QUALITY INSPECTION

Use Case	Steel Manufacturing Quality Inspection[26]
Description	The QA Departments of steel manufacturers need to test samples of the steel they produce to make sure it meets steel industry standards. Toshiba sold steel manufacturers a steel inspection equipment (MetalSpector) that included an auto-focus optical microscope, color area sensor camera, and an image processor.
Drivers for DX	• Labor intensive QA process • Long inspection hours caused by increasing number of samples • Lack of consistency in grading judgement depending on inspector • Skill transfer difficulties from veteran inspectors to junior inspectors
DX-enabling Technologies	Toshiba replaced MetalSpector with a cloud-based and AI-enabled Steel Grade Evaluation as-a-Service offering: • Capture steel images into a historical database • Transfer image data to a cloud service that feeds an AI model estimator • AI model analyzes digital images and estimates steel grade quality • Estimates is sent back to client through the service offering • Estimates used to assist QA inspectors in making final decision about steel grade quality

---

[22]   *https://www.hartenergy.com/ep/exclusives/life-extension-through-predictive-maintenance-179799*

[23]   *https://www.rechargenews.com/transition/shell-inks-key-energy-transition-digitalisation-deal-for-oil-gas-and-wind-projects/2-1-931734*

[24]   *https://www.akselos.com/news-detail/akselos-and-shell-sign-three-year-agreement*

[25]   *https://www.akselos.com/storage/upload/media/resource-pdf/shell-success-story-north-sea.pdf*

[26]   Refer to the article in this issue of the Journal of Innovation titled "Applying Digital Transformation to Steel Grade Evaluation Services"

Use Case	Steel Manufacturing Quality Inspection[26]
Transformative Value	• Business application changed from product function to product usage • Business revenue stream changed from hardware sales model to as-a-service sales model • Data integrity eliminates data fraud • Transfer of skills to the junior inspectors
DX in the Enterprise	• Project has Divisional CxO visibility and is being used as one of the key measures to show value of DX for the enterprise
Sources	• Toshiba

4.3 NIKE

Just like many other companies in the consumer and fashion industry, Nike was heavily affected by COVID-19 lockdown. Nike closed more than half of its 1,100 stores in China in February 2020 and half of its US stores by mid-March.[27] In order to maintain their connection with customers and keep the business and the brand alive, Nike boosted its digital strategy and its direct sales. It also created multiple digital spaces for customers to interact with the brand's big influencers: the high-performance athletes.

Nike also deployed several digital platforms for free. *Nike's digital ecosystem:* A library of digital workouts and resources for free. *Livestream workouts:* Live workouts are streamed every Saturday by Nike Master Trainers on YouTube. *Digital Fitness Challenges:* The Living Room Cup is a digital workout series where athletes set challengers for users to take part in at home.

4.4 DOMINO'S

Domino's story is a fairy tale of Digital Transformation in the 21st century[28]. In the 90s there was no home delivery system for pizza. For most people in North America, the main choices were to go to either Pizza Hut or Domino's. Pizza Hut used to win most of the time because they used to give experience and ambiance at the restaurant that Domino's could not.

Since then, Domino's has pursued a multi-pronged strategy mainly relying on digital transformation. It invested heavily in digital capabilities and with quick cadence, starting with rock-solid IT capabilities that would be able to support the new digital innovations:

- 2008: "Pizza Tracker" to keep customers updated on the progress of their order,
- 2011: iPhone app to allow customers to order on the go,
- 2015: "Anywhere" to allow customers to order from anywhere and anytime,
- 2016: world's first drone delivery of pizza, and

---

[27] *https://digital.hbs.edu/platform-digit/submission/nike-just-do-it-differently/*
[28] *https://thestrategystory.com/2020/07/11/dominos-digital-transformation/*

- 2020: "Domino's Carside Delivery service" as a way to fight against COVID through a transformation of its carryout method.

Domino's is today a technology company with half of its workforce at headquarters in software and analytics. In FY2019, it achieved an annual revenue of $14 billion through its 17,020 restaurants across the world. A $1000 investment in Domino's stock in 2004 (the year they went public) was worth $58,000 in 2020.

5 CONCLUSION

Digital Transformation is the inescapable journey of the organization from the "mounting challenges" to the "better outcomes" that address these challenges. *DX at the enterprise level* is more encompassing in scope and complexity than its "simpler" *DX at a process level* brethren (project), especially in regards to the IT-OT convergence technical and organizational issues.

DX at the enterprise level is not a cruise. It is a trail trek with plenty of opportunities to make wrong turns that could derail the strategy. Before jumping into implementation cycles, the organization should define the executive vision for DX and establish a program that transforms that vision into a mission and a tangible, and agile roadmap. The program must also be led by an empowered "DX Tsar" who guides the DX efforts and steer them as conditions change.

6 ACKNOWLEDGEMENTS

➢ Return to *IIC Journal of Innovation landing page* for more articles and past editions