DEVELOPING AND EXECUTING DIGITAL TRANSFORMATION STRATEGIES

Digital Transformation Planning Guide
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Digital transformation provides the pathway to success for industrial, infrastructure, and smart city organizations. Yet, mistakes, false starts, and dead-end investments are all too common. To modernize, organizations need a digital transformation-specific planning method to ensure initiatives are aligned with business goals, grounded in operational realities, and designed to scale.

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Executive Overview

The digital transformation of industry, infrastructure, and cities is under way. ARC sees this across all markets and among organizations of all sizes.

New business processes, services, and models are being pursued. This energy and investment is a rational response by organizations (and even countries) to digital economies that present new and very real opportunities. When combined appropriately, data and technology can provide competitive advantage, that – in some cases – enables organizations to leapfrog their peers.

This report details ARC's three-phase methodology for developing and executing digital transformation strategies. It provides direction for organizations planning or engaged in digital transformation. Organizations can use it as a blueprint to ensure their initiatives are aligned with business goals, grounded in operational realities, and designed to scale.

More data is being generated and accessed than ever before. Increasingly, physical assets (devices, machines, and other "things") are being interconnected. Advanced technologies such as machine learning proliferate. The cost of these advancements continues to drop, encouraging industrial and infrastructure-related organizations to harness this combination to modernize, improve, and transform their businesses and services.

More than ever, digital transformation is mission critical for business health and viability, both short- and long-term. Digitally transformed organizations will be able to transition to and thrive in digital economies, making digital transformation a matter not of "if," but "when."

Despite the promise, companies are struggling to execute and scale digital transformation. ARC has observed a huge gap between the desire of most organizations to digitally transform and their ability to do so.

But we're seeing pockets of success. ARC has witnessed real results from digital transformation, Industry 4.0, and Industrial IoT-related projects. Predicting asset failure, optimizing processes, and improving product quality are three areas where organizations have achieved good, measurable return.

However, these results are typically limited to narrow, often-siloed uses of digital transformation technology. The question, of course, is why?

In many instances, ARC clients indicate that formative aspects of solutions are difficult to replicate across use cases and applications, which hampers

scalability. At this point, it seems uncertain as to whether "productization" of these solutions is a reasonable expectation or if customization will be the norm from project to project.

Less disruptive solutions, like use of drone for data collection or rules-based remote monitoring, may lend themselves to repeatability. However, this might not be the case for more operationally invasive applications such as implementing prescriptive analytics or edge machine learning since the resource and expertise required may be burdensome or not well understood. It's no wonder, then, that return on investment is often poor or inconsistent. Simply put, sustainable, scalable digital transformation remains hard to achieve.

With no bridge between strategy and execution, digital transformation remains limited in terms of scope, ROI, and sustainability.

In response, many bits of wisdom have been offered, often by solution providers: focus on business need, start small but plan big, identify low-hanging fruit use cases, and empower subject matter experts. These are broad enough to be conceptually helpful, but not granular enough to act upon. ARC has observed that with digital transformation the output can be so far from status quo operations and traditional comfort zones that change is difficult to envision, plan for, execute, or sustain.

Strategic-level "wishes" often get pushed downhill to operations to carry out, without an understanding of the process, technological, and cultural realities preventing success. Or, there is some type of "dip the toe(s) in the water" operational execution with limited guiding perspective of enterprise-level considerations or reasonable expectations for scale. With no bridge between strategy and execution, digital transformation remains limited in terms of scope, ROI, and sustainability.

This report explains ARC's three-phase methodology for developing and executing digital transformation strategies. It provides direction for organizations planning or engaged in digital transformation. Organizations can use it as a blueprint to ensure their initiatives are aligned with business goals, reflect operational realities, and include scalability planning.

Common Missteps

Digital transformation presents many challenges. These can range from the potential for massive revamping of business and work processes to completely new models for customer engagement. Some challenges are understood but still difficult, such as dealing with legacy technology and infrastructure. Many challenges simply can't be foreseen, yet the organization must be prepared to deal with them.

This dynamic of modernizing and future-proofing in parallel is difficult and traditional methods of strategizing do not hold up well. Due to this, many organizations are making missteps as they work through their digital transformation journeys. ARC has identified three common contributors to poor outcomes in digital transformation strategy development and execution.

Misstep #1: Possibilities without Direction

When considering digital transformation, one must start with a seemingly straightforward question: what is it? ARC defines it as the transformation of industrial products, operations, value chains, and aftermarket services that are enabled through the augmentation of people and knowledge, through the expanded use of sensors, data and analytics, automated and crowdsourced.

When viewed through that definition, there are many ways to achieve digital transformation. A few examples include employing:

- New ways to maintain operating assets
- New operating tools, techniques, and procedures
- Digital simulation and AI-based product design
- Different sourcing mechanisms and procedures
- Dynamic digital knowledge bases and virtual experts
- Selling/buying outcomes instead of products
- Dynamic relationships with customers, instead of one-time sales

The myriad opportunities involved require some means to filter decision making on which path(s) to take, why, and in what order. Without cohesive direction, leadership lacks the ability to galvanize the organization around what change means.

Misstep #2: Pursuit of Technology

As organizations contemplate approaches to digital transformation, many of those tasked with implementing the transformation are asked to explore concepts, technologies, and methods outside their areas of expertise. A natural line of thinking arises: a technology or set of technologies (e.g., platform) can be identified and purchased to drive all or most aspects of change.

As a result, conversations become technology-centric. Digital transformation turns into the pursuit of the silver-bullet solution or a proof of concept of the latest-and-greatest technology. Striving to get a potentially high-risk decision right, organizations look to compare solution techniques, tools, and technology architectures in "apples-to-apples" ways, even when that's not possible. What gets washed away in the process is a critical success factor: the focus on the people aspect of digital transformation.

Misstep #3: Organizational Impediments Limit Scope

If and when the organization moves beyond the non-productive, "hamster wheel" pursuit of technology, it ends up in a better place. It figures out, often with the help of vendors, how to view digital transformation in terms of a defined, and usually narrow business need.

If an organization focuses only on the business need, it might get solved, but the business will rarely be sustainably transformed. In many cases, the organization limits its ability to confront organizational barriers that impede sustainable change.

This defined business need becomes the stepping-off point for digital transformation, which leads to organizations pouring energy into figuring out how to scale from this starting point. ARC is now seeing a segment of the market in this state.

The business need focuses on specific use cases, processes, people, data, measurement, and return. While this is certainly a step in the right direction, it still contains a critical flaw.

If an organization focuses only on the business need, it might get solved, but the business will rarely be sustainably transformed. In many cases, the organization limits its ability to confront organizational barriers that impede sustainable change. As a result, it should come later in the digital transformation planning process, not first.

Three-phase Path to Digital Transformation

It may help to consider digital transformation in terms of butterfly metamorphosis. The four stages of the lifecycle—egg, larva, pupa, and adult—are distinct yet inextricably linked. The starting point within one is very different from the result at the end of the stage, and it may even look or feel transformational. However, it's not viable to stop after just getting through one or two stages; a halfway butterfly is not an acceptable end state.

Like the butterfly, halfway transformation won't work for industrial, infrastructure, and smart city organizations. To achieve sustainable outcomes, plans and roadmaps for digital transformation must link strategic objectives with the specifics of each project that is executed. This ensures organizational adherence to a cohesive business strategy at all levels and throughout the entire transformation process.

Just as importantly, the strategies that drive digital transformation must be fully informed by operational realities for buy-in, scale, and long-term success. This top-down, bottom-up synergy requires connective tissue that maps one to the other and allows enough flexibility for dynamic adjustment as plans and deployment pilots unfold.

ARC recommends a three-step process when planning digital transformation. This process accounts for the unique, forward-thinking ideas that drive digital transformation.

To ensure success, ARC recommends a three-step process when planning digital transformation. This process accounts for the unique, forward-thinking ideas that drive digital transformation. It also provides a meaningful way to consider the role of technology and pilots in terms of how to select, deploy, and scale them within a strategic framework. Finally, and perhaps most importantly, it accounts for the people side of digital transformation, often the hardest barrier to success.

At its simplest, ARC's process addresses three related questions that cover organizational maturity, applications and technologies, and readiness and execution. As shown in the following figure, these questions and their answers provide a framework from strategy development through tactical execution.

ARC's Three-step Process for Digital Transformation

This should not be considered waterfall planning; the visual merely reflects strategy-to-tactics thinking inherent in any good business planning. Unlike waterfall methods, ARC's process invites more agile methodology into the planning process to better account for the nature of digital transformation.

Looking at the process one layer deeper, each of the phases includes a digital transformation-specific purpose along with the goal necessary to achieve it. The process also identifies the managers of each phase:

Organizational Maturity

Purpose: Define the company in terms of digital transformation, based on strengths and weaknesses

Goal: Understand current processes and human capital, identify gaps, and level set expectations

People: C-suite and other senior executives

Application & Technologies

Purpose: Identify operational aspects where change can be affected and what technologies might be applied

Goal: Provide an operational view of digital transformation and map that to available solution pathways

People: Operations and line-of-business leads

Execution Design

Purpose: Design path for organization's ability to pilot/deploy and gain value, based on preferred technology

Goal: Create execution plan & Identify execution barriers that limit proof of concept and scale

People: Project team and subject matter experts

Drive Continuity Across the Digital Transformation Process

Phase 1: Ensure Reality Informs Strategy

The first phase of creating and executing any vision or plan involves identifying and defining the strategy. This is a corporate responsibility with which most C-suite and other senior executives are conceptually familiar and comfortable.

There are many solid approaches for working through this process and driving the outcome into operational execution. There are even methods for working through substantial, disruptive change. However, these methods seem to fall apart when it comes to digital transformation. Why?

Even when begun with small starting points, digital transformation will eventually reinvent core swaths, if not the entire business. Because technology is such a key piece, it will drive transformation in many ways (and at a speed) that simply cannot be anticipated at present. This is where traditional planning falls short.

In one example of this, an operations group was tasked by its C-level executives to implement real-time monitoring and predictive maintenance solutions. The operations team obviously had a clear understanding of the legacy assets in use (though visibility into these assets was limited) and the maintenance strategies that had been applied, however ineffective. Yet, the team tasked with executing the initiatives had no real insight into the nuances of predictive analytics techniques and Industrial IoT connectivity, expertise in data science and data wrangling, or how they could apply any of these in a practical manner.

In fact, operations had massive gaps in data and access to it, particularly around failure modes for its vast quantities of borderline-obsolete assets. Also, operations had no real awareness of the immensity of these barriers when it came to real-time monitoring and analytics. Why should they?

The company wasn't prepared to or capable of implementing condition-based maintenance, much less predictive methods. Yet, its executives, with no practical guidance into what they were asking, insisted operations figure it out and gave the group budget to stand up pilots. Not surprisingly, this didn't go well.
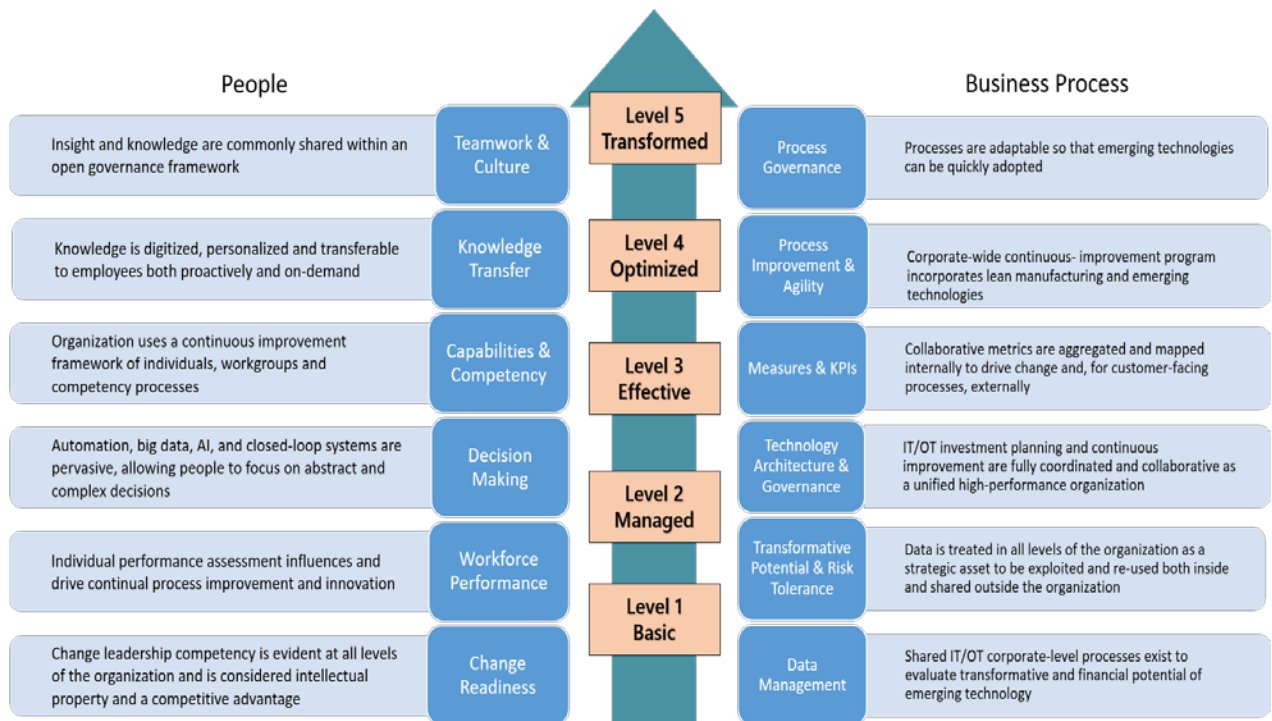
To avoid this, strategic decision making must be grounded in operational reality. This can be achieved by filtering enterprise-level, forward-thinking

views through organizational makeup and capabilities. This means candidly examining (and, perhaps, confronting) the organization's:

- Culture of innovation, which indicates the organization's willingness to change
- State of things and processes, which reflects scope of change required
- Organizational expertise, which indicates resources and skills available for change

This examination can be conducted through an organizational assessment. To be effective, the assessment needs to be specific to digital transformation.

ARC's assessment process consists of twelve categories that cover both business and people readiness. As shown in the chart below, these are measured against five levels of digital transformation maturity.

Digital Transformation Categories and Maturity Levels

The output of this phase is a profile that compares the organization's makeup specifically against maturity levels of digital transformation. The assessment process helps ensure that:

- Digital transformation is given organization-specific context based on accepted definitions, goals, and benefits
- The impediments to transformation are identified

- Expectations can be set for levels of difficulty for change
- A means for prioritizing change (i.e., strategic direction) is generated

Once the organizational assessment is complete and a profile generated, the final step in this phase is to harmonize it with existing strategic objectives. This alignment ensures that digital transformation supports overall business goals, such as financial growth targets, competitive market position, and customer satisfaction.

For example, if the strategic goal is to generate incremental revenue by entering a new market, the organization can identify how digital transformation initiatives might support the effort and determine if organizational barriers are likely to hinder progress. That helps set direction in phase two for prioritizing digital transformation initiatives.

The assessment and profile processes provide high value, both immediately and over the longer term. An organization that leads with this step will be well placed to examine any given digital transformation initiative - current or future, small or large - and objectively consider its strategic importance, potential benefit and ROI, and likelihood for sustainable success. This speeds go/no-go decision making for any business case put in front of executives.

Phase 2: Connect Strategy to Business Need

With a completed assessment and profile, the company can focus on defining action paths. As a result, the second phase should be completed by operational and line-of-business leadership, informed by the results of the assessment and under the guidance of a C-level sponsor. Bringing in this layer of leadership helps ensure that decisions reflect operational realities.

The goal is to provide a prioritized, operational view of digital transformation and map the solution pathways available for doing so. In this phase, the term "solution" should be considered broadly (analytics, connectivity, cybersecurity, augmented reality, etc.) to describe the likely technology buckets that will need to be leveraged to achieve an outcome.

This phase determines the playbook of high-priority initiatives that will be addressed. The second phase becomes the connective tissue between strategic direction and tactical execution of business needs. Its purpose is to

identify where change can be made, how challenging it will be to undertake it, and what means might be considered.

With the assessment as a framework for identifying what needs to be done, leaders can pinpoint and weigh specific business needs. Examples include:

- Targeting lagging process, business, or operational areas that could slow overall transformation or significantly impede a strategic goal
- Comparing benefits versus level of internal difficulty relative to other priorities
- Examining competitive movements or macro trends in the market and the potential to address them to achieve advantage

Filter	Outcome
Change Definition and Objective	What business need does the initiative address? Based on how the organization currently works, how will it operate in the future if the initiative is successful?
Metrics	Based on key performance indicators, how will the organization know if the initiative is successful?
Human Resources	What skill sets are necessary and where (or) do they reside in the organization? Who champions the initiative and why?
Data and Cybersecurity	What data strategy and security are necessary to support the improvement? What changes will be necessary to current data management and governance?
Infrastructure	Is the existing infrastructure ready to support this improvement? If not, what will need to change?
Dependencies	How contingent is the success of the initiative on change in areas outside of its defined scope? Are those dependencies also part of another high-priority initiative?
Solution Path and Justification	What technology or solution category will be needed to support this and why? What means were considered and bypassed and why?
Strategy Mapping	To what overall strategic goals does this initiative contribute to and how?

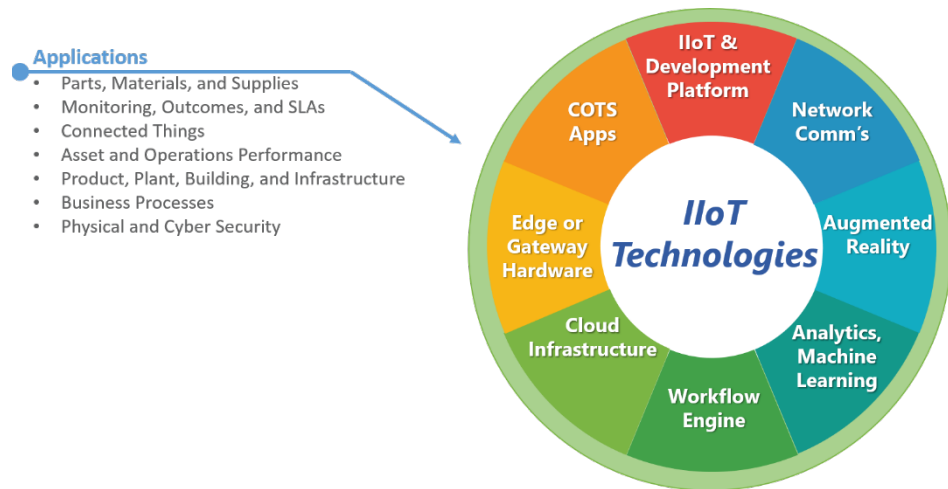**Potential Filters and Outcomes**

As these possibilities are weighed, a prioritized list of initiatives will become evident. With the list in place, a pragmatic decision framework will need to

be built to provide operational and business context that guides the priorities. The filters for this decision framework are likely to vary across businesses.

As decisions are made and documented, the output of this phase is a business case (or series of them), well grounded in both strategic direction and operational realities. Thus, it is ready for C-suite review, adjustment, and sign off.

For a potential scenario, consider an industrial company that has completed an assessment. The C-suite now understands that its data management and process governance capabilities are relatively mature, but it has major gaps in operational knowledge and cybersecurity and lacks key expertise in continuous improvement.

Understanding those challenges, operational leadership completed the framework, considering the technology paths to support problem solving. The team identified asset performance management and environmental management as priorities.

Applications
- Parts, Materials, and Supplies
- Monitoring, Outcomes, and SLAs
- Connected Things
- Asset and Operations Performance
- Product, Plant, Building, and Infrastructure
- Business Processes
- Physical and Cyber Security

IIoT Technologies

IIoT & Development Platform · Network Comm's · COTS Apps · Augmented Reality · Edge or Gateway Hardware · Analytics, Machine Learning · Cloud Infrastructure · Workflow Engine

IIoT Technology Paths to Problem Solving

The business cases indicate that intelligent hardware, analytics, cloud processing, and a workflow engine will be required to support improvement, with some form of augmented reality assisting with knowledge transfer and compliance verification. It will all be underpinned by active defense cybersecurity defense.

At the end of this phase, the organization has:

- High-prioritized, strategic initiatives identified, defined, and mapped to granular processes, people, and things that can carry them out

- Strategic rationale for considering the means of change (analytics, digital twins, cloud, etc.) while also avoiding "shiny-object" decision making on technology and vendors

- Understanding among leadership as to the difficulty, breadth, and benefits of transformation as well as agreement as to why specifically defined change will be undertaken

Of course, for each organization the specific applications and technologies will depend upon the output of phase 1 combined with the answers provided in the framework in phase two. However, the examples given in the above scenario can serve as a model.

Phase 3: Align Framework to Tactics

With the first two phases complete, an organization has put in place the fundamental building blocks for a digital transformation plan and begun the move toward action. It has discovered where possible changes could be made and determined how capable the organization is of transforming. It then uses that discovery to narrow its focus to where change will take place and why. The organization has also created an operational framework and rationale for how transformation will occur and what (and who) is involved.

With strategic and operational direction in place, the organization can now focus on phase three: execution. This entails designing a pathway to pilot and deploy technology to help solve a specific problem (i.e., use cases). The goal is to create an execution plan that accounts for barriers that limit proof of concept and scale. While operational leadership will likely need to begin the work in this phase, they should turn it over to a cross-functional team once the appropriate project leads and subject matter experts have been identified.

ARC's method for the execution phase encapsulates five elements for piloting and scaling a digital transformation solution. The five components are common to many complex projects and technology deployments. However, they will be couched here within the context of digital transformation.

In fact, these components provide more granular, pilot-focused detail to the questions raised in the framework portion of phase 2. The components are:
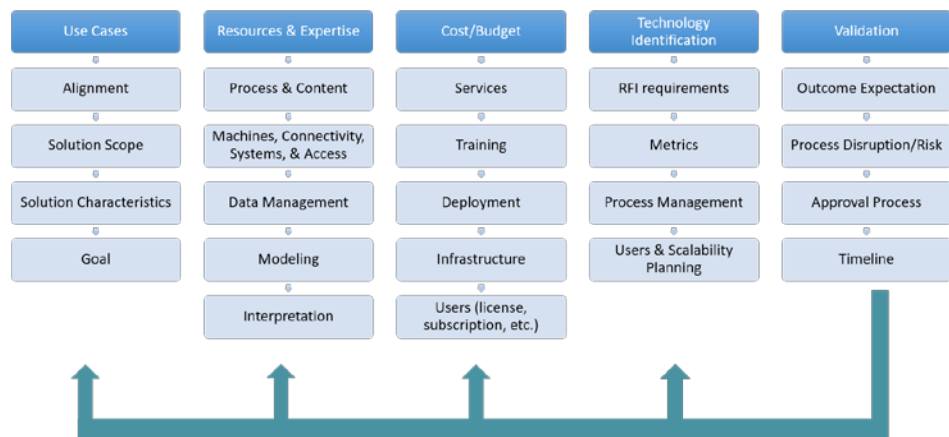

1. **Use Cases:** Identifying the specific problem to be solved and what needs to change to do so, irrespective of technology. The scope is identified to limit the unwarranted expansion that often occurs when trying to justify ROI of digital transformation projects. For instance, a predictive analytics pilot could be limited to an asset within a plant, a class of rotating assets across multiple plants, or simply a test data set.

2. **Information and Expertise**: The organization must determine what skills and information are needed to execute a use case pilot and scale the solution. This will almost always involve subject matter experts from operations, but could also include system super users, data scientists, decision engineers, coders, etc. Understanding what experts need to be included sets organizational expectations for how disruptive the pilot might be on existing job roles, responsibilities, and operational processes. In ARC's experience, the members that will be called upon to make up the project team are typically self-evident to operational leaders.

3. **Cost and Budget**: As with any project, cost and budgets need to be considered. Here, the organization must consider elements that can be specific to digital transformation, such as subscriptions and other pricing models, data storage, and intelligent device purchases.

4. **Technology Identification**: There are many technology providers for digital transformation. Many are niche and/or new, some are legacy providers, and others resemble a mix of both. The possibilities can be overwhelming. It is best not to employ traditional RFI processes for

digital transformation projects since typical RFI questions asked of vendors are insufficient. A three-phase approach is more strategic here, since it enables the organization to precisely describe to vendors what it is trying to accomplish and/or overcome and how it wants to do so. It enables the pilot team to accomplish a difficult task - comparing vendors in a like-to-like manner. It also engages vendors in identifying likely paths for scaling their solutions, based on the use cases and data they must work with.

5. **Validation**: The final step of the third phase provides an alignment check for the pilot. It ensures that outcomes meet expectation and that disruption and risk are understood and accepted at all levels of leadership, not just handed over to the project team to deal with. This step emphasizes understanding the associated disruption since, by definition, digital transformation requires organizations to reinvent or rethink processes, many of which have been in place for decades. As the prior steps are put through the validation process, feedback, refinement and adjustments can be made as necessary.

Like phase two, details within the five components will be specific to an organization based on which initiatives are prioritized and what technology paths make the most sense. Based on the example used in this report, ARC's method would consist of the following:

Framework for Digital Transformation Pilots and Technology Deployment

By linking all three phases in a cohesive manner, the organization avoids the missteps associated with an endless spiral of piloting digital transformation technology without strategic purpose. Consider phase three "piloting with purpose."

Completing this phase provides C-suite leadership with assurance that strategic, high-priority initiatives get put into action. For other layers of leadership, it limits "toss-it-over-the-fence" thinking endemic in many current digital transformation projects. For operations personnel, it provides context and tactical reasoning as to what projects are executed and why. This creates buy-in at all levels of the organization.

Additionally, it helps identify barriers to progress early on so all levels of the organization understand the scope and difficulty of challenges, both technologically and culturally, and the benefits of improvement. This increases the cultural willingness to undertake and sustain change. It also injects needed sanity into digital transformation. Processes for transformation are more easily "productized" so groups can quickly learn from and build upon one another's efforts.

Finally, given that operations groups typically spend too much time every day just putting out fires, this approach provides rationale for changing how work gets done. It justifies actions that must be taken to support the greater good, so if big changes are needed, such as a major shift to cloud computing or a shift on job roles, everyone knows why.

Recommendations

Digital transformation can provide the pathway to success for industrial and infrastructure organizations. Failure to transform is likely to undermine the future viability of the organization. Yet, mistakes, false starts, and dead ends are all too common.

Considering all that's at stake, ARC recommends the following actions for organizations planning and executing digital transformation:

- Honestly assess the organization's appetite and ability to support digital transformation. Don't try to "fit a square peg in a round hole" and then wonder why it doesn't work. If the round hole needs to first be carved into the shape of a square, recognize and plan for it.

- Account for the human element in digital transformation. Organizations need to apply as much, if not more, energy to managing workforce and culture change as they do technology improvement. This focus needs to

start in the initial phase. As the organization outlines short- and long-term objectives, it must ask human-centered questions.

- If you are piloting many technologies and having trouble scaling, connecting them in a cohesive way, or justifying ROI, rethink the "why." While it's certainly possible that technology suppliers might be over-promising, this can often be dealt with by improving the RFI process. Also, issues with scale and ROI are most likely due to blind spots in the planning process. This typically occurs when the organization is too technology-centric during planning and requirements gathering or has not placed adequate emphasis to changing processes and job roles for those involved.

- Make sure strategy accounts for reality but isn't held back by it. It's crucial to build mechanisms that confront and rationalize decision-making processes at all three phases from strategy through execution. For example, if IT governance has traditionally prohibited the use of an external cloud, understand the impact of that dynamic. Don't ask operations to implement a robust predictive maintenance program using an internally developed and supported private cloud. It won't work. Either change governance or de-prioritize the initiative.

- Be willing to change current philosophies to data management and cybersecurity. This does not mean instilling a new "one-size-fits-all" approach, such as relying only on a data lake or passive defense technology. As organizational gaps are uncovered and initiatives prioritized, the organization should consider what capabilities provide the broadest set of benefits while also accounting for more critical, niche needs.

- If you are not already a member, take advantage of the opportunity to join the [Digital Transformation Council](). It's an end user-only community of industry, energy, and public sector professionals. It's free to join and vendors aren't allowed, so it's a great place to learn from and share experiences with peers.

Today's industrial, infrastructure, and smart city organizations should certainly be pursuing scalable, sustainable and secure digital transformation. However, a successful journey needs a framework to provide direction. That entails using a method specific to digital transformation and designed to connect strategy and tactics in clearly understandable ways. In doing so,

organizations will be able to define, plan, and execute initiatives that generate specific outcomes and investment return while also supporting the larger business goals achieved via cohesive digital transformation.

Acronym Reference:

COTS	Commercial-off-the-Shelf	**IT**	Information Technology
DT	Digital Transformation	**OT**	Operational Technology
IIoT	Industrial Internet of Things	**RFI**	Request for Information
IoT	Internet of Things	**ROI**	Return on Investment
KPI	Key Performance Indicator	**SLA**	Service Level Agreement

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