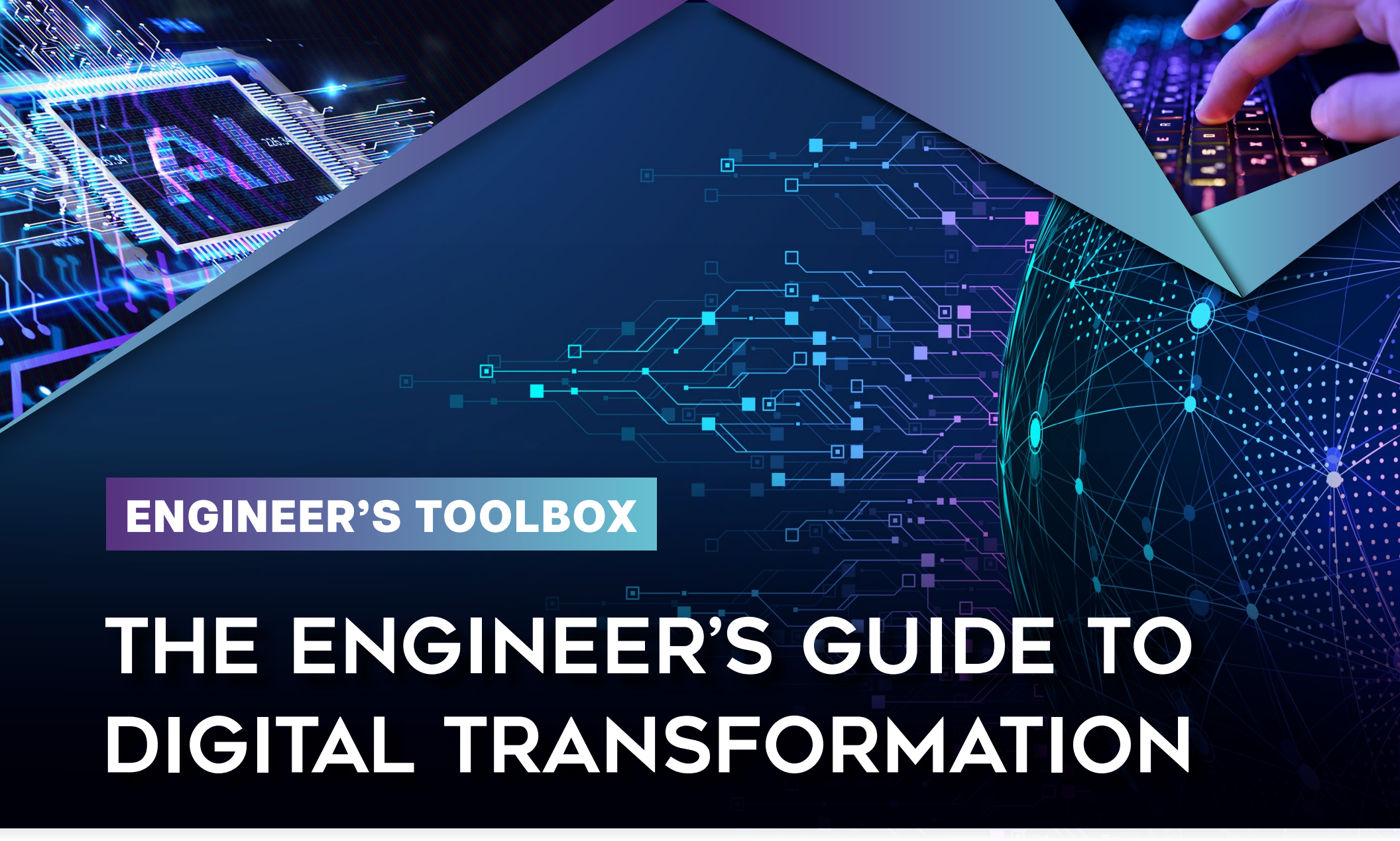

ENGINEER'S TOOLBOX

THE ENGINEER'S GUIDE TO DIGITAL TRANSFORMATION

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ENGINEER'S GUIDE TO DIGITAL TRANSFORMATION

Peter Carr is the author and instructor of the University of Waterloo Watspeed Digital Transformation Certificate Program, available globally online and focused on overcoming the challenges of successful technological change. The program is jointly offered with the Ontario Society of Professional Engineers.

In this toolbox, Carr provides step-by-step guidance on planning, executing and leading digital transformation at your organization. Though geared toward engineering and manufacturing organizations, the information in this guide is broadly applicable to any digital transformation project.

From the editors of:

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INTRODUCTION: WHAT IS DIGITAL TRANSFORMATION?

Technology advances are impacting almost every area of life today. Their combined impact is often referred to as the fourth industrial revolution, and this term isn't hyperbole.

In the first industrial revolution, we saw fundamental changes in where people lived (from the countryside to cities) and how and where they worked (from fields to factories). Family life and education were radically changed. How people were governed, how trade took place between nations and the standards of living they enjoyed were very different in 1850 than they were in 1780, when the first industrial revolution began in the UK.

Sound familiar? We are seeing changes in all of these areas today and more, and they are happening faster and across the globe. Most organizations understand that they will not survive by continuing to do things the way they do them today. Organizations designed for very gradual change are struggling to adapt to the fourth industrial revolution, which requires a radical response.

And that response has a name: digital transformation.

Digital transformation is necessary but difficult. According to the McKinsey consulting company, 69 percent of digital transformation projects fail. If they can't radically change, organizations will fail as well. The reasons for failure are varied, but they all stem from the fact that most organizations were designed to focus firmly on repeating tomorrow what they do today. Most organizational leaders have never led a transformation.

Image: Adobestock

Peter Carr, author and instructor of the Watspeed Digital Transformation Certificate Program at the University of Waterloo. (Image: Peter Carr.)

I'm here to help. As the author and instructor of the Watspeed Digital Transformation Certificate Program at the University of Waterloo, I've studied organizations big and small to learn what makes for a successful transformation—and how to avoid problems that lead to a digital dead end.

In this comprehensive guide, I'll cover three important pillars of digital transformation. The first relates to planning. What should you be doing with information-based technologies? How do you develop your strategy and what should it include?

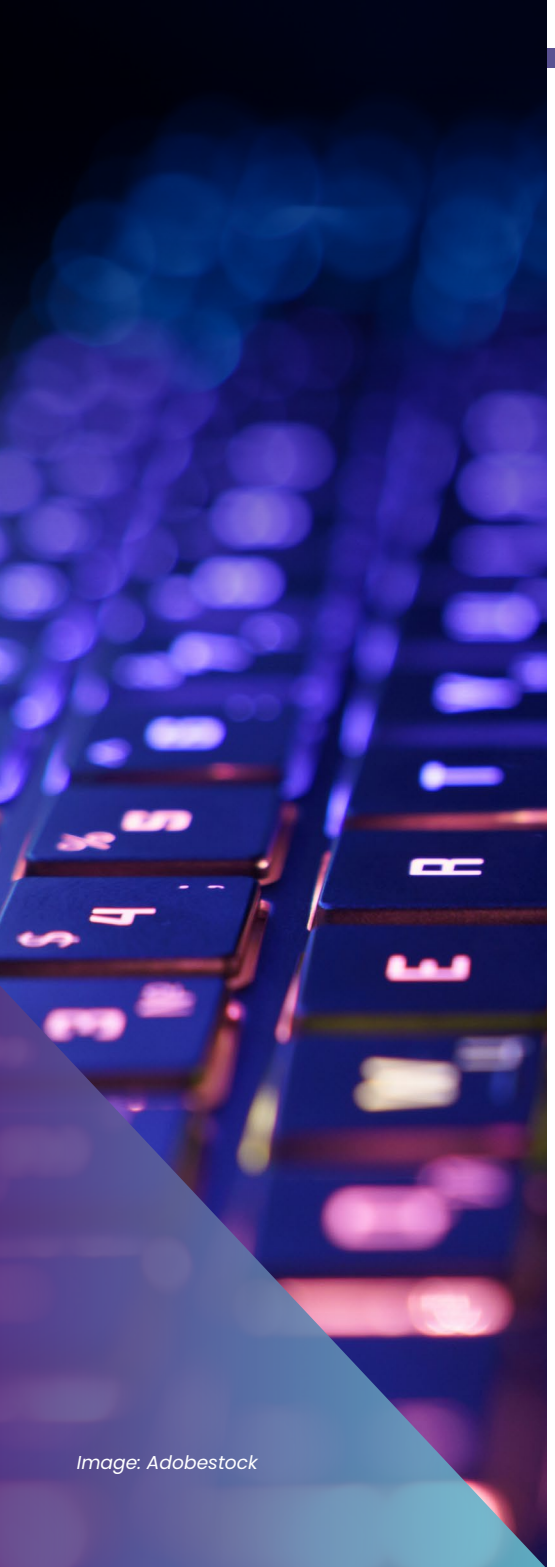
The second pillar is execution. How do you put it into practice? We've studied and worked with a range of organizations from a variety of sectors. What are the main implementation challenges they face, and how can they be addressed?

The third pillar, and arguably the most important, is leadership. How should digital changes be led? How can today's leaders and managers increase the probability that their digital transformation will be successful?

How to use this guide

This guide includes practical advice and easy-to-use tools that will help you plan, execute and lead digital transformation at your own organization. The examples pertain to engineering and manufacturing organizations, but the information in this guide is broadly applicable to any digital transformation project. Each chapter pinpoints one aspect of digital transformation, so feel free to skip to the chapters most relevant to you.

Many chapters include custom-made tools to help you evaluate and strengthen a particular aspect of your organization. I encourage you to complete all of the exercises you encounter, and I doubly encourage you to do so in collaboration with others in your organization. You'll find that deliberate collaboration is a theme throughout this guide, and is one key to successful transformation.



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This guide is divided into three sections corresponding to the three main pillars of digital transformation: planning, execution and leadership. An overview of each of these sections is provided below. It can help you determine what aspects of digital transformation are most pressing to your organization.

Planning your digital transformation

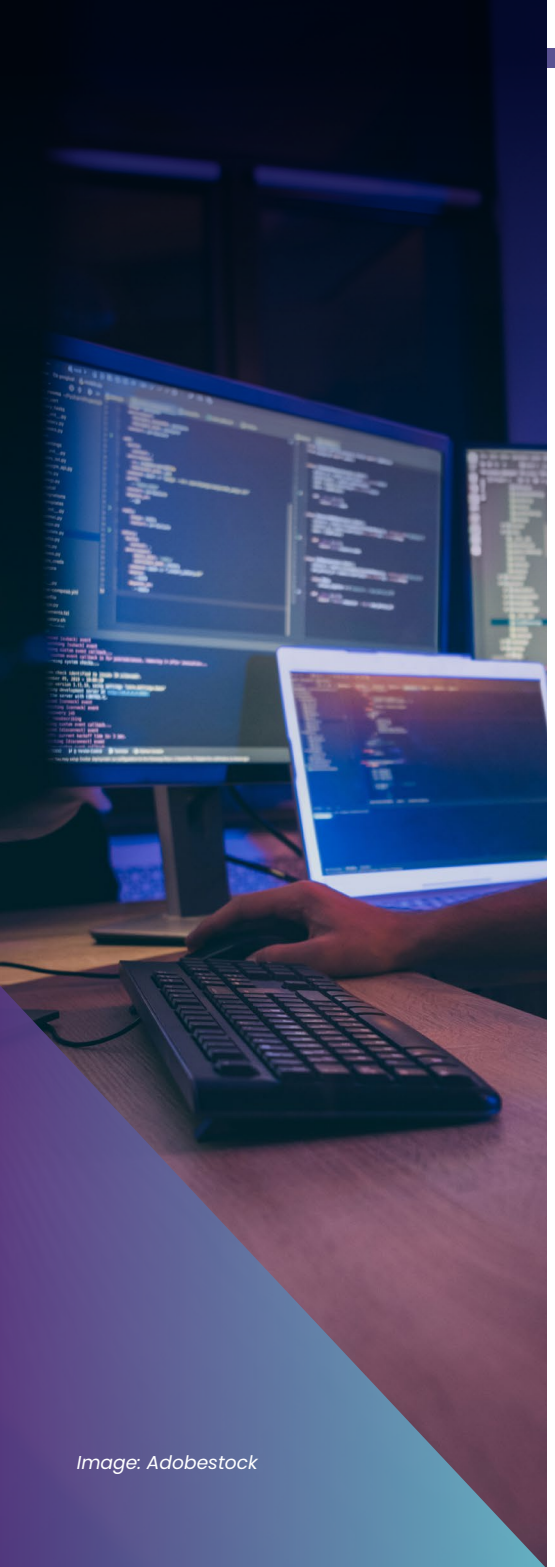
While many leaders of organizations today have a strong sense of urgency about digital transformation, you must carefully consider the changes with rigorous planning processes. This involves making difficult and appropriate choices from the wide range of technological options that exist along with how they will be applied in your organization.

One of the most common weaknesses is a failure to adequately consider the existing and desired future operating model. This is the set of principles, processes and practices that are used to integrate and manage operational activity to meet your performance objectives. Common models include Scientific Management, Lean and Agile. Often technologies are implemented in ways that are inconsistent with the model being used, and this can have significant negative impacts. Taking time to understand your operating model and ensuring that your strategy is consistent with it is essential.

The starting point for strategy development is an understanding of external factors—what is happening now and what do you expect will happen in the future? This should include understanding competitors, technology and societal trends. Your own future vision will build on your existing internal capabilities, which must also be analyzed and understood.

For example, a manufacturing company in the automotive sector with global operations was viewing a changing automotive environment on a range of fronts: new products and services with electric cars and other technological advances, new market conditions with the rise in protectionism and new requirements from the large automotive companies they supply.

These external factors, along with the company's internal capabilities, including high skill levels in an aging workforce, were the foundation for applying technology to their global product development activities, using advanced data analysis and online collaboration. The decision on the technology to use and how it would be applied was based on the business possibilities and needs.



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The strategy development tools you'll find throughout this guide are now used in many organizations because they encourage confidence in managing digital transformation. The process you use to plan will have a significant impact on your implementation—it should maximize the involvement and commitment of, and collaboration between, all organizational stakeholders.

A good basic understanding of the information-based technologies available and of your options in applying them is necessary to develop your strategy. Today, all organizations should have an education plan that develops basic technology awareness and supports knowledge and skill development. Most do not.

Executing your digital transformation

Why do so many digital transformation projects fail? We studied a wide range of reports and visited many organizations to understand the reasons. They encompass people and culture, technology and process integration, innovation and privacy, security and regulatory requirements.

Successful digital transformation requires that organizations have wide employee participation in continuous improvement, to tackle implementation challenges and to maximize the value of new technologies. This is difficult. It must be built into your transformation plans.

Alignment across the organization requires careful planning and coordination during your implementation. Supportive collaboration is necessary in planning and execution. Siloed organizational structures and cultures are a major barrier to digital transformation. Most technologies you introduce will impact processes in more than one area and require choreographed change. Silos work against this.

A major manufacturing company applied one of our tools, the digital transformation roadmap milestone matrix, to develop their roadmap to implement new engineering software. Their plans included the software selection process, training engineers to use it, integrating existing engineering data, establishing effective governance of their project and efforts to support the cultural change needed to fully exploit the new technology. You'll learn about the digital transformation roadmap milestone matrix and other helpful tools in this guide.

Image: Adobestock

Leading your digital transformation

The priority for most organizations is the ability to deliver their product or service today. Consequently, this is their top priority when recruiting leaders. Most leaders were not appointed because of their ability to lead large, radical technology-based change projects.

Changing culture is frequently cited as being necessary and yet difficult in digital transformation. Digital mindsets are used to describe the change in thinking that organizations believe is needed for digital transformation. This usually includes being able to work with others, data, change and technology in better ways and remaining conscious of the impact on society. Achieving this mindset will usually involve training and changes in processes that support its development and sustenance. The digital mindsets assessment tool, found later in this guide, can help.

A manufacturing company that participated in our program identified engineering communications as a major weakness impacting large scale technological change. They understood that expenditure on technology would be wasted if their business practices were not ready for it.

It is also important to recognize that large scale, rapid change will often have a substantial societal impact, whether that is on the jobs of employees, on the local community or the environment. Understanding and managing the impact of the technological change is the responsibility of all who are part of digital transformation.

Successful digital transformation is essential for the survival of most organizations today. They know this. Leading the planning and execution of the radical change required is difficult for most leaders and managers, and yet they are the only people who can do it. While some existing leaders may not be able to adapt to the needs of the new world, others are the only people with the knowledge and experience of their organization's market, people, processes and technology that is necessary for effective digital transformation. They urgently need support, tools and guidance to develop the capability and confidence to do it for themselves.

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A3D MANUFACTURING

A3D Manufacturing: Bridging Tradition and Innovation for Scalable, High-Quality Production

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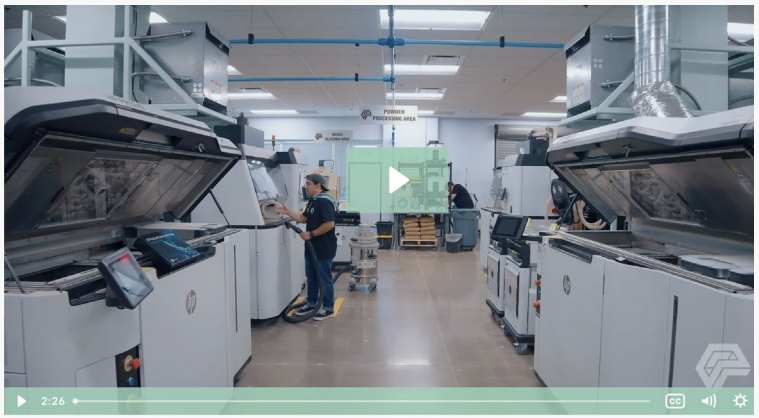

A3D MANUFACTURING

North American Manufacturing Services On-Demand

MaaS: The Key to Scaling Up Your Production

Manufacturing as a Service with A3D Manfucturing helps you prototype and test faster, get to market before your competition, reduce dependency on outside factors, and choose a sustainable and local partner for your manufacturing needs. Partnering with A3D Manufacturing gives you additive and traditional manufacturing options, ensuring flexibility, cost efficiency, and scalability.

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- **Financially Prudent:** Get only the parts and prototypes you need, plus advice on the type of machining or manufacturing best suited for your project.
- **Flexible Options:** Multiple forms of manufacturing such as traditional CNC Machining, Injection Molding, Cast Urethane, 3D Scanning, and 3D Printing.
- **Fabricated Locally:** Optimize manufacturing process, reduce costs, and add scale by working with a local, North American-based manufacturer.

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PART I: PLANNING YOUR DIGITAL TRANSFORMATION

Evaluating your business's operating model

To be greater than the sum of your parts, you must first sum your parts.

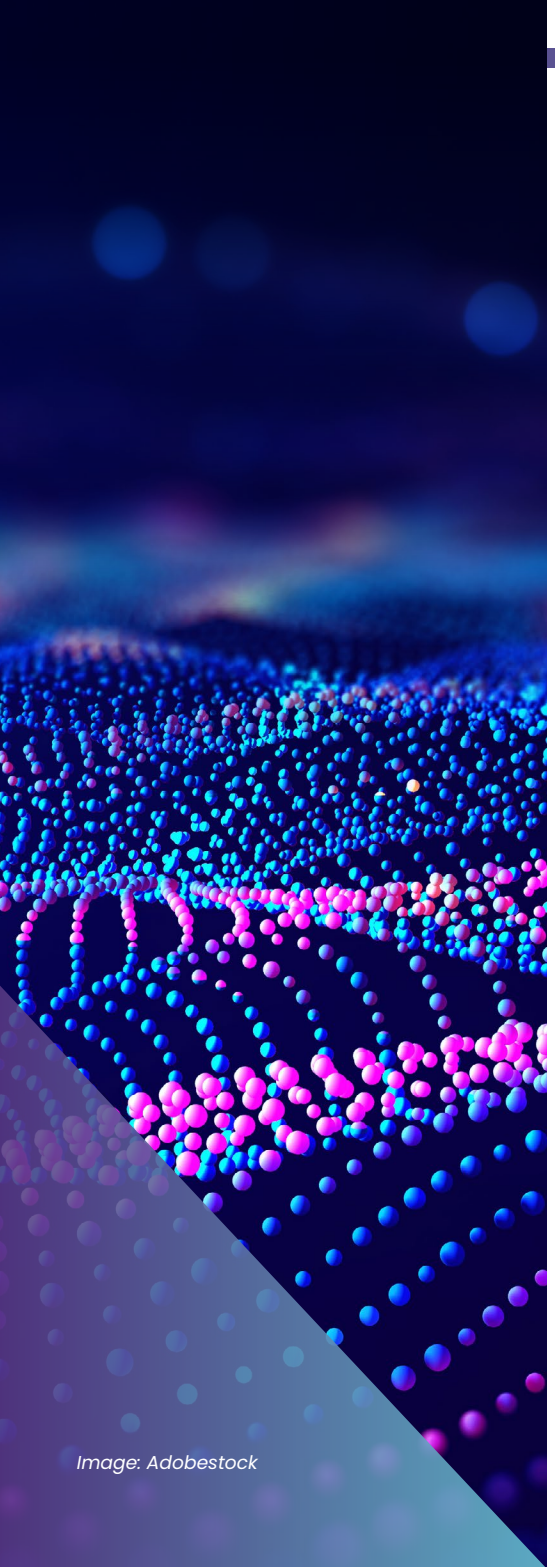
The success of any organization is determined by how effectively it combines all the different things it does. For an engineering company, this might include product design and development, production and delivery processes, supply chains for process inputs and distribution networks, sales and marketing, finance and human resources. It involves physical and non-physical processes and equipment and the people who make them work.

All these elements are combined according to an organization's operating model: a system of principles and practices that govern process design, people management, and an organization's culture and performance.

Organizations often don't explicitly define their operating model. Instead, they evolve over time and establish the basis for the decisions the organization makes, large or small. But there are several well-defined models that have been embraced for different reasons—and understanding where your organization lies on the spectrum is crucial to succeed in digital transformation.

The three main operating models

Until relatively recently, the main characteristics of the operating models used by most organizations in manufacturing and elsewhere were the same—only one model existed which everyone used. Often referred to as Scientific Management (and also Fordism or Taylorism) it sought to apply "science" to the management of organizations.



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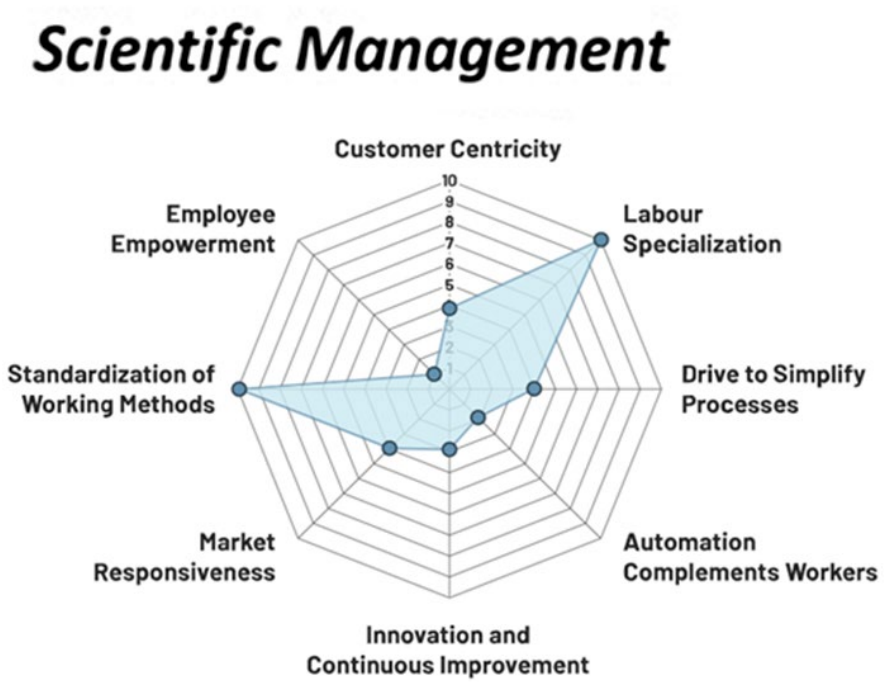
Emerging in the 1920s, this model features careful definition and control of working practices, minimization of costs, division of work between many low-skilled workers and a small number of managers and professionals, and minimal employee participation in improvement or innovation.

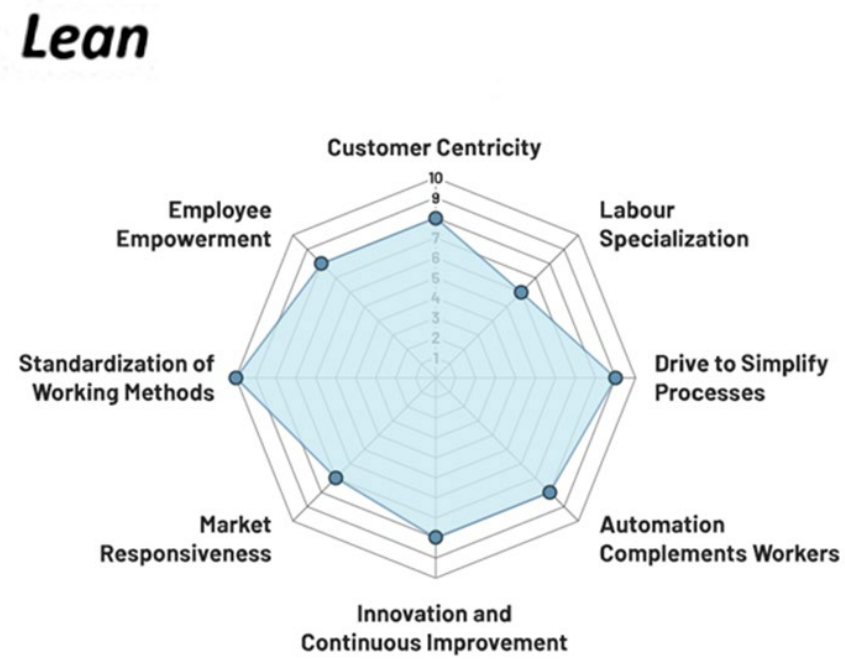
Radar charts are a fantastic tool for illustrating the main characteristics of an operating model. This chart illustrates the priorities of Scientific Management:



Radar chart of the Scientific Management operating model. (Source: Author.)

In 1990 researchers Womack, Jones and Roos studied the operating model that was used in Japan, one which had brought success to the country's manufacturing sector since the end of the Second World War. The result was "The Machine That Changed the World," a book which introduced the Lean operating model to the wider world.

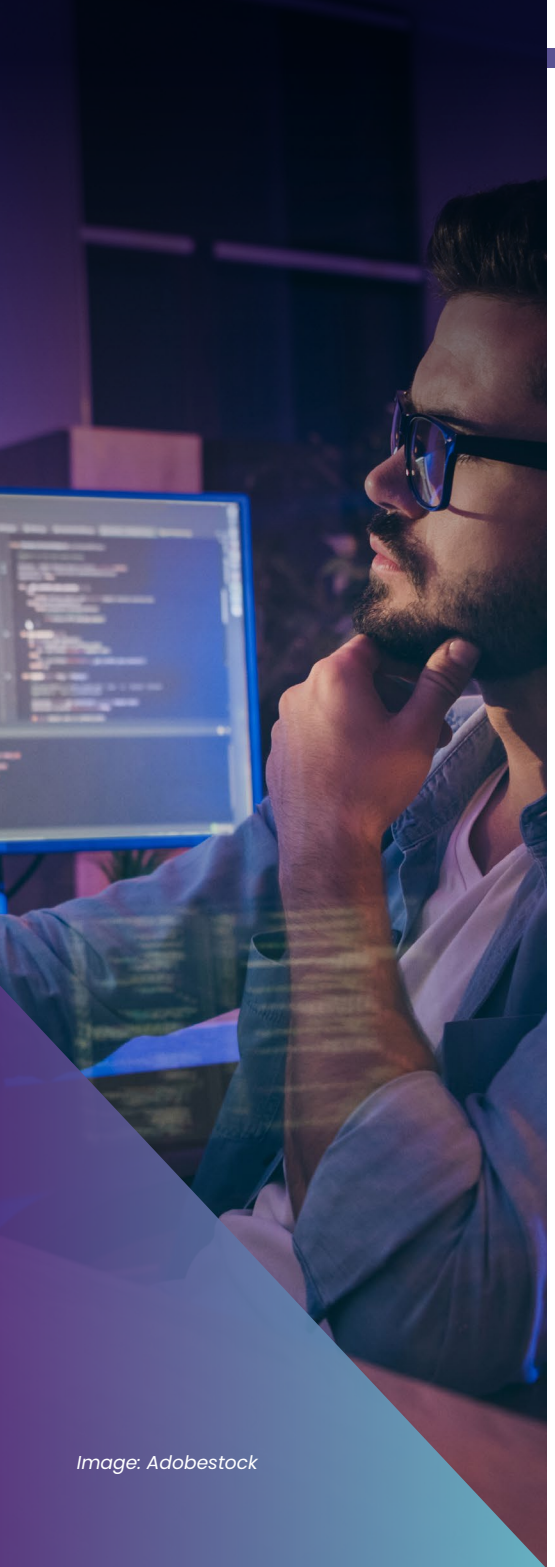
Compared to Scientific Management, the Lean model featured higher levels of employee skill and flexibility, lower levels of inventory, greater focus on the customer, a new "just in time" approach to workflow and employee participation in continuous improvement and innovation.



Radar chart of the Lean operating model. (Source: Author.)

Many organizations outside of Japan have made efforts to implement the Lean model, in all industrial sectors, with varying degrees of success. The model's emergence introduced organizations to the notion that there were choices to be made about the model they would use, which would significantly influence their management activity and their organizational performance. Operating models were now a competitive factor.

Image: Adobestock



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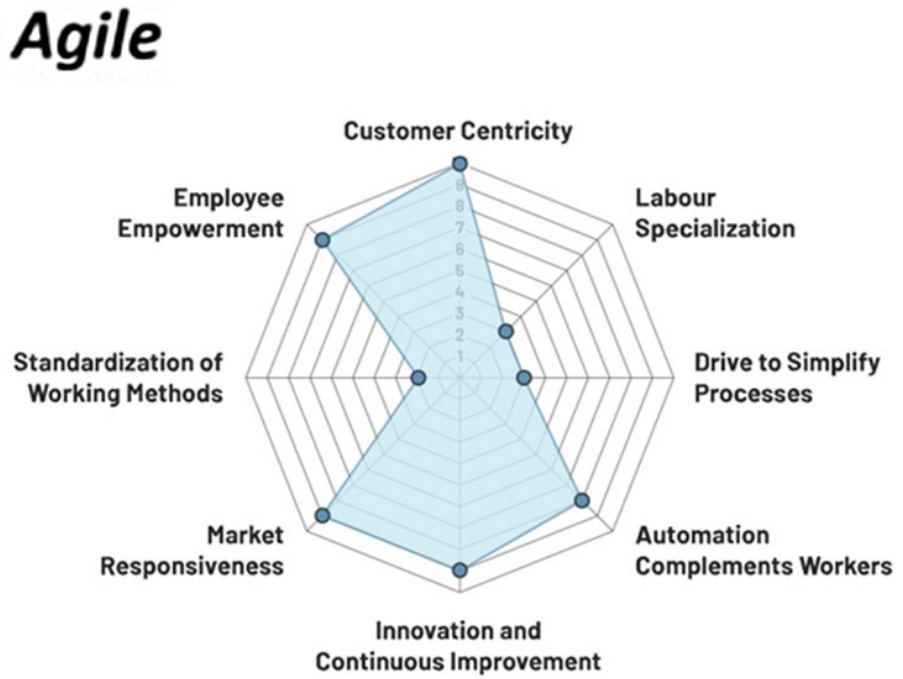
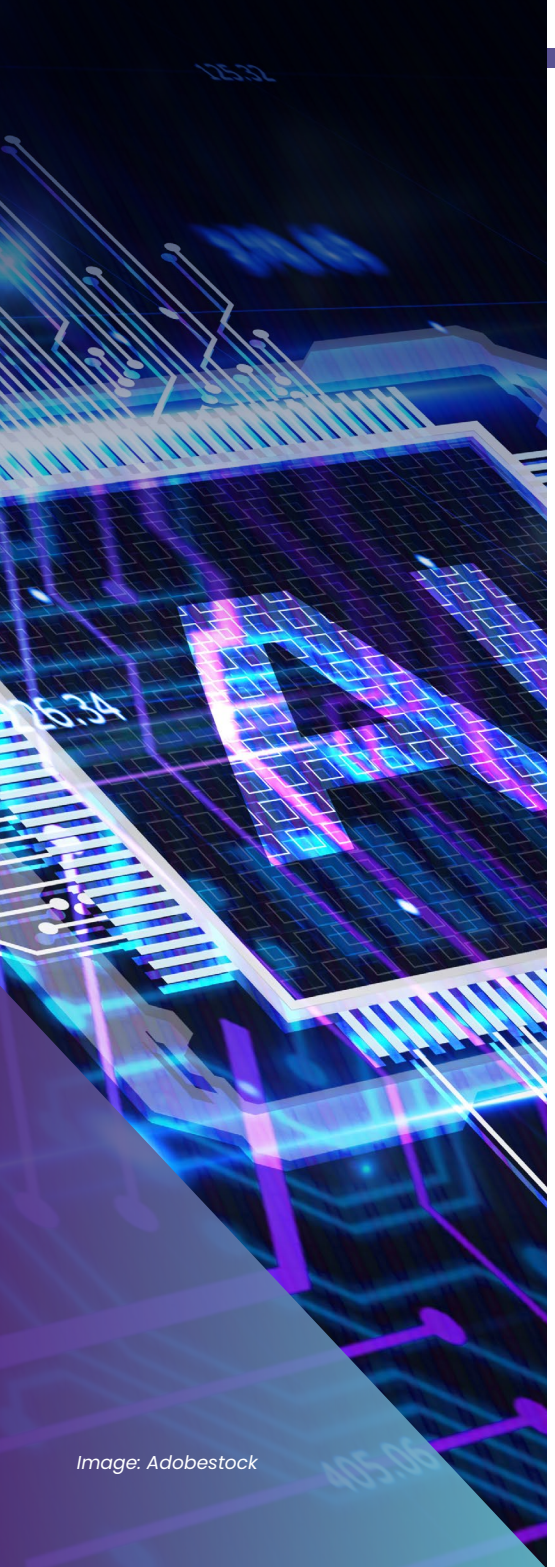
The third main operating model is Agile. This model emerged as globalization and technological change contributed to intensified competition for many organizations. They sought to make changes more quickly to the volumes they produced, the products and services they offered and the processes they used.

The Agile model emphasizes processes, equipment and work practices that enable flexibility, creativity and innovation.



Radar chart of the Agile operating model. (Source: Author.)

While explicit commitment to a specific operating model is not always present, most organizations are oriented more towards one of these three models, and all are in common use. In recent years a fourth model has been discussed: a Lean/Agile hybrid, which some organizations have pursued.



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The radar charts show that these operating system models differ significantly from each other. Practices that are essential for the success of one model may be fatal for another. For example, empowering employees is essential for Lean and Agile but very undesirable in Scientific Management.

The technology implications of your operating model

Operating models are extremely important, but often overlooked in digital transformation initiatives. Consider the following hypothetical example.

Amir Kaur is the CEO of a consumer electronics manufacturing company. Competition in his industry is intense as competitors battle to develop and introduce new products quickly and produce and deliver them cost effectively. Information technology has the potential to positively impact most areas of the company.

Amir's company uses a Lean operating model. They emphasize low inventories, pull systems of workflow, and have empowered employees who participate regularly in continuous improvement activities. At his weekly executive team meeting, Amir asked his direct reports for their ideas on how the company should apply technology over the next couple of years—what should it spend money on today?

The responses covered a range of areas. For example, one suggestion was that Operations should install an automated warehouse system that would enable more inventory to be effectively managed, reducing stock outs. Human Resources suggested tools that would more closely monitor employee behavior, while others argued that the product development process could be accelerated with more advanced online collaboration tools.

Amir considered all the suggestions and was concerned that while some were consistent with their Lean operating model, others would clash with it and damage company performance. The automated warehouse would increase inventories and eliminate many benefits of Lean. Technologies that closely monitored employees would negatively impact empowerment and motivation. On the other hand, collaboration tools in product development could enable better understanding of customers and more rapid integration of knowledge within the company and throughout the supply chain—consistent with the Lean approach.

As technology has been introduced in organizations today, its impact on and consistency with operating models has often not been considered. This is an important cause of digital transformation failure.

Image: Adobestock

A technology application, which may have benefits in one part of the organization and on one performance objective, could conflict with the corporate operating model and produce negative consequences overall.

When all organizations used the same Scientific Management operating model, new technologies were usually (though not always) applied in ways which were consistent with that model. Objectives were straightforward: reduce costs, increase output and simplify work. As new operating models became more widely understood, performance objectives multiplied and reflected their varying emphasis. It has therefore become very important that the introduction of new technology be consistent with the model being used. Often it is not.

Digital transformation is accelerating, and this makes operating model consistency increasingly important. Multiple technology changes over a short time, if inconsistent with the operating model, have the potential to rapidly create fatal chaos.

Further, as organizations consider their investment in technology, they should be considering the operating model that will be appropriate for their organization in the future. The model today may not enable them to compete effectively in the future. Implementing technology in an outdated model today will make it harder to change later. For some, this will mean adopting a new model while transforming their technology.

Developing your digital transformation strategy

Charting the best path forward for organizations today is a greater challenge than ever before. Covid-19 accelerated technology-based change in most sectors and it hastened the need for radical change. Despite the urgency, many companies are struggling to decide on, and commit to, significant strategic digital transformation.

Major strategic decisions usually involve a high degree of risk. They are based on choices about future products, services and processes that have major financial and other consequences if judgements are wrong or implementation fails. Most organizational leaders have never made decisions of the scale needed. They were employed for their ability to manage today—not to lead a revolution. Their organizations are designed for reliability.

All that makes change difficult. But not impossible, if you can plan properly.

Image: Adobestock

Planning for radical change

Significant technological advance requires a wide range of organizational changes, usually including new processes and skills and involving new practices from employees and managers. Strategic planning needs to effectively combine a wide range of knowledge and skills. In siloed organizations, the extent of the collaboration needed is far greater than anything done previously.

Take as an example the transition from ICE to electric vehicles, taking place alongside widespread technological change in manufacturing in the automotive sector. Many automotive producers and suppliers need to make substantial changes to products and processes alongside growing international competition. Similar levels of change are present in most sectors. Adapting to that change requires a plan, a strategy for transformation.

Many tools are used for strategy development. They categorize and guide the areas to consider and can include processes supporting strategic decision making. When determining the best tool to use for digital transformation, it's important to focus on the desired outcome.

The challenge is to develop a digital transformation strategy with a high probability of successful implementation. The solution lays in both the tool selected and the way it is used. We don't just want a tool that facilitates strategy creation, but one that enables a range of skills and knowledge to be combined from a large set of stakeholders, and contributes to their commitment and enthusiasm for implementation.

One such tool has stood the test of time, and it's a great place to start for digital transformation.

Tool: SWOT analysis

SWOT (Strengths, Weaknesses, Opportunities and Threats) was developed at the Stanford Research Institute in the early 1960s. The tool is still widely used today, and its longevity is evidence of its effectiveness. It has a good analytical framework, using categories that reflect the areas of importance in digital strategy formulation, and can be applied to engage a wide range of stakeholders.

SWOT analysis uses a matrix to integrate understanding of the internal and external elements that should be considered together as strategy is developed. Internal factors (the organization's Strengths and Weaknesses) are combined with external factors (Opportunities and Threats). Strengths can be accentuated and weaknesses minimized, while opportunities can be exploited and threats countered.

Image: Adobestock

The following chart is a simple application of SWOT analysis to a brake pad supplier in the automotive industry:

Automotive Brake Pad Supplier EV SWOT Analysis

Internal factors

Positive

Strengths

- → Historical knowledge
- → Loyal workforce
- → Research and development organisation
- → Relationships with manufacturers
- → Early market entrant

Weaknesses

- → Information technology skills
- → Employee skills
- → Culture
- → Pace of management of change
- → Legacy information systems

Negative

Opportunities

- → Growth of electric vehicle market
- → Government support
- → Customer desire for collaboration
- → Supplier relationships

Threats

- → New market entrants
- → Labour shortages
- → Customer urgency for change
- → International competition

External factors

A simple SWOT analysis for an automotive brake pad supplier. (SWOT template: BDC.)

When it was originally developed, SWOT strongly emphasized involving a wide range of stakeholders in the strategy development process. Today, much discussion on SWOT focuses on how the tool is used to structure strategy thinking. This is valuable, but it is important to understand that its value lies also in facilitating stakeholder engagement. All appropriate knowledge and data should be included in decisions to maximize commitment to implementing the strategy.

7 steps to using SWOT properly

Digital transformation is an organization-wide revolution, and its success depends on a high level of motivation and commitment from everyone involved. Here are seven key points to using SWOT effectively for digital transformation:

Image: Adobestock

1. As you prepare to develop your digital transformation strategy, provide and encourage access to information that will assist the SWOT discussion throughout the organization. Information on the market, competitor activity, technology options and possible opportunities for employees should be included. Emphasize the collective nature of the change that is coming.

2. Design a process of engagement to support the SWOT. You should assume that this will take some time (how much will depend on the size of the organization). Provide a range of ways that everyone can engage in the process. Consider town halls, surveys and discussions with groups of employees. This both maximizes the ideas that will emerge and increases confidence that the concerns and fears that people have will be addressed carefully.

3. Use a simple tool for the process. I like SWOT because it provides an easily understood, transparent framework. Complex tools create confusion and mistrust.

4. In larger organizations, mini SWOT exercises can be conducted by units, departments or other groups and feed into the process. This is a good way to deal with the volume of knowledge that will be created by the consultation process.

5. When the senior management team uses the outcome of the SWOT process to develop the whole organization's digital transformation strategy, make sure everyone is prepared. Expect that members of the leadership team have reviewed their appropriate data and have it available in the meeting. Use a skilled facilitator.

6. It is essential that there be appropriate follow up after the strategy is written. Take time to ensure it is understood by everyone.

7. Continue the discussion. Digital transformation never ends. Encourage everyone to learn about all aspects of digital transformation. Continue to hold discussions about the future. Revise the SWOT through a participative process annually.

SWOT analysis was created to facilitate widespread stakeholder engagement in the strategy development process. Successful digital transformation requires levels of engagement that are rare in most organizations today. Use SWOT to address this challenge.

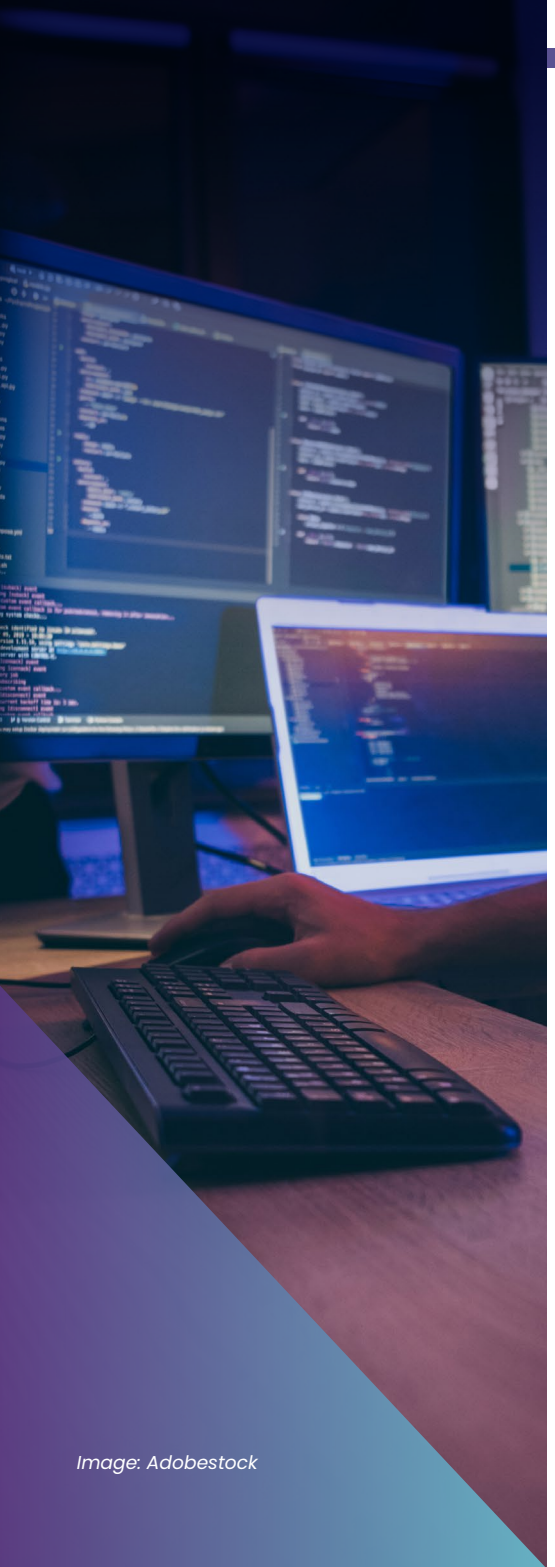


Image: Adobestock

As I work with people on their stakeholder engagement in technology-based change, I usually have to ask them to think bigger. Most only consider immediate stakeholders and underestimate the level of activity that is necessary here. Well planned, extensive stakeholder engagement is essential—without it you are guaranteed to fail.

Think about how SWOT will be used in your organization. Design the engagement process that you think will enable the level of participation that your organization requires of its digital transformation strategy development.

The external forces impacting your digital transformation

Why are well established companies failing so often today and, more importantly, what could they have done to ensure their survival? In every sector, inadequate response to technological change is regularly causing corporate demise. Many household brand names have been brought down in this way: Blackberry, Sears, Nortel, Kodak, Toys R' Us, and many more.

These failures have resulted in lost livelihoods for the people they employed and impacted their communities. While their activities may be replaced by those of other companies, these may be in other cities, states or continents. In terms of economic development, helping existing companies adapt is very important, especially as technological change, and hence failure, is accelerating.

There are, of course, many reasons that companies fail to adapt, including technical capability, employee skills, culture and leadership incompetency. One of the major reasons, though, is that changes in their external environment were not recognized and given sufficient attention in corporate decision making, including in strategy development and tactical application.

The Boston Consulting Group undertook a study in 2016 which showed that organizations get more introverted as they get bigger. They become focused more on internal metrics like cost, inventory and quality, and not enough on external developments that threaten their existence.

This tendency is more important today. Digital transformation has increased competition with rapid development of new products and services. It has transformed processes, often dramatically impacting

Image: Adobestock

performance, while customer relationships are often now fundamentally different than in the past (especially after the pandemic). While introversion was a problem before, it is a much bigger one today. The tool that will help you address it is known as PESTLE.

Tool: PESTLE analysis

PESTLE analysis (originally known as PEST, before the L and E were added) categorizes your analysis and understanding of the external factors that are important to your organization: Political, Economic, Social, Technological, Legal and Environmental.

Political: The tech sector and organizations' use of technology are facing increasing scrutiny by local, regional and national political bodies, which may constrain the use of information technology. The U.S. government's concerns about Huawei, for example, have influenced many organizations' choice of technology suppliers. Political concerns about competition in the tech sector and the impact of automation on jobs are further areas of government focus today. Technological decisions require consideration of possible political decisions today.

Economic: Higher levels of employment make it more difficult for organizations to recruit the new skills they need. Low interest rates may make investment easier. Trade barriers may restrict markets and limit international supply chain activity.

Social: Public attitudes toward technology have been changing quickly in recent years. Privacy concerns have grown and influence the adoption of technology-based products. COVID-19 has led to more people using information technology and opened up more technology-based opportunities for many organizations. Increases in working at home change the way organizations use technology.

Technological: Innovation in the technologies available to organizations continues to take place rapidly. Advances in artificial intelligence (AI), automation and the internet of things (IoT) are appearing regularly. Every advance opens up new possibilities for organizational application.

Legal: New legislation will influence organizational use of technology. Legislation on privacy, employment practices, cybercrime, data governance, and in many other areas is emerging today and likely to continue to rapidly develop.

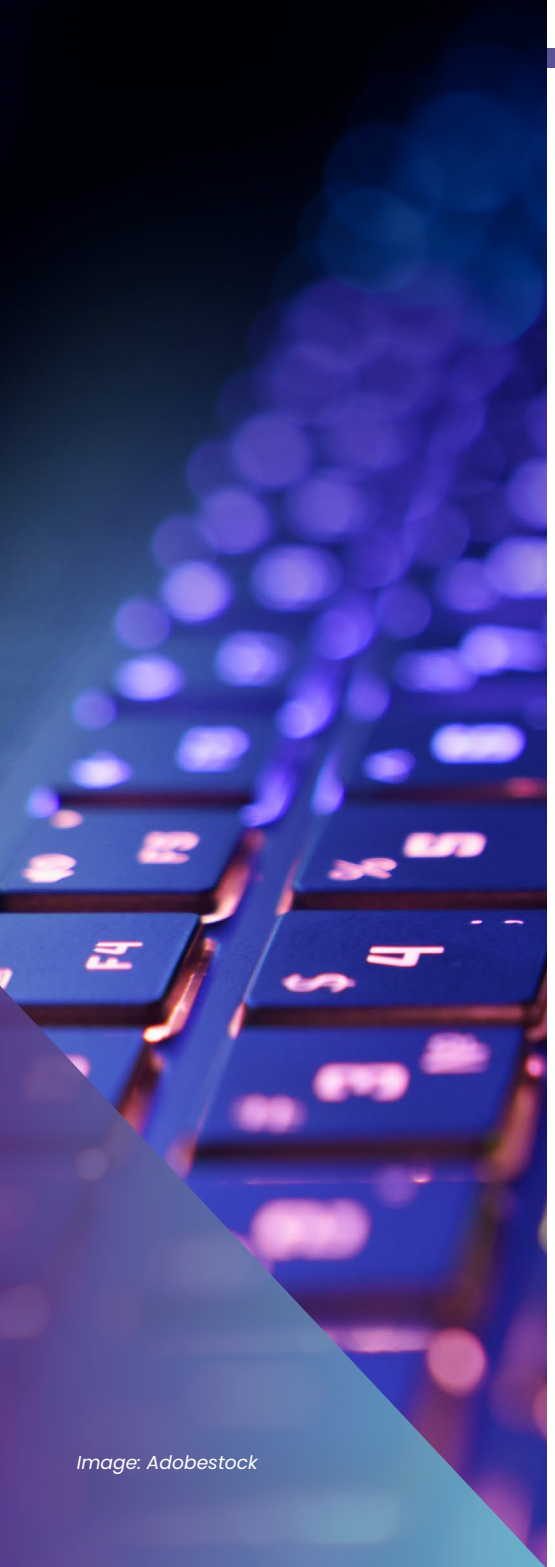


Image: Adobestock

Environmental: Concerns about climate change and other aspects of the environment are now impacting many areas. Technology impacts the environment negatively and positively. For example, it helps organizations manage their energy use and at the same time raises concerns about the impact of the disposal of redundant equipment.

Example of a PESTLE analysis for digital transformation

The following chart provides an example of the application of PESTLE for digital transformation in a forestry industry company. Note that I have utilized a three-year time horizon and included a "Possible Action" column to focus attention on the outcomes of the discussion:

Element	Now	In Three Years	Possible Action
Political	Turbulence in export markets	Increasing international competition for access to forest resources	Contract expertise in lumber product trade
Economic	Decline in construction due to higher interest rates	Increased new housing demand due to government policy	Invest in automation to accommodate increased demand
Social	Increased concerns of local community impact	Concerns expected to further increase	Improve stakeholder management strategy
Technological	Internet of things applied to forestry processes	Opportunities with artificial intelligence to utilize IoT data	Recruit AI capable specialists and skills train workforce
Legal	Land access legal challenges	Data regulations in use of artificial intelligence	Access expert advice on expected regulation and modify processes
Environmental	Increase in forest fires	Increased restrictions on forest activity in dry periods	Introduction of longer range planning of operations to accommodate more downtime

Image: Adobestock

PESTLE is valuable because it provides a framework for understanding the external environment, but that's not all or enough. Its greater purpose is as a group tool that is used to help pool knowledge and develop collective understanding. In applying it, you should think very carefully about how you do this, to maximize the impact it has on reducing your organization's introversion. Here are some tips:

- Use PESTLE for management team discussions at other levels beyond the most senior team to reduce introversion everywhere.
- Ensure discussion participants prepare for the PESTLE session and bring knowledge that is appropriate to their role.
- Record and share outcomes in briefings for others.
- Think about how you can bring the outside into the organization—many successful organizations do this by inviting guest speakers, encouraging external visits, etc.
- Encourage education—broadening knowledge and understanding opens minds and supports the needed innovation.
- Make PESTLE a regular activity—as the pace of change increases it will be more important that PESTLE discussions occur.

Think about the focus your organization has today. What are the factors that encourage an internal concentration and what encourages an external one (such as your performance metrics and the areas of discussion in management meetings)?

Next, do your own PESTLE analysis. It is better if you can find a few other people to do this with you (maybe your own management team) but if you can't do that, then do it by yourself. Finally, consider the actions you could take to improve your organization's external orientation.

The internal forces impacting your digital transformation

Understanding your organizational capabilities today is essential for developing your digital transformation strategy. You need to know what you are good at and where you need to improve. To do so, you need a realistic strategy that combines all of the elements that are important in transformation: human, technical and organizational. Finally, completing it well requires effective stakeholder engagement.

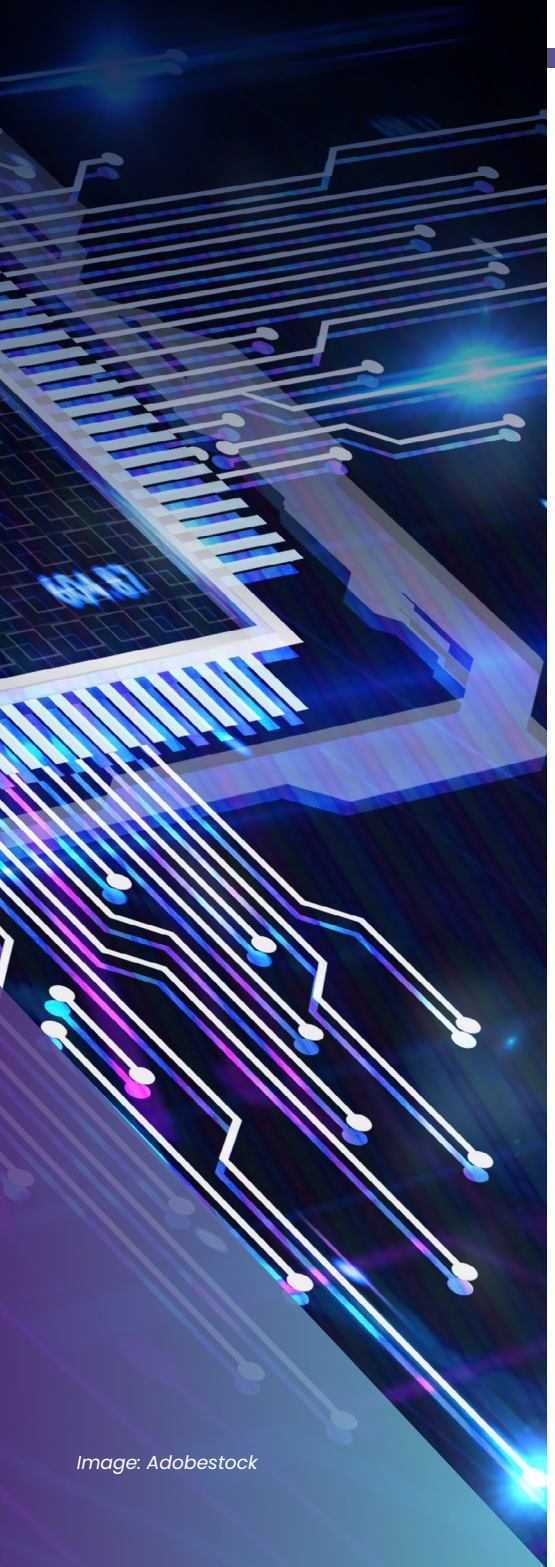


Image: Adobestock

In this chapter we'll look at how to conduct an internal analysis simply, collaboratively and—most importantly—honestly.

Why honesty is important (but difficult to achieve)

Honesty is essential. Your digital transformation strategy must be based on an accurate understanding of your internal situation and there must be a willingness to face that reality—warts and all! If you can't do that, the strategy that results will be flawed and unlikely to be successfully implemented.

Achieving the levels of trust and openness necessary for honesty to be expressed in internal analysis is very hard. In most organizations, identification of weaknesses elicits a defensive response. People throughout the organization, including at the most senior levels, are afraid to reveal problems because their own position may be made weaker.

The following example illustrates how important honesty is. During the Vietnam war, reports from the battlefield were sent to military leaders in Washington by U.S. forces. A reluctance to admit to failed or not fully successful missions meant that decisions by the leaders in Washington were often badly flawed—a major cause of the U.S. defeat.

Creating a culture of honesty is difficult and takes time. If you don't have it now, your strategy development will be more difficult. You can't wait until your culture is perfect before embarking on your digital transformation journey, but you will need to place a high emphasis on basing your decisions on accurate information. Even when you do this, your probability of success will be less than if you have an honest culture.

A range of tools for internal analysis

Internal analysis is used in many ways by organizations, so there are a variety of tools used. For example, gap analysis looks at where you are versus where you want to be. A strategic evaluation helps you understand progress on your grand plan. VRIO (Valuable, Rare, Inimitable and Organized) looks at your organization resources.

These and other analysis tools structure your gathering of information, ensuring that you are focused on the aspects of company activity that are most important for the decisions you are making. They also structure the discussion that people in your organization are having.

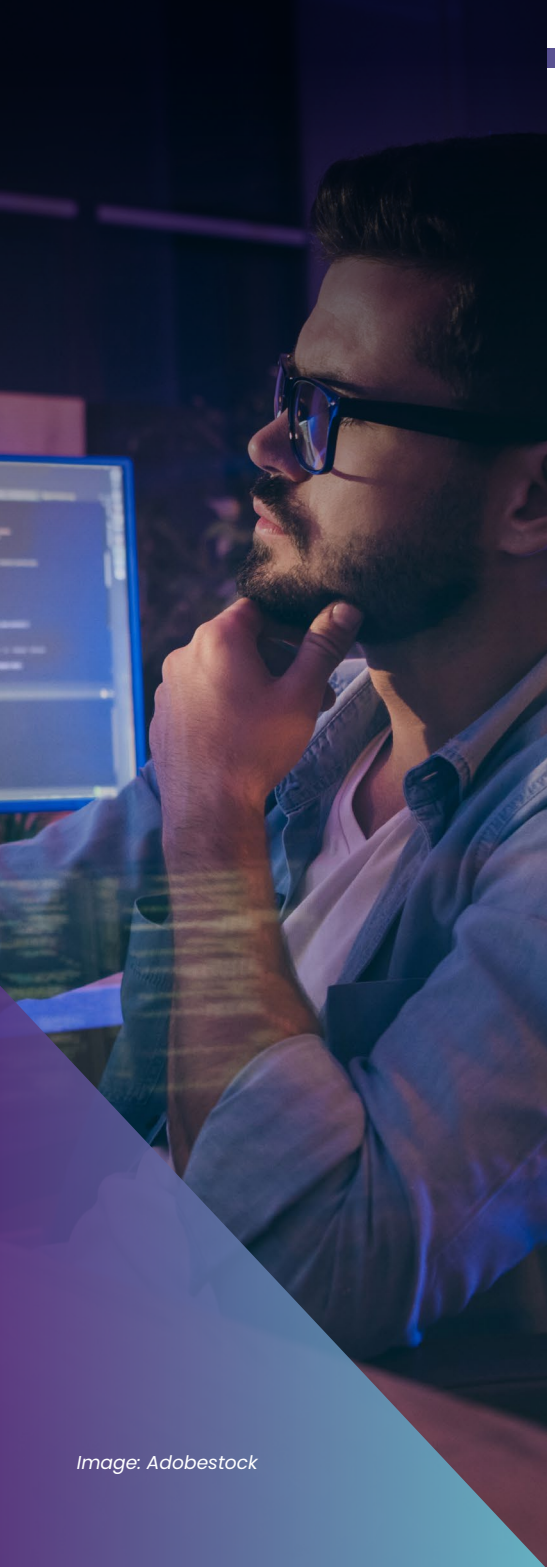


Image: Adobestock

Whatever the tool, the process must be simple. The tools I advocate in the Digital Transformation Certificate program are intended to be used by groups of people. Collaboration across organizational silos is essential in effective organizational change. Simple tools that are easily understood and applied are much more effective for this.

For digital transformation strategy, we'll use an internal analysis tool based on one created by Deloitte: the digital maturity model.

Tool: The digital maturity model

This internal analysis tool is intended to focus on five key areas of importance to digital transformation: customer focus, strategy strength, technology capability, operations engagement, and organizational and cultural commitment. Each category is rated on a scale of 1 (weak) to 5 (strong).

1. Customer focus

More rapidly changing products, services and markets mean that your organization needs to be more focused on your customers than may have been the case in the past. How aware is everyone in your organization of their needs, and how effectively do you incorporate customer feedback in current activity and future product development? How engaged are you with the customer? This is often reflected in their level of loyalty to you. Remember, this is about your internal capabilities in focusing on the customer.

2. Strategy strength

Digital transformation is continuous (you don't just do it once). Your internal strategy processes need to be strong and able to update as needed in response to technological, market and other developments. Stakeholders should be widely engaged through close relationships. They also need to be transferred into action using effective management processes. Your strength here will influence your ability to make your digital transformation vision a reality.

Image: Adobestock

3. Technology capability

While it is important to remember that technology is only one part of digital transformation, you need to be able to implement, maintain and improve it effectively. Is your network suitable for the changes you want to make? Do you have the capability to manage and exploit the data? Is your security strong enough?

This means having effective IT resources and effective technology skills and knowledge throughout the organization. All employees need understanding that will enable them to contribute to and be comfortable with technological change.

4. Operations engagement

The success of your digital transformation will depend on how effectively it's applied throughout the organization. The relationship between your IT resources and your operational resources needs to be strong. They need to work together more than they have in the past, so tension here is a serious problem. Are operational areas ready to use the new technologies in ways that will improve performance (for example, through automation and data analytics)?

5. Organizational and cultural commitment

Digital transformation always requires a substantial cultural change in organizations. Levels of confidence and trust in leadership need to be strong if change is going to be supported. Innovation and continuous improvement must exist widely if new technologies are going to be effectively introduced and exploited. Are leaders capable of creating this new culture? How effective is your training activity now? It will probably need to be better.

Example: Furniture manufacturer

Let's apply this internal analysis tool to the hypothetical example of a furniture manufacturer. The manufacturer has (honestly!) rated itself on each of the five categories and given an explanation for the rating.

Image: Adobestock

Element	Rating (1 is weak, 5 is strong)	Explanation
Customer Focus	4	Important in this competitive market, where trends change quickly.
Strategy Strength	3	Regular strategy development takes place but implementation is often weak.
Technology Capability	2	Technology human resources are stretched thin and infrastructure is outdated.
Operations Engagement	2	Effective in managing efficient operations today but not so good at managing change.
Organizational and Cultural Commitment	3	Positive employee relationships and good management team cohesion, but weak in innovation and continuous improvement processes.

As with all of the tools we have introduced in this guide, the value of this internal analysis is only realized with extensive stakeholder engagement. This enables multiple perspectives and sources of knowledge to be combined in effective decision making. In most cases of digital transformation strategy development, I've found that stakeholder engagement should be stronger.

Consider the question of honesty. Is this a challenge in your organization? If it is, what should be done to overcome it? If it's not an issue, consider your plan for engaging stakeholders. Document your thoughts and apply them when you do your own internal analysis.

Image: Adobestock

How to choose the right technology for digital transformation

The range of technological options available to organizations today is immense. It's like being in a restaurant with a very long menu—there are many mouthwatering possibilities, but your stomach (or your budget) forces you to choose. Similarly, the menu of technology options can be daunting to organizations seeking to digitally transform. How do you know what to choose?

Later in this chapter I'll share a simple tool that will help you narrow it down. But first, it's crucial to understand two things about effective technology selection: strategy and collaboration.

A strategic foundation and collaborative approach

Technology investment decisions and the projects that follow from them should always be based on strategic objectives. It is important to take the time to properly understand the environment in which your organization is operating, technology trends, activities of competitors, etc., and to make judgements about the future direction that your organization should take.

Knowledge of your business and the technological options open to it must be effectively combined in and between your organization's various divisions, departments and functions, and sometimes externally within an ecosystem of customers and suppliers. This is why it's imperative that technology decisions are made collaboratively. Those with expertise and responsibility, and with knowledge of the business and technology, need to be able to work well together to make the best decisions for digital transformation.

The trickiness of technology decisions

The information technology solutions available to support digital transformation are advancing and expanding daily. Most organizations understand that technology-based change, accelerated during the COVID-19 pandemic, is here to stay and for many, it poses an existential threat. Understanding how this impacts your organization and developing your response is critical to survival.

Understandably, technology vendors are keen to win as much business as they can. Each technology solution they offer focuses on an area of benefit to many organizations and will have a positive business impact. A business case can reasonably be made for many of the solutions available to many businesses.

Image: Adobestock

For example, a manufacturing company may have viable technology investment options in process automation, data gathering and analytics, customer relationship management, process management and control or robotics, all of which might benefit from the application of artificial intelligence (AI). There may also be benefits in operations, sales, human resources and beyond.

Making decisions about where limited financial and other organizational resources (such as technical skills, project management, leadership attention, engineering skills and equipment) should be focused is a significant challenge for most organizations. Choosing where investment should be made and which technologies to use requires a clear digital transformation vision and strategy.

Tool: The digital technologies selection template

To help you carefully combine your skill and knowledge in selecting the right technology for your organization, we developed the digital technologies selection template. Designed to be used by groups, it fosters a common commitment to the success of your decisions through a participative approach.

The digital technologies selection template enables you to make informed choices between technology options. It is important to evaluate not just the technologies, but are also where and how they will be used. The template is based on seven categories, described below, with each category evaluated on a 6-point scale. A 0 indicates that the criteria has not been met and a 5 indicates a high degree of strength in that category.

The categories are as follows:

1. **Strategic Alignment**

To what extent does the proposed technology investment contribute to the strategic objectives of your organization? Investments which are not consistent with strategic objectives should not be pursued.

2. **Urgency of Need**

Does the investment meet a pressing need that if not met very soon will cause harm to your organization or prevent it from taking advantage of an important opportunity? Urgent organization needs should be a priority for investment.

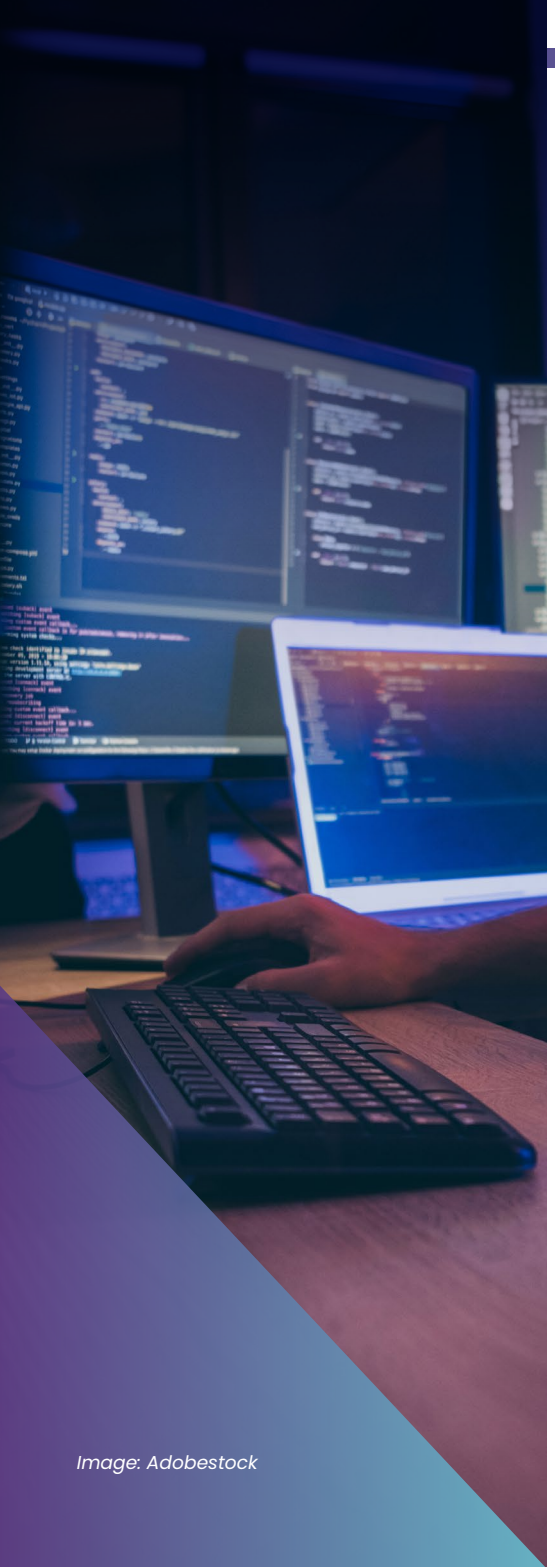


Image: Adobestock

3. Execution Capability

Does your organization have the capability (skills, knowledge and resources) needed to introduce and utilize the technology? If not, how easily can it access this? If execution capability cannot realistically be available and utilized, then the technology option is not feasible. Introducing the technology in the future may be possible if internal or external capability can be developed.

4. Business Performance Impact

What will be the impact of the technology on the performance of your organization? Consider the key performance metrics for your organization and how the technology will impact these.

5. Implementation Timeline

How long will it take to introduce the new technology? If the need that it is meeting is urgent, will the desired results be achieved in time? Will disruption of existing activity due to the implementation be tolerable to your organization?

6. Ease of Integration with Existing Technology

How easily will the new technology be integrated with the existing technologies in your organization? Will specialist help be needed for this integration, and how confident are you that the integration is feasible? Many technology implementations fail because this aspect of implementation has been neglected.

7. Future Potential

Is the technology consistent with the plans of your organization or will it quickly become obsolete?

How to use the digital technologies selection template

The best way to use the digital technologies selection template is to display it on a screen or whiteboard so that a group of people can contribute simultaneously. No transformation will be successful if it cannot effectively combine the skills and knowledge of a wide range of people.

Participants should determine their own ratings for each transformation project being considered, with the resulting discussion developing a consensus on the ratings for the group. It can be helpful to aggregate numerical ratings as part of the process of achieving consensus.

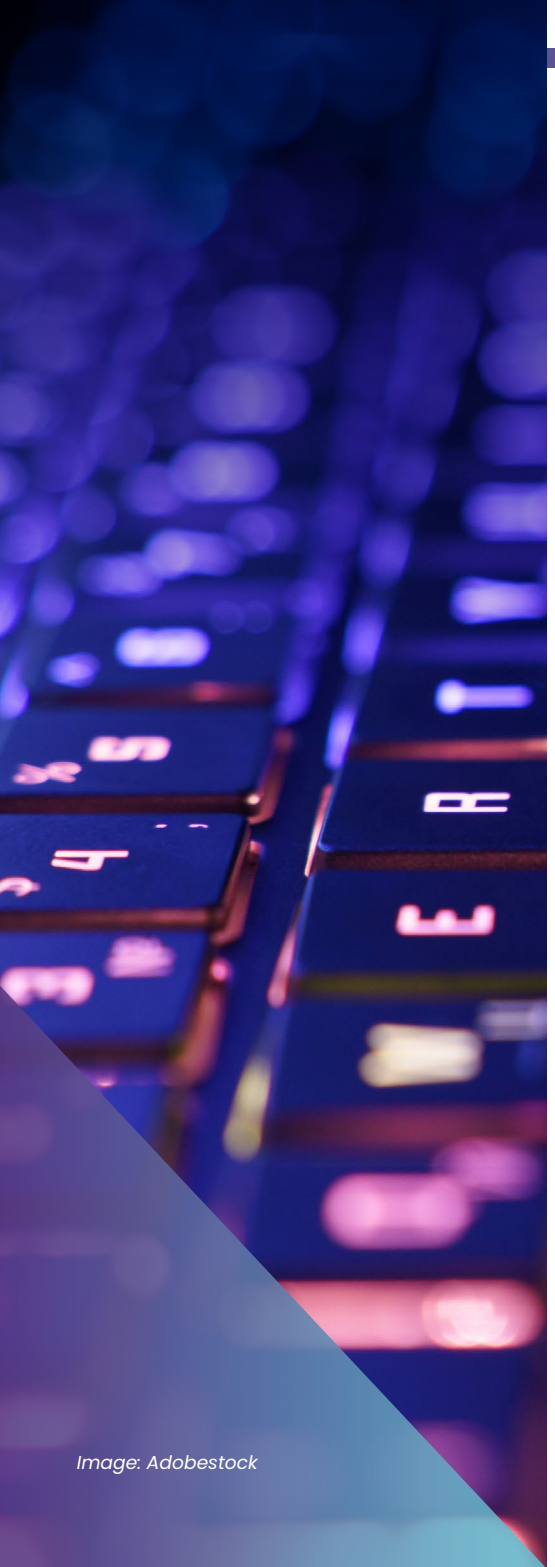


Image: Adobestock

Here's an example of how an electrical power generation facility might use the digital technologies selection template:

Transformation Project	Strategic Alignment	Urgency of Need	Execution Capability	Performance Impact	Implementation Timeline	Integration With Existing Technology	Future Potential	Total
Artificial Intelligence in Forecasting	4	3	2	4	3	3	4	**23**
Automation in Fabrication	3	2	2	2	4	3	3	**19**
Digital Twinning of Power Generation Equipment	4	3	3	4	3	2	4	**23**
Maintenance Use of Augmented Reality	4	4	4	4	3	4	5	**28**

In this example, the most preferable technology to pursue is augmented reality for maintenance. (Image: Author.)

The digital technologies selection template is a simple method for selecting your digital transformation technology. You can better understand its use by reflecting on how it could be applied in your organization. Think about who would be involved, what your own ratings would be, and how you would overcome any challenges you might face.

AI and digital transformation

Recent history has set a strange stage for the AI revolution. COVID-19 forced many organizations to change more quickly than they would previously have thought possible—but it didn't usually change the fundamentals of their culture or work organization.

The upheaval of COVID-19 has been followed by a period of reflection, with more corporations understanding that the world has changed. This has prompted greater attention to developing a technology-based digital transformation strategy or, for others, finding their own new balance between the old world and the new.

Artificial intelligence is challenging these new normals. Just as organizations have been starting to feel that they are regaining a measure of post-COVID stability, the AI hype is demanding yet more radical change. Many organizations fear that unless they get on the AI train now, they will be left behind.

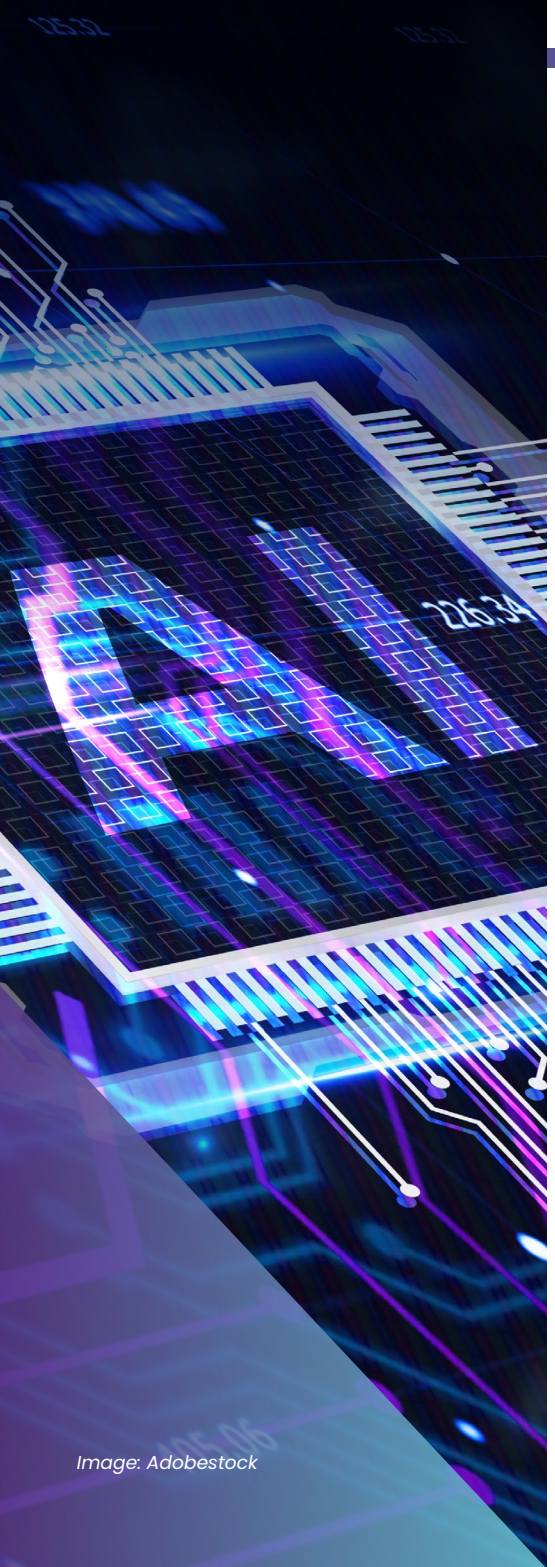


Image: Adobestock

The fourth industrial revolution requires that organizations be aware of and ready for rapid technological change, understanding the technological developments that are happening in their industry and adopting and implementing appropriate strategies. A digital learning culture is one of the essential elements.

Living in a world of digital transformation should involve the establishment of digital early warning systems. The apprehension with which AI is now being regarded is an indicator that most organizations don't have them.

What to understand about the AI hype

It is important to understand two aspects of the AI hype. It is certainly true that AI has huge potential to radically impact many aspects of organizational activity, and that you need to carefully consider what it means for your organization. However:

1. The term artificial intelligence applies to many different things and is much abused today. The recent discussion has been about generative AI, which "generates" a response to questions. However, organizations frequently use the term to refer to machine learning and other technologies that have been around for some time. This is confused and adds to the hype.

2. Organizations have done very little with generative AI so far. In a 2024 report by ETR, *Generative AI Growing in Business*, only a minority of organizations surveyed were using it for production tasks, and most of these were relatively simple and unlikely to indicate radical transformation.

So, while it is very important you understand and develop your response to AI, you have time to do this carefully. Our methodology will help you to assess your AI project ideas. Our tools allow you to assess whether artificial intelligence is the appropriate technology to apply to address the need you have identified.

Step 1: Should you be using AI for this project?

If your response is NO to any of the below requirements, you should carefully examine whether artificial intelligence is appropriate for your project.

Image: Adobestock

AI Requirement	Description
Does your data change rapidly?	If you are simply trying to understand a set of data that doesn't change quickly over time, you don't need AI. You can analyze it with technology that uses basic analytics.
Are very complex rules required?	If your data does change quickly, AI is only useful if you need to use complex rules to achieve your objective, answering complex questions or finding complex patterns.
Can you tolerate inaccuracy?	AI is not accurate or correct. It cannot be used for any purpose where this cannot be tolerated.
Is relevant data available?	Have you got or can you get the data that will be needed?
Is representative data available?	Is the data representative so that it will enable your AI to provide results that are of value?
Is enough data available?	Is there enough of the data to enable your AI to provide the desired results?
Can you adequately protect the data?	If you have good data, will you be able to protect it to ensure personal and organizational interests are safe?

Step 2: Which project should be my highest priority?

You may have a number of possible artificial intelligence projects in your organization and limited resources to pursue them, so you'll need to prioritize. The below rating matrix will help. Feel free to add to it if there are additional criteria that are important to you.

The criteria in the artificial intelligence project selection matrix are:

Factor	Description
Measurable benefits	You should be able to measure the impact that the project will have on the metrics that your organization uses to assess its performance.
Unmeasurable benefits	Your project may contribute to the organization in ways that are beneficial but impossible to measure.
Wider use	Projects that will develop resources or capabilities that will be of value to the organization beyond the initial project scope.
Ease of implementation	Easier implementation increases the probability of project success and of its sustainment.

The matrix is provided below, with sample data provided to illustrate its use. The weight column indicates the maximum score for each factor, which allows you to vary the emphasis given to each factor in your decision-making. In this example, Project 3 is the best choice.

Image: Adobestock

Factor	Weight	Project 1	Project 2	Project 3	Project 4
Measurable benefits	10	9	6	9	3
Unmeasurable benefits	10	3	5	9	8
Wider use	6	4	6	5	4
Ease of implementation	8	8	6	4	3
Overall rating		24	23	27	18

Step 3: Am I able to use artificial intelligence for this project?

Using artificial intelligence requires that the organization has the necessary resources and capabilities. The below tool helps you review this and develop an action plan to address any deficiencies you find.

Resource	Description
Finance	The budget for your project. This should be in a form used in your organization that may be presented for project approval.
Expertise	Do you have the skills to complete the project and support it after implementation? These may include internal and external skills, but must only include those that you are confident will be available for the project.
Computing capacity	Can your computing equipment run the technology you are introducing? Artificial intelligence usually requires substantial, powerful computing capability.
Leadership support	Will the senior management team provide the support needed to drive the introduction of the technology in the organization?
Legal / regulatory / ethics	Have you reviewed the ethical, legal and regulatory implications of your project and developed plans to ensure compliance and socially responsible technology use?
Maintenance capability	Do you have the expertise and resources to maintain the technology, or will your project develop it?

Review the requirements for successful artificial intelligence adoption using the following tool and develop your own plans to address deficiencies.

Image: Adobestock

Requirement	What is available	Sufficient?	Action required
Finance			
Expertise			
Computing power			
Computing infrastructure			
Leadership support			
Legal / regulatory / ethics			
Maintenance capability			

These three simple steps provide tools to help you consider your artificial intelligence projects. They will enable your management team to carefully consider the use of artificial intelligence in your organization.

Image: Adobestock

PART II: EXECUTING YOUR DIGITAL TRANSFORMATION

Why so many digital transformation projects fail

According to a 2021 study by the McKinsey consulting company, 69 percent of digital transformation projects fail—a shocking statistic. That organizations continue to invest in projects that fail at this rate is evidence of the high level of strategic importance that is attributed to them. The cost of this failure is much more than the cost of the resources wasted on the implementation project—it is the impact on the organization's competitive position.

Digital transformation means different things to different people. For some it may be product focused, for others process, business model or a combination of these.

My colleagues and I have reviewed the available literature and conducted interviews with manufacturing companies about their digital transformation activities in an effort to better understand how failure rates can be reduced. Some of the challenges we identified were technical, but most were not. I'll go through one of the most significant causes of failure in a hypothetical case study based on our research.

Continuous improvement for engineers

Continuous improvement (CI) refers to collaborative activity designed to make incremental improvements in an organization's activity, including products, services and processes. One of the areas that we identified as being a significant cause of failure in digital transformation projects was a lack of employee participation in continuous improvement activities.

Image: Adobestock

Employee involvement in improvement activity is an objective that many companies have pursued, with varying degrees of success. It is a critical element in digital transformation. Employees should contribute when implementing digital transformation projects, and when the implementation process is complete, continuous improvement helps overcome initial glitches and refines flow in new processes. Later, CI helps companies maximally exploit new technologies as processes and requirements change in response to rapidly changing markets.

To better understand how continuous improvement can help overcome the challenges of digital transformation, let's see how it works in practice.

The operations manager's dilemma

Gerry Santos is an operations manager for a manufacturer of automotive brake components. He oversees various machining operations, some of which are now automated and others that are completed by technically skilled employees. The manufacturer uses Lean principles in its operations.

Gerry's company has been considering how the increasing use of technology in business will impact it and what its response should be. The managers know they have limited resources to invest and want to maximize the value of any investment made. While people with the appropriate technical skills will be contracted to install the new equipment and applications, Gerry will be expected to apply the technology in his department effectively.

The company has decided to introduce Internet of Things (IoT) technologies, adding sensors to machines that will gather data that can be used to improve operational activity. Gerry will have access to the data and it is expected it will contribute to his daily management activities. The engineering team will be able to use the data for their maintenance activity too. It is hoped that the machine operators will also be able to use the data to improve their own work through the application of continuous improvement processes.

The company does not have employee continuous improvement processes that are being used in any meaningful way. While training in CI had been done a few years ago, daily production targets had been the priority and the training had not been applied in shop floor activity. Levels of mistrust between management and employees were also a concern. Layoffs during COVID two years ago had made employees cautious

Image: Adobestock

about suggesting improvements that could lead to job losses. Recent recruitment, as business has improved, has meant that some employees are less familiar with industrial processes beyond their immediate job.

Gerry was also concerned that the improvement activity should be aligned with company performance objectives. He didn't want well-meaning employees being demotivated when ideas they had were not supported because they weren't performance priorities.

Gerry knew that for continuous improvement to be introduced and sustained he would have to consider these factors. Improvements made would need to be consistent with the lean principles that were in place in the factory, time would need to be found in daily activities to work on improvement projects, trust would need to be restored between managers and machine operators and knowledge of processes may need to be increased for some employees. Clearly, implementing continuous improvement would require more than just training in continuous improvement skills.

The continuous improvement plan

Gerry considered the main elements of his continuous improvement plan. First, he needed to improve his employees' understanding of the operating system model (Lean manufacturing) being used in the factory. He wanted to ensure that the improvements arising from employees would be consistent with the model, and so decided that training in its fundamentals would be part of his plan, along with training in continuous improvement problem solving skills.

It would be difficult to allocate the appropriate time for problem solving activity. Gerry was under pressure to maximize output and he knew that wouldn't change. Continuous improvement activity would need to be based firmly on its performance impact. This would require a review of performance metrics and updating them where appropriate to ensure that any production time lost would be more than recovered in the benefits of the improvements made.

Gerry decided that a weekly continuous improvement meeting would be held at the start of work on Wednesdays, for 10 minutes, to brainstorm ideas and identify possible projects. He would use overtime to allow employees to work on projects if required. Gerry also believed that improvement would require resources and empowerment. Maintenance engineers would be instructed to provide support and an approval levels policy would be created, defining what shop floor teams could change on their own.

Image: Adobestock

It would take time to improve trust levels, to motivate employees to actively participate in improvement and to give them confidence that their ideas would not result in a deterioration in the quality of their jobs. Gerry would start to do this by discussing it with the Operations Vice President who could raise the topic at a senior level, necessary for the consistent commitment to positive company-employee relationships.

Process knowledge would also be improved with training and the introduction of greater role flexibility. Knowledge of a wider range of jobs in the factory would enable better collaboration in process improvement and enable more flexible working, with its own performance benefits.

Digital transformation requires careful planning

The introduction of Internet of Things technology is intended to enable processes to be better understood and improved. Often, the performance benefits of this technology will only be gained when employees throughout the organization adopt and engage with the technologies, in ways that modify and improve existing processes on a continuous basis. This case provides an example of the range of issues and the level of commitment needed to maximize the beneficial impact.

Gerry's plans are typical of the efforts organizations make to implement continuous improvement, but his plans don't guarantee success. They will need to be carefully monitored and it is likely modifications will be needed. Allocating 10 minutes at the start of the shift on Wednesdays will require careful planning to ensure the time is used well and delivers the results desired. Training in process knowledge will need to be of good quality and achievement of outcomes will need to be confirmed. Flexible working will often require negotiations with employees and its own implementation activities.

This case study shows that digital transformation is about transforming the whole organization, and it requires awareness of the technology impact and requirements as well as careful planning to incorporate them. Weaknesses in these areas are the most common cause of failure.

There has been some discussion elsewhere that the impact of technology will reduce competitive differences between similar organizations. If the impact of technological change was gained simply by installing it, this argument may have merit. This case emphasizes that it is the quality of the work that is done to exploit the technologies that will create competitive advantage.

Image: Adobestock

Continuous improvement for digital transformation

Active participation in continuous improvement and innovation is critical for successful digital transformation. Employees across all levels in an organization must be involved in, and committed to, technological change. This will make it easier to solve problems when they arise, identify new opportunities and foster organizational agility and innovation.

To that end, it's important to effectively communicate and analyze ideas for change—and one of the best methods to do so is a tool called the Value Proposition Canvas. Originally developed to guide tech startups, the Value Proposition Canvas has proven to be an important tool to overcome the challenges of change that plague most organizations.

Why innovation is so hard—and why it requires teamwork

Many organizations have sought to encourage continuous improvement and innovation, but most are unsatisfied with the results. According to McKinsey & Co, 86% of CEOs believe innovation is critical to growth but only 6% are satisfied with their innovation performance.

Continuous improvement is a collective process. Anyone who has an idea should be able to easily share it with others, gain their input and have it considered for implementation. Decision makers should be able to easily understand which ideas have value and are worthy of further consideration. The Value Proposition Canvas in a collaboration tool that enables this to happen.

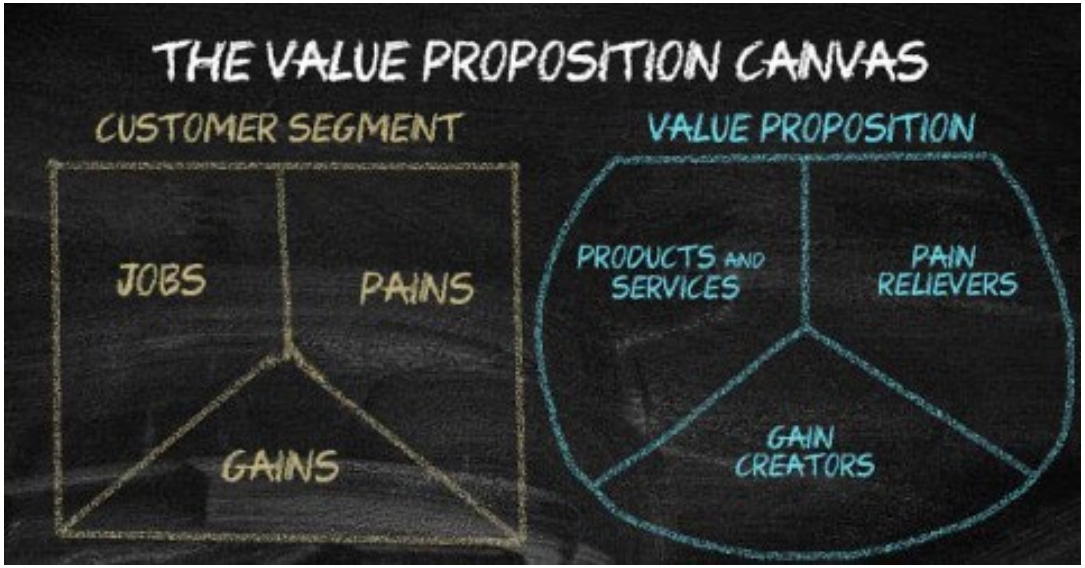
Tool: The Value Proposition Canvas

The Value Proposition Canvas was originally conceived by Alex Osterwalder as part of the Lean startup methodology, a widely used framework to guide the development of tech startups. That methodology was pioneered by Steve Blank to develop business and product ideas, identifying those that have a reasonable possibility of success and implementing them.

Many companies now recognize that the Lean startup methodology is not just for tech startups, but can also be used to support innovation and continuous improvement in established organizations large and small.

Image: Adobestock

The Value Proposition Canvas allows an idea for a new product, service or process to be expressed and communicated on a single page. It summarizes an idea and its value with a simple format that can be understood by all it. The Value Proposition Canvas has two main elements: the Customer Segment and the Value Proposition.



How to use the Value Proposition Canvas for digital transformation

The Customer Segment describes the problem or opportunity that an idea is intended to address. When applied to digital transformation, it can be used to describe the focus of the improvement being proposed. Consider as an example the introduction of augmented reality headsets to support maintenance activity in a manufacturing facility.

Each of the main elements has three parts. In the Customer Segment these are:

- **Jobs:** The objectives of the customer or users of the technology being suggested. In the example these would include monitoring, maintaining and repairing factory equipment.

- **Pains:** The challenges that are faced in getting the jobs done. In the example these might include keeping equipment knowledge up to date for all maintenance employees, retirement of boomer employees and consistency of the quality of maintenance work.

Image: Adobestock

- **Gains:** The benefits that are desired or achieved by doing the jobs well. Perhaps: reliable equipment, good production quality and lower equipment downtime.

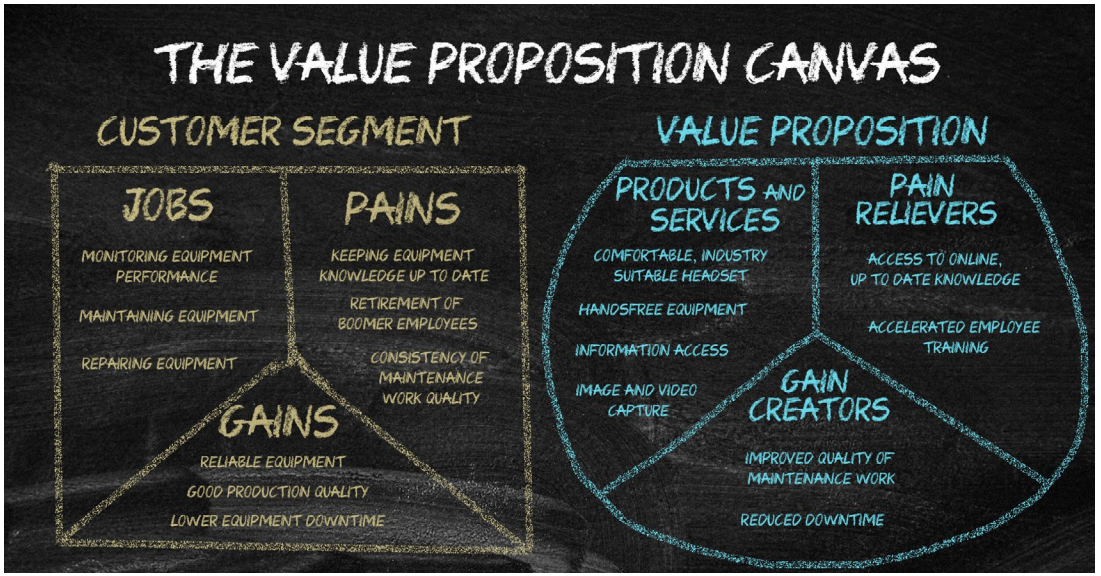
The Value Proposition side of the canvas describes what the innovation or improvement is and how it will benefit the Customer Segment. It has the following elements:

- **Products and Services:** The main elements of the idea. For example: A comfortable headset which is suitable for an industrial environment, providing hands-free access to digital equipment maintenance data and the ability to capture images and video of equipment to share with colleagues.

- **Pain Relievers:** How the idea addresses the pains in the Customer Segment. Perhaps: Providing access to online, up to date equipment knowledge in real time at the work site and accelerating new employee training.

- **Gain Creators:** How the idea contributes to the gains. For example: Improvement in the quality and productivity of maintenance work resulting in reduced downtime.

The completed VPC might look like this:



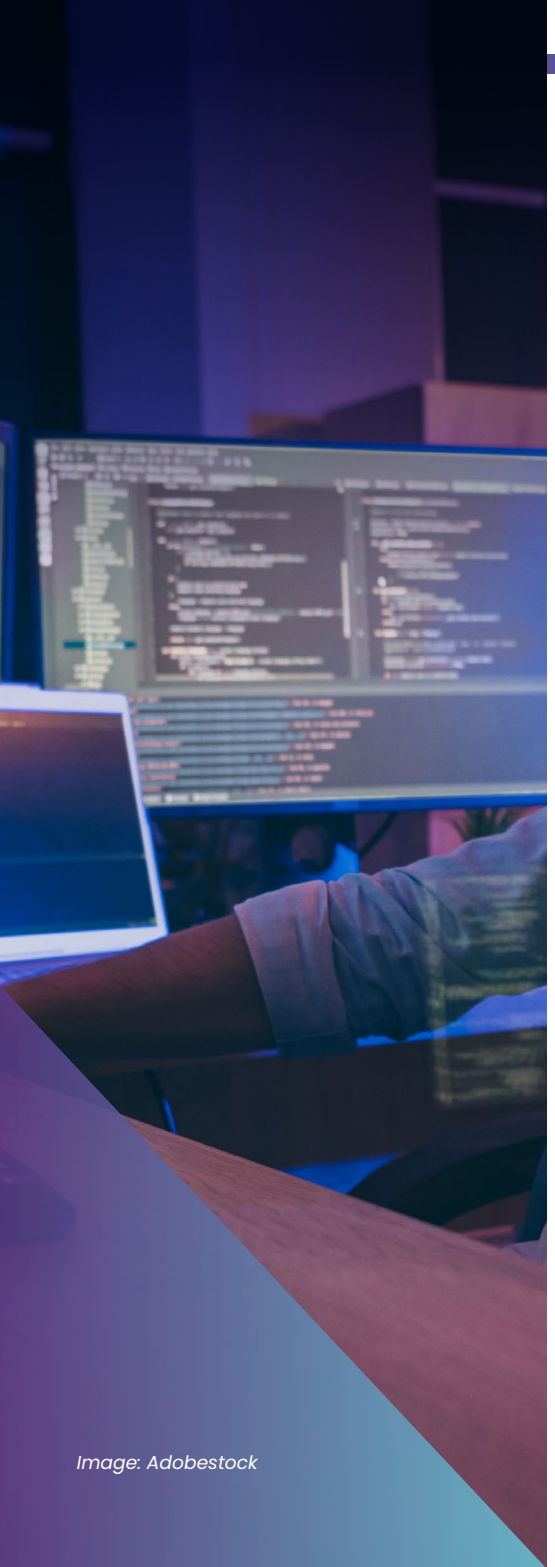


Image: Adobestock

Collaborate for continuous improvement

Creating the Value Proposition Canvas should be a collaborative process. A group can create it and all stakeholders can be asked to contribute their ideas. This enables ideas to be refined and the fit between the idea and the customer, user or process to be improved. It can be the basis of discussions with decision makers to obtain approval and resources for implementing the idea.

Establishing innovation and continuous improvement is essential for successful digital transformation activity. You need everyone to actively participate in effective technology-based change. If someone is not participating in change, it is much more likely they will be resisting it.

The Value Proposition Canvas tool is used to enable participation, but it isn't enough on its own. It should be accompanied by efforts to develop an appropriate digital culture and mindset and clear processes and practices that empower employees to suggest and implement ideas.

Consider an improvement that you know about in your workplace. Create a Value Proposition Canvas for that idea. Take some time to consider your work—how good was the fit between your Customer Segment and Value Proposition?

Next, select an idea you have for a technology-based innovation in your workplace. Assemble a small group of your colleagues and complete a VPC on your idea. You can use post-it notes to complete the canvas elements, enabling everyone to add their own ideas.

Adapting your business model for digital transformation

Digital transformation is different for every organization. It depends on a wide range of factors—some internal, like culture and existing technology, and some external, like competitor behavior and economic conditions. Digital transformation activities can be big or small, from establishing an entirely new business model to automating a single process.

Whatever the nature of your transformation, understanding its whole business impact should be incorporated in your plans. A change in one department may have implications elsewhere that you will need to consider. If you are planning a whole business change, understanding how everything fits together is critical.

Image: Adobestock

This chapter introduces a simple tool that enables you to take an integrated view of your digital transformation activity. It focuses on your business model—the main elements that enable your organization to function effectively—and makes them visible in a holistic, easy to understand way.

The problem with traditional business planning

Organization business planning has traditionally been a lengthy process. Long periods of consultation are followed by the creation of detailed, organization-wide business plans that are often articulated in verbose documents.

This long planning process restricts the pace of change and is inadequate in the age of digital transformation. It also makes modifying the strategy difficult. This process was designed for an era of slow change. Today it is obsolete.

Tool: The Business Model Canvas

Last chapter we introduced the Value Proposition Canvas, a tool that makes it easier to develop and validate ideas for new products and processes. Developed by Alex Osterwalder, this tool was designed for Lean tech startups, and it's part of a larger planning tool called the Business Model Canvas.

The Business Model Canvas integrates the main elements of an organization on a single A3 sheet of paper. The tool has been used with great success by tech startups to design their business models to create and deliver their technology products and services.

This tool can also be used to plan your digital transformation activity. By viewing all of the key business elements together, the Business Model Canvas makes it easier to understand the impact of technological changes and plan for them effectively. It is also much easier to make modifications as you see the actual impact of your implementation.

The Business Model Canvas considers both the internal and external aspects of your business, and is centered on your value proposition—the value that your business provides to customers. Once you have

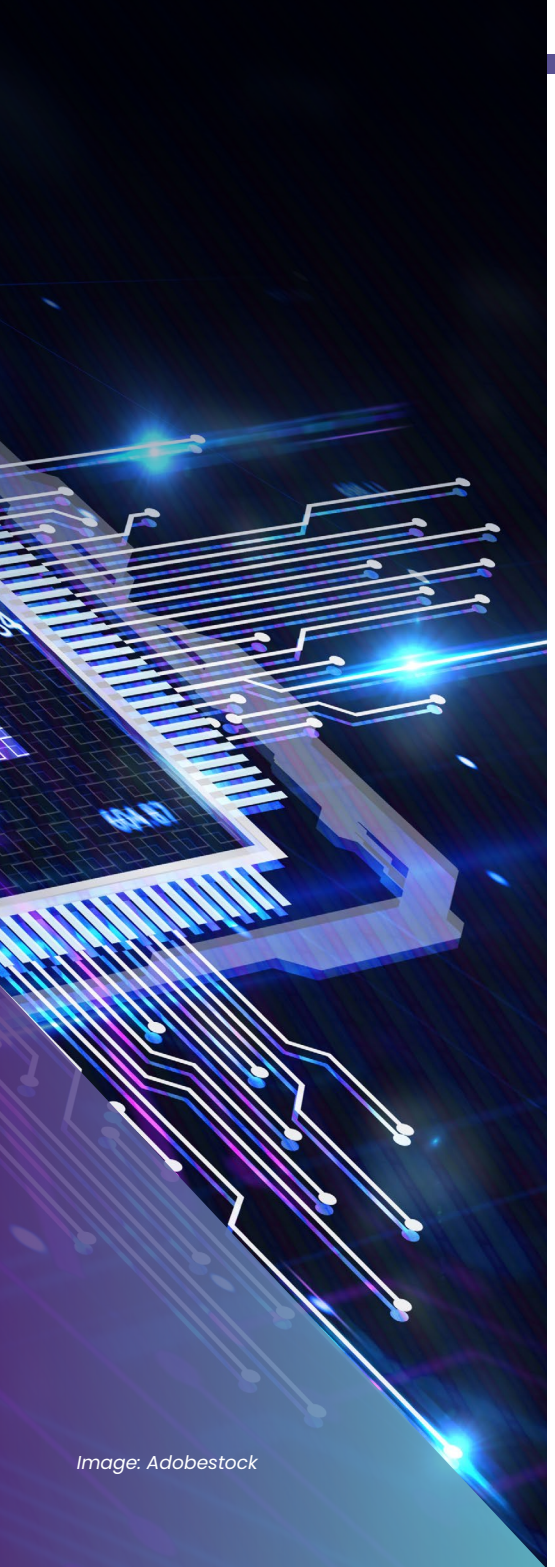


Image: Adobestock

established your value proposition, you can complete the rest of the Business Model Canvas. It includes the following:

- **Customer Segments**: Who are your customers, and are they in different segments? Will your transformation activity change this?
- **Customer Relationships:** How do you routinely engage with your customers (email, phone, conferences, etc.)? Will your transformation activity change this?
- **Channels:** How do you contact your customers to make sales (email lists, social media, advertising, sales reps, etc.)?
- **Key Activities:** What are your main activities that create the value proposition? This may include your manufacturing, design, maintenance, etc. Does your new technology change this?
- **Key Resources:** The main practical resources you need to create your value. This may include physical equipment (machine tools, robots, etc.), floorspace, people, the internet, etc.
- **Key Partners:** The external organizations or people that you need to create value and complete key activities. This may include suppliers and services such as cloud providers. These may change as you digitally transform.
- **Cost Structures:** What are your main organization costs (human resources, energy, distribution, raw materials, etc.)?
- **Revenue Streams:** How does the value you create result in revenue for the organization (e.g. subscriptions, sale of products or services, etc.)? What does your transformation mean for your costs and revenues?

The Business Model Canvas can be organized as in the below template from Strategyzer.

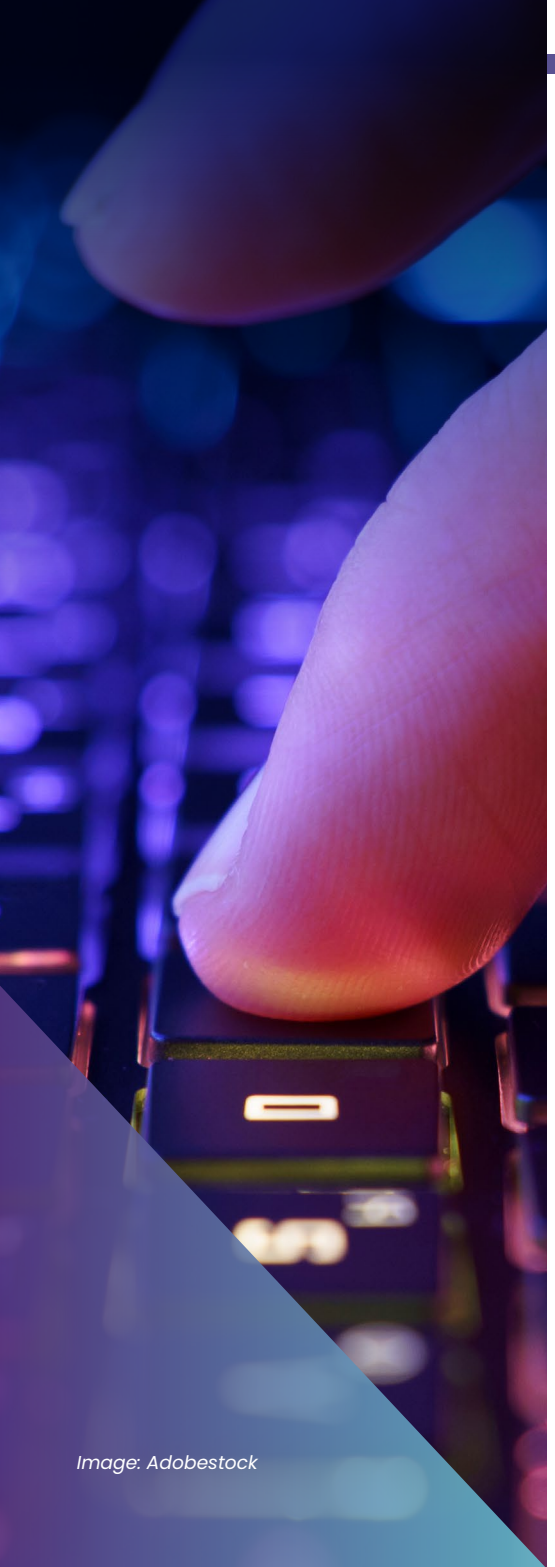
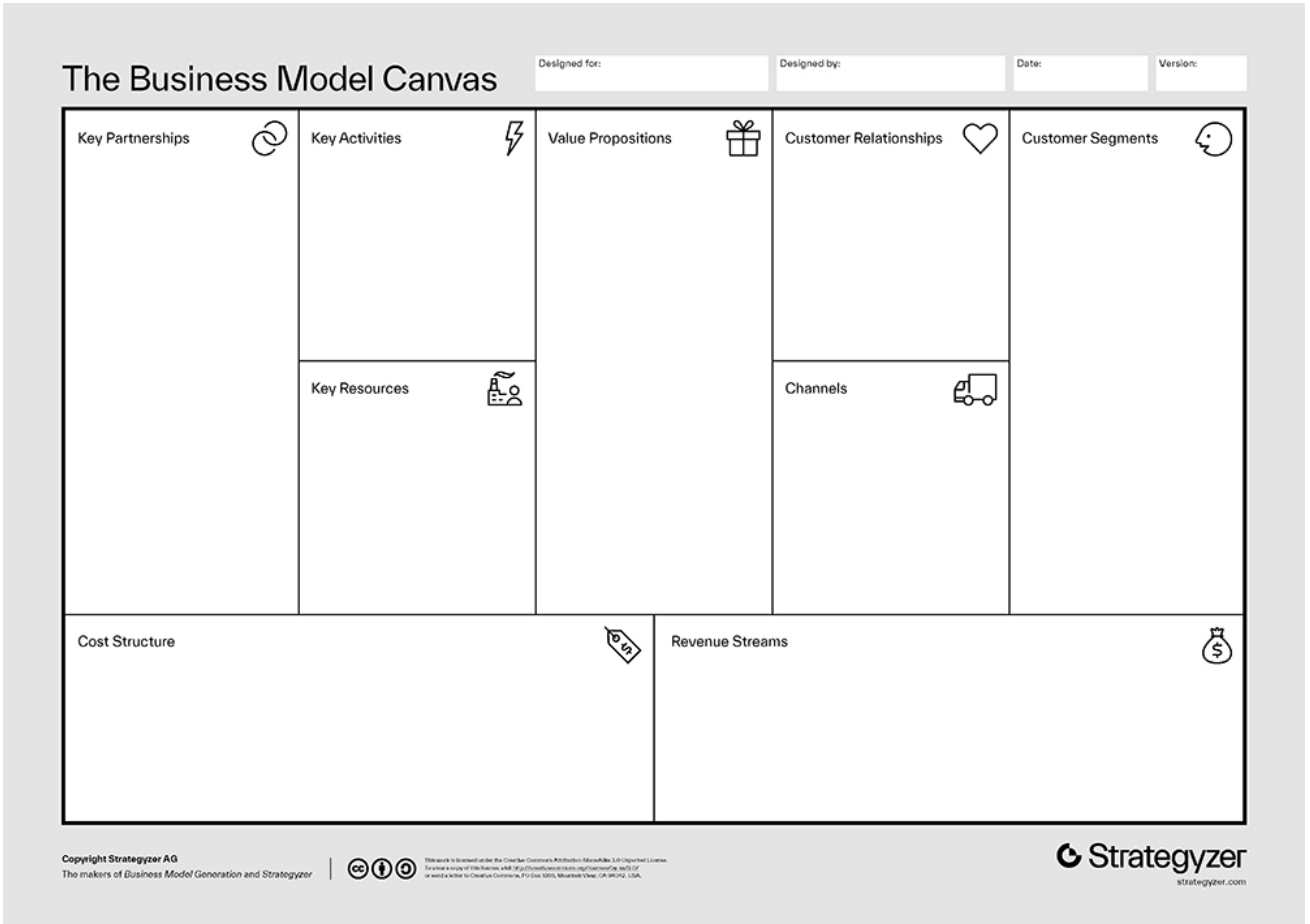


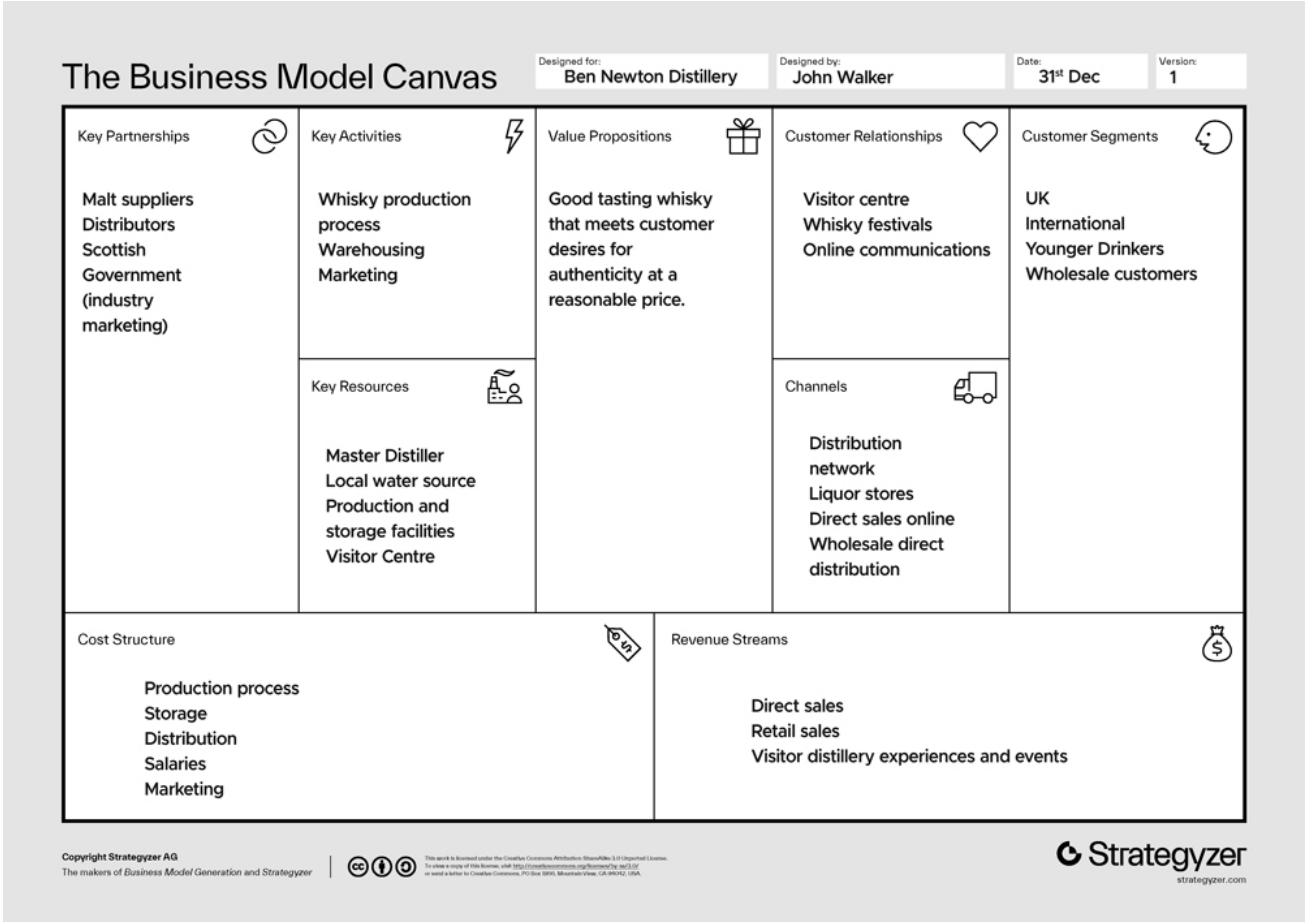
Image: Adobestock



Template for the Business Model Canvas. (Image: Strategyzer.)

The Business Model Canvas in action

The following example of the Business Model Canvas considers the introduction of technology in a whisky distillery. The current position of the business is represented in the Business Model Canvas below:



The Business Model Canvas

Designed for: Ben Newton Distillery
Designed by: John Walker
Date: 31st Dec
Version: 1

Key Partnerships
Malt suppliers
Distributors
Scottish Government (industry marketing)

Key Activities
Whisky production process
Warehousing
Marketing

Key Resources
Master Distiller
Local water source
Production and storage facilities
Visitor Centre

Value Propositions
Good tasting whisky that meets customer desires for authenticity at a reasonable price.

Customer Relationships
Visitor centre
Whisky festivals
Online communications

Channels
Distribution network
Liquor stores
Direct sales online
Wholesale direct distribution

Customer Segments
UK
International
Younger Drinkers
Wholesale customers

Cost Structure
Production process
Storage
Distribution
Salaries
Marketing

Revenue Streams
Direct sales
Retail sales
Visitor distillery experiences and events

Strategyzer
strategyzer.com

The distillery wants to move into more direct-to-customer distribution while expanding its product range to appeal to more people in a younger market. This will require automation in the production process to enable faster changes from one product type to another (for example, from Cask Strength whisky to Sherry Oak Finish).

A warehouse management system will be needed to handle the complexity in the new warehouse, which will include sensors to enable closer monitoring and control of warehouse conditions (an important element in whisky aging), and to support the substantial increase in direct shipping that is expected in the future.

Image: Adobestock

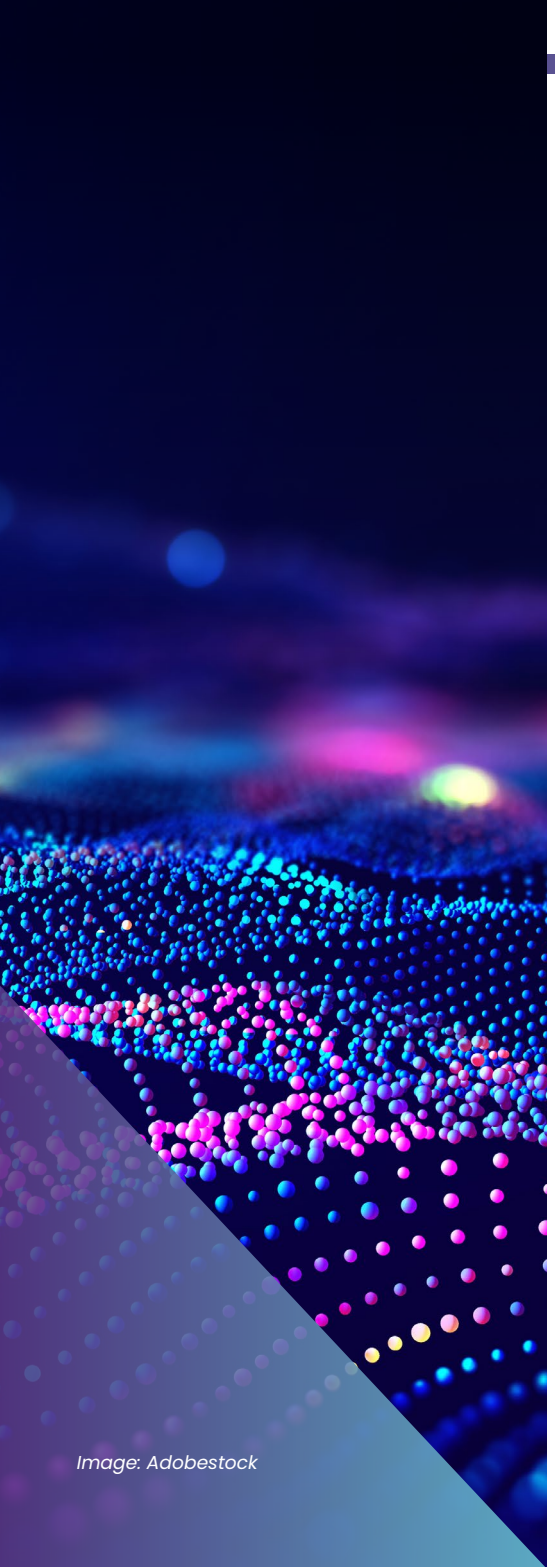


Image: Adobestock

A CRM system with data analytics capabilities will facilitate direct relationships with customers and support the direct sales activity, including the use of artificial intelligence to enable individualized customer communications. Given the distillery's level of technical capability, cloud hosting will be used where possible.

The management team create a new version of their Business Model Canvas for the completed technology project (the changes are in italics):

The Business Model Canvas

Designed for:	Designed by:	Date:	Version:
Ben Newton Distillery	John Walker	31st Dec	2

Key Partnerships

Malt suppliers
Distributors
Scottish Government (industry marketing)

Technology providers
Financial institutions

Key Activities

Whisky production process
Warehousing
Marketing

Direct distribution
Direct marketing

Key Resources

Master Distiller
Local water source
Production and storage facilities
Visitor Centre

Marketing team
Technology specialists in house

Value Propositions

Good tasting whisky that meets customer desires for authenticity at a reasonable price.

Customer Relationships

Visitor centre
Whisky festivals
Online communications

Direct marketing
Customer engagement activities

Channels

Distribution network
Liquor stores
Direct sales online
Wholesale direct distribution

Customer Segments

UK
International
Younger Drinkers
Wholesale customers

Cost Structure

Production process
Storage
Distribution *(Likely to significantly change in areas of emphasis)*
Salaries
Marketing *(Likely to increase substantially)*

Technology

Revenue Streams

Direct sales *(Will increase substantially)*
Retail sales *(Likely to continue to decline)*
Visitor distillery experiences and events *(Explore potential to increase as a result of new technology)*

Strategyzer
strategyzer.com

Image: Adobestock

Using the Business Model Canvas for digital transformation

The Business Model Canvas has been used by organizations globally to assist with their strategic change. You can modify the Business Model Canvas if you feel that there is another category needed. Remember, though, that the simplicity of the Business Model Canvas is its strength. It can be quickly understood and form the basis for a group discussion on changes being made.

Digital transformation requires engagement from everyone in the organization. Wide, patient consultation on changes is needed and should create support for the changes you are making. The Business Model Canvas allows that to happen.

Old business model planning models required extensive documentation and were hard to change. The Business Model Canvas can be created quickly and often, providing a historical record of your discussions and the changes made.

It won't take you long to try out the Business Model Canvas. Try it and you'll see how easy it is to use and gain confidence in arguing for its adoption in your organization. First, create a Business Model Canvas for your organization today. Next, imagine a technology-based change that you think would be valuable, and create a Business Model Canvas based on that change. Finally, use your completed charts to demonstrate its value to others.

Aligning your digital transformation efforts across your business

Most digital transformation efforts stall after the initial project activity. Even after a successful pilot project, there can be hesitation to move forward with large scale changes that radically impact the organization. According to analyst McKinsey, 70% of organizations report that their digital transformation has stalled at some point.

Even though the rapid change in most industry sectors today is broadly understood to require a substantial response, most organizations lack the confidence to proceed. But there's a way to get this confidence, and it's easier than you think.

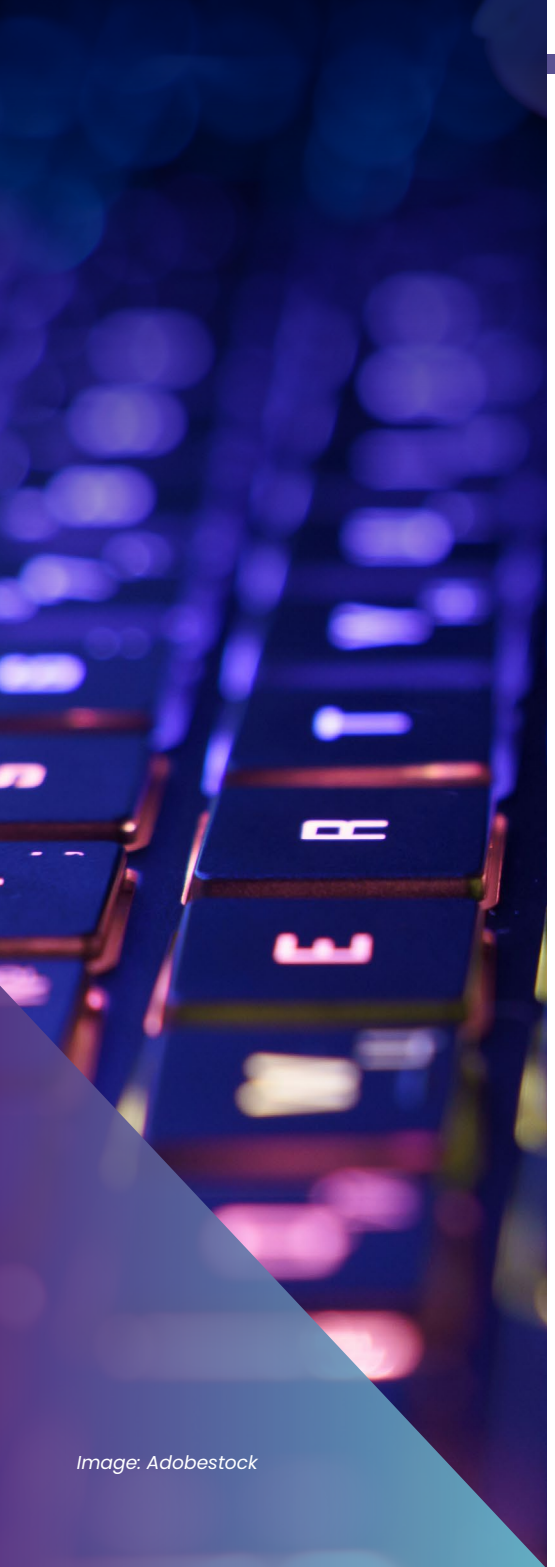


Image: Adobestock

Digital transformation requires integrated management

The majority of successful organizations achieved their success by repeating the same processes year after year. When tweaks were made, they were within an organization that was specifically designed for reliable repeatability, not for revolutionary change. It is little surprise that most organizations now find digital transformation difficult and, as the research tells us, most fail.

The reasons for stalls are usually within the control of the organization itself. According to McKinsey, the controllable aspects are:

- Ineffective or misinformed transformation strategy
- Ineffective design of transformation
- Insufficient alignment and/or commitment across the organization
- Lack of clarity on transformation strategy
- Resourcing issues

This research indicates that effective leadership planning and coordination of digital transformation is rare. But there are ways to break through the conservatism that holds back many organizations today.

Breaking through conservatism

Most CEOs were hired to manage in a conservative way, since radical strategies with a high degree of risk could be career ending. Organization structures, practices and culture are all designed for slow change. Silos are widespread and management team collaboration is weak.

It is important to emphasize that the focus on safety and reliability that exists today has been valuable in the past and will continue to be in the future. It will still be important that organizations are effective at producing reliable, high quality goods and services at an appropriate cost. Negatively impacting this in the pursuit of transformational change would be a fatal mistake. Instead, organizations need to carefully change, maintaining operational effectiveness while more easily incorporating continuing transformation.

Image: Adobestock

Silos in organizations inhibit integrated cross organizational change. They limit understanding of the impact of change in one area on another, resulting in unintended negative and positive consequences. Collaboration on changes impacting more than one department is restricted, meaning larger projects are less likely to be successful and that the organization will be less likely to undertake them. Data that may have value across the organization is not shared and processes operate in disjointed ways, and this is exacerbated when new technologies are introduced.

Organizations must change to overcome the challenges of their current structure, practices and culture. How? With a simple tool called the Digital Transformation Integration Analysis Matrix.

Tool: The Digital Transformation Integration Analysis Matrix

The Digital Transformation Integration Analysis Matrix is intended for use by a group within an organization. It should be completed collaboratively, using a flipchart, whiteboard or some other format that enables everyone to participate in the digital transformation planning. This facilitates integrating digital transformation activity across the organization.

It looks like this:

DX Integration Analysis	Finance	Human Resources	Operations and Supply Chain	Sales and Marketing	Information Technology
Finance: [Initiative]					
Human Resources: [Initiative]					
Operations and Supply Chain: [Initiative]					
Sales and Marketing: [Initiative]					
Information Technology: [Initiative]					

Image: Adobestock

The left column lists the digital transformation initiatives or projects the organization is engaged in. Each of the other columns represents a separate function or department. Within the matrix, the implications of each initiative for each function or department are recorded, based on the discussion within the group completing the matrix. Initiative implications may include opportunities to exploit new technology or requirements for change in processes or practices.

Take the following hypothetical example in which a canoe manufacturing company is planning to introduce new technologies. The changes planned for each organizational function are described in the left column and their main implications for each of the other functions are given in the other columns. This matrix was prepared by the management team and reflects their combined understanding of the integrated digital transformation work.

DX Integration Analysis	Finance	Human Resources	Operations and Supply Chain	Sales and Marketing	Information Technology
Finance: ***Manufacturing cost reporting system***	Improved financial management	Better control of employee costs	Manufacturing cost control	Costing of customer quotations	Management of technology projects
Human Resources: ***Augmented reality training system***	Training in financial systems for Finance and other employees	Improved corporate training services	Training for operators on the shop floor	Augmented information for new product understanding of retailers	Training on new systems for IT and other employees
Operations and Supply Chain: ***Internet of Things sensors on machines***	Tracking of machine usage expenses	Increased data on machine usage and employee wellness	Management of quality and maintenance	Traceability of customer orders	Increased value of senior management reports
Sales and Marketing: ***Social media unit creation***	Increased awareness of marketing expenditure effectiveness	Support for recruitment	Product performance intelligence for quality management	Improved customer engagement	Privacy implications of data gathered and stored
Information Technology: ***Data dashboard for central systems***	Company expenditure data reporting	Management of employee costs	Performance management	Understanding of impact of new product initiatives	Self-service data for senior team and others

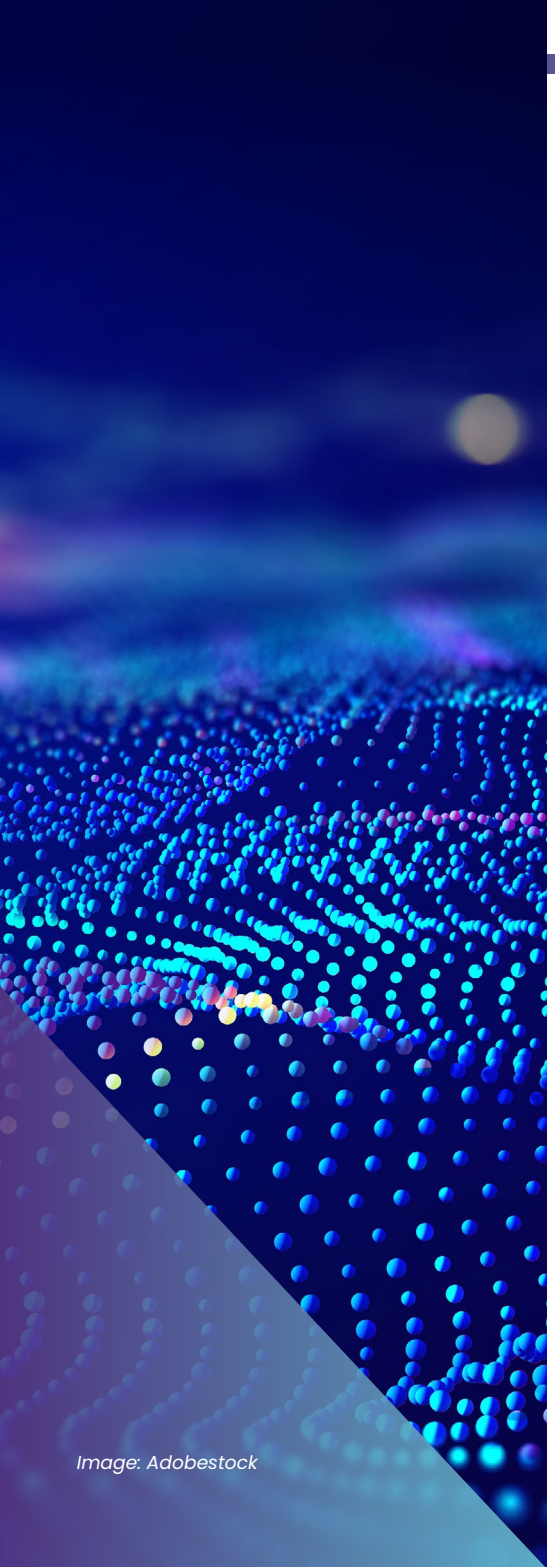


Image: Adobestock

Most digital transformation initiatives have substantial implications in many other areas of the organization. Failing to fully consider these will result in missed opportunities and unanticipated negative consequences.

Consider a digital change initiative in your organization. Apply the matrix to this initiative and identify its impact throughout the organization. Talk to others about their thoughts on what should be included in the matrix. Are there now areas worthy of attention that were not addressed effectively before?

Overcoming hurdles in your digital transformation

It's no secret that organizations have struggled with digital transformation. According to McKinsey, only 30 percent of transformation projects prior to 2020 were successful. The analyst drew attention to a fundamental challenge in an article entitled *How to Restart Your Stalled Digital Transformation*, which showed that while 90 percent of organizations had pursued a major digital initiative, 70 percent experienced "stalls" in implementation and only 36 percent restarted work on their project after the stall occurred.

Why do these stalls occur, and how can businesses pull out of them? It all comes down to effective organizational collaboration, and a simple tool called the digital transformation roadmap milestone matrix can help you through the challenges.

Why so many organizations stall on digital transformation

Effective technological change requires that those with knowledge and technological capabilities work closely with those with business responsibilities. Many organizations have created Chief Information Officers and given them a seat at the executive table. It is now clear that while this may have increased the focus on technology in the executive team, it has not been enough to provide a solid foundation for the large-scale technological change needed today.

The McKinsey report suggests that collaboration between technology and the business remains a significant challenge that is critical to the success of technological change.

Image: Adobestock

When asked the main reason for their stalls, 59 percent of survey respondents pointed to failures of collaboration, including:

- Misaligned culture and ways of working (18 percent)
- Ineffective or misinformed transformation strategy (7 percent)
- Ineffective design of transformation (7 percent)
- Insufficient alignment and/or commitment across the organization (14 percent)
- Lack of clarity on transformation strategy (14 percent)

All of these issues require effective collaboration at a senior level in the organization, between all functions, which most have not effectively done so far. Aligning culture and ways of working requires a common commitment from the management team and the people they manage. Effective transformation strategy requires that there be wide, active participation in the strategy development and a high level of motivation for its implementation, including in the design of the transformation activity itself. Large-scale digital transformation is only possible with a tremendous whole organization effort from a united senior management team.

Tool: The digital transformation roadmap milestone matrix

One of the key objectives of the University of Waterloo Watspeed Digital Transformation online certificate program is preventing and overcoming stalls, enabling organizations' large-scale transformation.

We have developed processes, tools and techniques that make digital transformation collaboration better and which our program participants apply in their own organizations, from development of their transformation vision to addressing common implementation challenges. One of these is our roadmap milestone matrix.

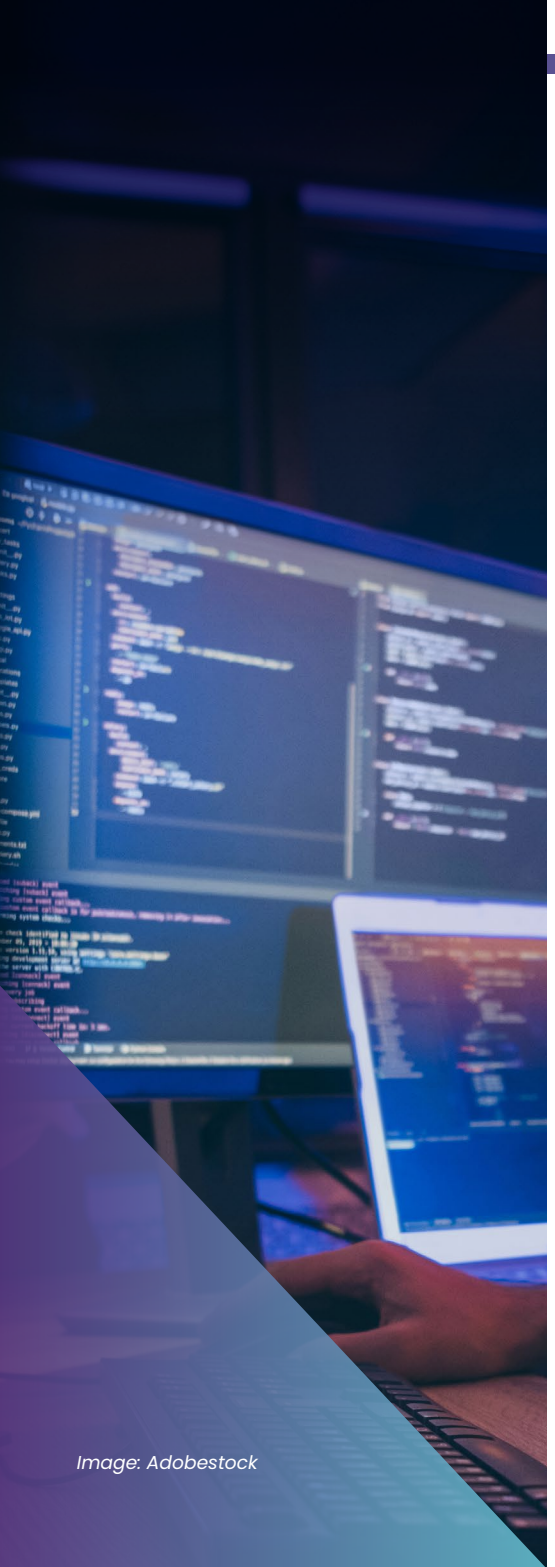


Image: Adobestock

THE DIGITAL TRANSFORMATION ROADMAP MILESTONE MATRIX

Element	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	5th Qtr	6th Qtr	7th Qtr	8th Qtr
Customers and suppliers								
Skills and Org Structure								
Use of Data								
Operational Processes								
Integration								
Leadership								
Culture								

The digital transformation roadmap milestone matrix. (Source: Author.)

Once the main elements of the transformation vision have been identified (after a thorough process that effectively engages key stakeholders, including the senior management team), and the main elements of the transformation strategy have been determined, the main milestones in the transformation implementation can be designed. The roadmap milestone matrix provides a visual template that enables collaboration amongst the members of the senior management team and fosters commitment to its effective implementation.

The milestones together summarize the main elements of the digital transformation project to achieve the transformation vision. They describe the main activities or tasks that are necessary. This simple process is designed to ensure that everything done in the project is focused on the initial vision. The vision is the reference point for the roadmap creation.

The digital transformation roadmap milestone matrix provides a framework for aligning project activity with the main elements that are critical in transformation: customers, suppliers, skills, organization structure, use of data, operational processes, integration, leadership and culture. The matrix has been applied frequently by our program participants in their implementation plan development. The following example illustrates its application in a canoe manufacturing company.

Image: Adobestock

Element	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	5th Qtr	6th Qtr	7th Qtr	8th Qtr
Customers and suppliers	Design of consultation process	Completion of consultations	Implementation of customer social media team	Establishment of RFID system for tracking supply chain items	Establishment of supplier collaboration processes		Review of continuous improvement processes	
Skills and Org Structure	Identification of skill needs for the Connected Canoe employees	Complete review of organisation structure and identification of modifications	Establish training contracts and implement training HR system	New employees recruited and trained	Complete implementation of structure modifications	Establishment of multiskilling processes		Review of effectiveness of skills activity
Use of Data		Identify existing and new system data being collected	Move data warehousing to the cloud	Design data analysis processes and set up data analysis team	Train relevant employees in data understanding	Contract consultants to develop use of artificial intelligence exploitation of data	Review possibilities for development of products and services using AI	
Operational Processes		Establish continuous improvement processes in shopfloor teams	Implement automated vehicles to transport canoes	Establish new processes for the Connected Canoe production		Implement continuous improvement activity based on data from the Connected Canoes		Overall review of transformed processes
Integration	Establish monthly transformation implementation update meetings		Technological compatibility review of transformation		Technological compatibility review of transformation		Technological compatibility review of transformation	
Leadership	Senior Leadership Team Review Project	Senior Leadership Team Review Project	Senior Leadership Team Review Project Leadership technology training event	Senior Leadership Team Review Project	Senior Leadership Team Review Project	Senior Leadership Team Review Project Leadership technology training event	Senior Leadership Team Review Project	Senior Leadership Team Review Project
Culture	Transformation launch event	Innovation showcase event	Establishment of employee continuing education programme		Innovation showcase event			Celebration of project success

Example of the digital transformation roadmap milestone matrix for a canoe manufacturer. (Source: Author.)

Image: Adobestock

The categories in the digital transformation roadmap milestone matrix are appropriate for most organizations. They have been used in financial, manufacturing, military, retail, resource, education and other sectors. If necessary they can be amended according to organizational needs, but it is critical the simplicity of the model be maintained. Meaningful collaboration and engagement is only possible with clear, simple processes. The roadmap milestone matrix enables integrated planning and management of digital transformation activity—and helps avoid the dreaded stall.

Breaking through siloes blocking your digital transformation

In business, silos are everywhere.

A staggering 79% of knowledge workers report silos in their organizations, adding that communication outside teams is poor, according to a 2022 survey conducted by Forrester Consulting and commissioned by Airtable called *The Crisis of Fractured Organizations*.

Silos are organizational groups that work independently of each other, with little communication and cooperation and, often, some level of competition and negative behavior between them.

Many of the people I speak with who are engaged in digital transformation see silos as a significant barrier to change, and they speak about this with passion. They should. Digital transformation relies on cross organizational change to be successful.

The good and bad of organizational silos

Most organizations are divided into groups that can be effectively managed. In these silos, expertise can be developed and shared, responsibility and accountability can be clearly defined and group loyalty can create a secure and supportive environment for employees.

But silos can also negatively impact their organization. They limit the willingness of employees and managers to share information with others outside their silo. This lowers morale and encourages employees to advance the interests of their silo above those of other silos and/or the organization as a whole.

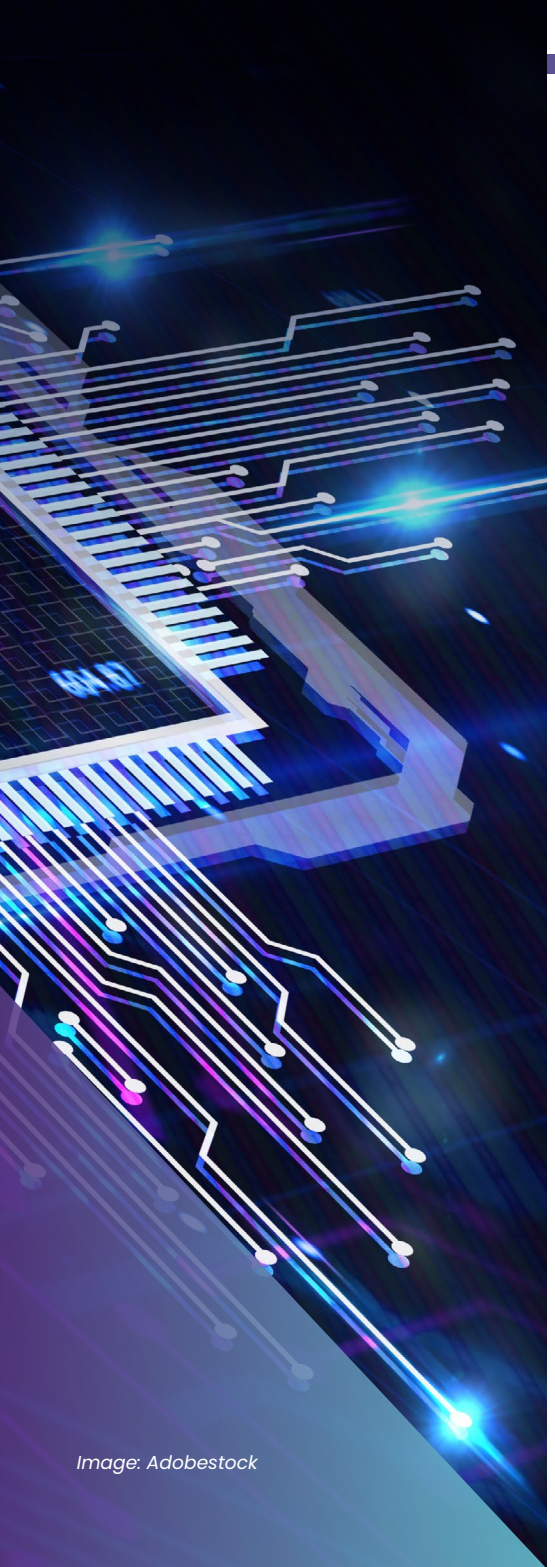


Image: Adobestock

Silos exist due to organizational structure, culture, performance management and the behavior of the managerial team. A culture that emphasizes competition between silos is often used to drive performance improvement. Where a competitive approach is used to manage the senior leadership team, it is reflected throughout the organization.

Silos have been recognized as a challenge in organizations for many years. Before our current age of rapid technological change, cross organization collaboration was less critical. Slowly changing products and services, more stable markets and long-established processes can be managed in the presence of silos. The organization can function reasonably well if the silos focus on their own performance, mostly in isolation from everyone else. Where silos interact, standard processes exist that enable the organization to function despite the reluctance to cooperate.

However, as the speed of competition and change has increased, silos work against businesses that want to keep up. Efforts to improve processes, to focus more on customers, to introduce new operating system models (such as Agile or Lean) and to become more innovative have been hampered by silo structures and cultures.

This is particularly true for digital transformation projects.

Silos and digital transformation

Changes in products and services can have an impact in many places—marketing, sales, operations and finance, to name a few.

These silos must work more closely together to respond to rapidly changing markets and customer demands. Process changes in one part of the organization will often have implications beyond the silo where they were introduced. New business models will often require radical organizational change that won't succeed if people can't work together in the interest of the whole organization, not just their own silo.

It is crucial to empower individual employees to realize digital transformation. Employees must actively participate in this change, but if they're stuck in silos, they'll support the interests of the silo over that of the organization.

Overcoming the challenges of silos is essential in this era of digital transformation. But how can you do it?

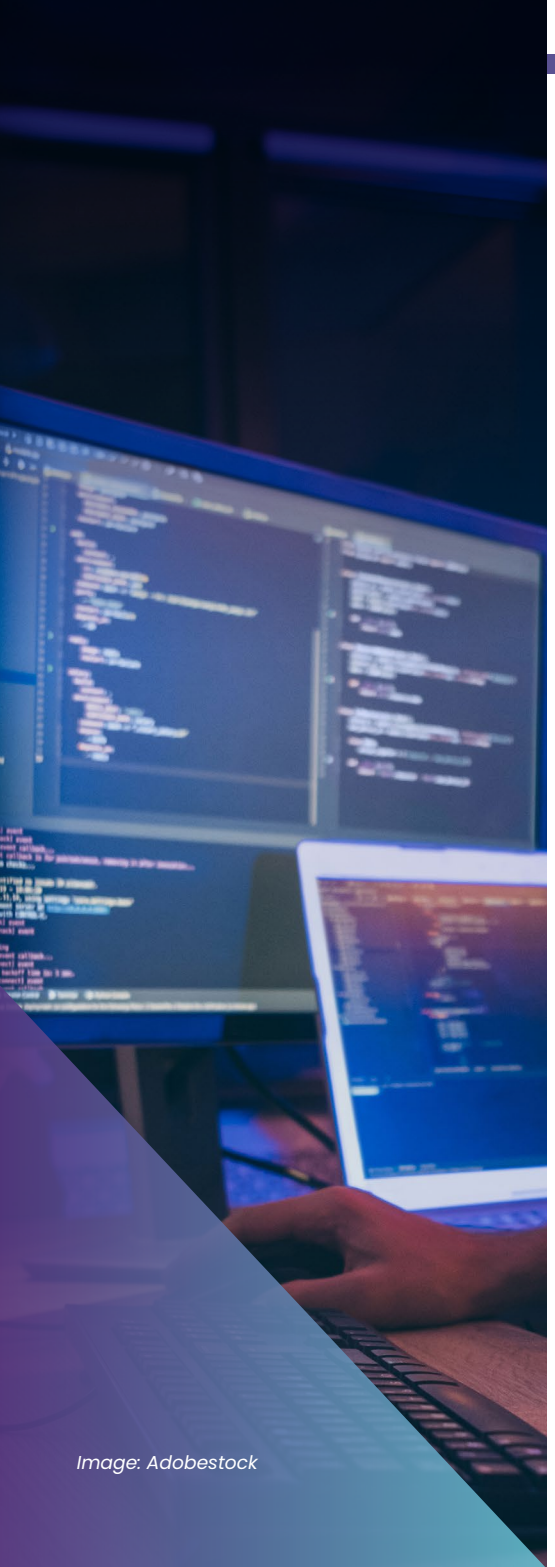


Image: Adobestock

Tool: Silo analysis

The starting point in fixing your silo problem is developing a good understanding of the silos in your organization. At the University of Waterloo, we have developed a tool for our Watspeed Digital Transformation program that helps you analyze your silos. This simple exercise will help you understand if silos are holding back your digital transformation.

Score each of the following statements on a 0 – 5 scale, with 0 indicating that it does not apply to your organization and 5 indicating that it is widespread:

	Score 0 - 5
Communications are open and frequent across the entire organization	
Employees are fully engaged with the organization and highly motivated towards its success	
Groups, departments and functions have good relationships and work effectively with each other	
The goals of all parts of the organization are well aligned with the overall organizational goals	
Most data in the organization is easily available and open to all	
Everyone understands and believes that the satisfaction of the customer or client is paramount	
Processes are smoothly integrated throughout the organization	
Where possible, everyone uses the same technologies to do the same things in the organization	
There is no competition between different groups, departments and functions in the organization	
Employees can easily find all of the information they need	
Total	x/50

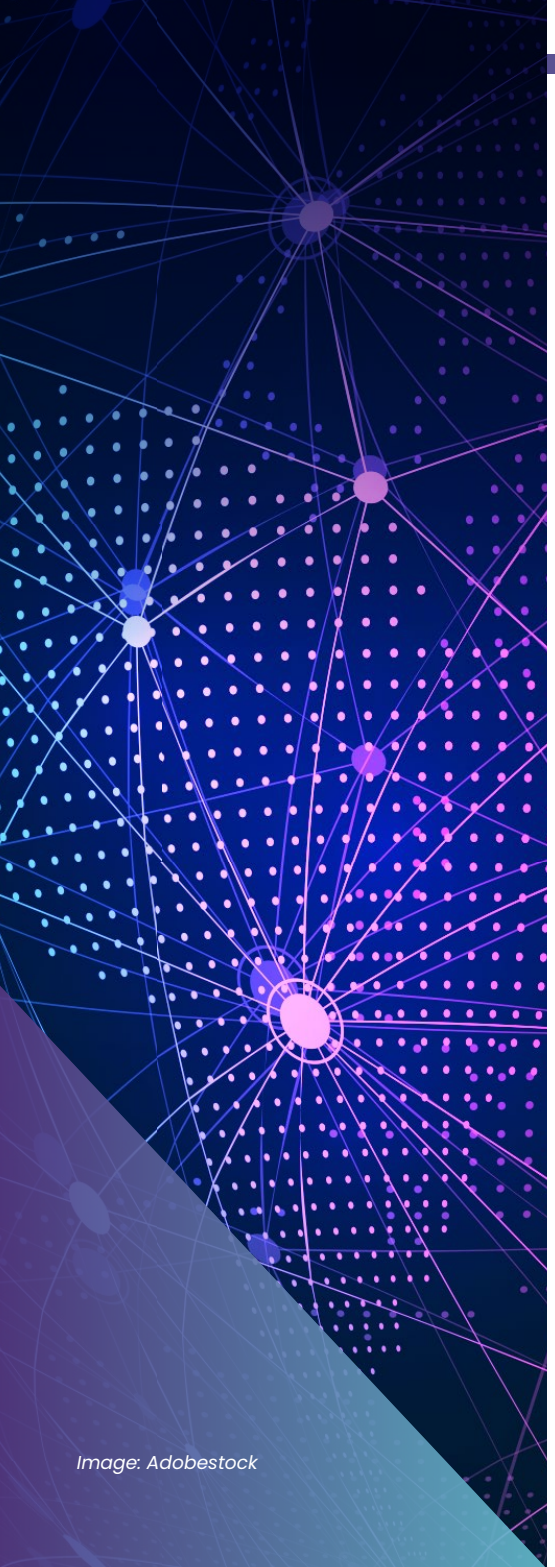


Image: Adobestock

Low scores in this exercise indicate that silos are a problem in your organization. High scores suggest that silos are not holding back your digital transformation.

What can you do to break down silos?

If silos are inhibiting your ability to digitally transform, here are some things you can do to break them down:

- **Create a common vision:** Aligning the whole organization behind the same digital transformation vision is essential for empowered employees to contribute towards it. Establish clear processes for engaging people in creating it, updating it and understanding it.
- **Use collaborative tools:** There are many collaborative platforms that enable people to work more easily across organizations today (such as Microsoft Teams). To be effective, employees need to be trained in their use and standard processes for collaboration must be established.
- **Shared accountabilities:** Performance management systems need to encourage collaboration rather than competition. Where possible, create shared accountabilities that cause people to work together to achieve them.
- **Bring people together:** Establish a program that helps people to work with and get to know others in the organization, establishing relationships that will enable future collaboration. This might include social events and gatherings.
- **Leadership behavior:** If leaders are seen to compete negatively with each other, often reflecting that in their communications with their teams, it will be reflected in the organization. If the most senior leader encourages this, it won't change until they stop doing it.
- **Training:** Conduct training that crosses boundaries, providing understanding of the organization beyond silos, and include people from multiple silos in each session.
- **Clear processes for collaboration:** Collaboration rarely happens automatically. Consider where your problems with collaboration between silos are greatest and establish formal processes and practices that improve it.
- **Value stream mapping:** Map organizational processes and address the weaknesses in process connections between silos.
- **Culture of transparency:** Insist on openness and sharing of information throughout the organization.
- **Single source of truth:** Technology makes it easier to establish a single source of data truth in the organization, which will create a common basis for decision making and reduce potential for conflict.

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PART III: LEADING YOUR DIGITAL TRANSFORMATION

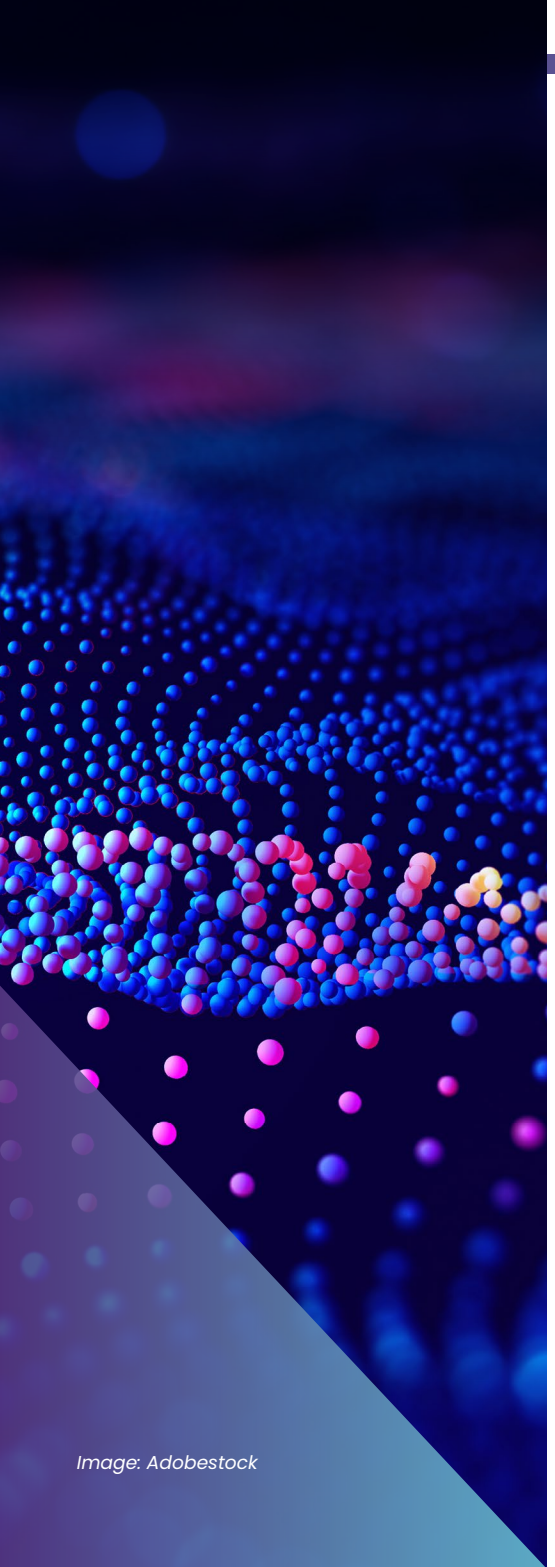
Fostering a digital mindset

Mindsets are how we see ourselves (our self-perceptions) and the world (our beliefs). All of our behavior is based on our mindsets—how we act and respond to situations at work and in our broader lives. Mindsets can support digital transformation or impede it.

In recent years there has been growing interest in mindsets as part of the explanation for digital transformation failure. It is argued that mindsets which may have been a very positive factor in slowly changing organizations are a negative factor in the digital age. For example, a mindset that is very effective and disciplined at managing repetitive processes may not be comfortable with, or appropriate for, continuous improvement or radical change.

Tsedal Neeley and Paul Leonardi have worked to understand digital mindsets. Their 2022 book, *The Digital Mindset: What It Really Takes to Thrive in the Age of Data, Algorithms and AI*, describes the areas they think are important in digital mindsets. This chapter is intended to build on their work, expanding understanding of digital mindsets and providing a practical model for action.

Understanding your own digital mindset as an individual will help you add value that will benefit your career. Understanding it for your workforce will enable you to understand a major constraint of digital transformation and allow you to plan how to address it.



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Assessing your digital mindset

At the University of Waterloo I have developed a model for the assessment of digital mindsets in organizations. The model is based on a review of publications discussing both digital mindsets and digital culture that would support successful digital transformation. The review identified characteristics that were frequently referred to, and these were consolidated into six categories for the assessment:

1. Working with others
2. Working with data
3. Working with change
4. Working better
5. Working with society
6. Working with technology

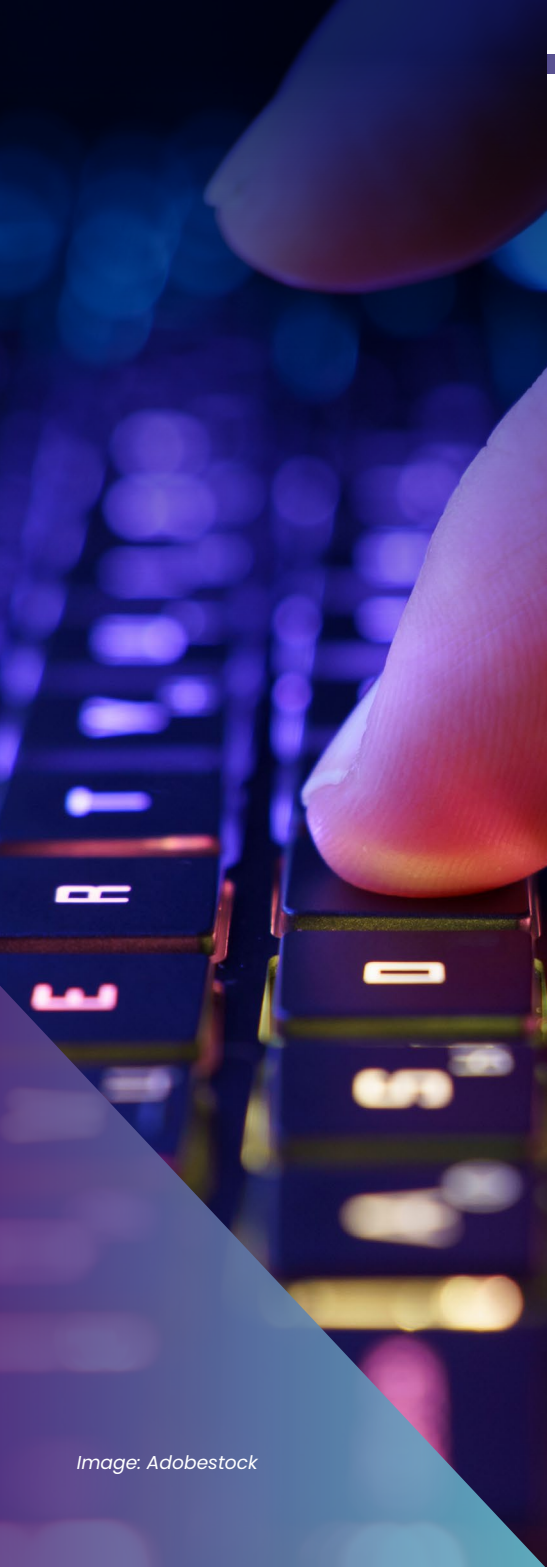
Individuals can use the assessment model to understand their own digital mindset, and organizations can aggregate individual responses to understand collective mindsets in units, functions and whole organizations.

The assessment can also be used to consider how the existing culture and practices in your organization are supporting the development and exploitation of digital mindsets, and enable the development of your own culture that supports and develops digital mindsets.

The digital mindset categories

Working with others

Successful digital transformation activity requires comfort in working with people and machines. Employees need to collaborate well with people online, working between and across organizational silos. They must work well with others outside the organization, establishing and operating within new digital ecosystems.



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In organizations that were changing slowly, departments or units could focus mostly on their own work, with little need for interaction with others. More rapid change requires close collaboration to understand and manage its impact across the organization.

Working with data

Most organizations have had data available to decision makers for a long time, and this has been applied effectively by many. Today, information technology can greatly increase the volume of data available at all levels in the organization. The potential for improved, data-based decision making is great, but requires mindsets and processes.

In the past, when data was less available, experience and "judgement" were valued in decision making. Establishing the discipline that adherence to data-based decision making requires is a substantial mindset change.

Working with change

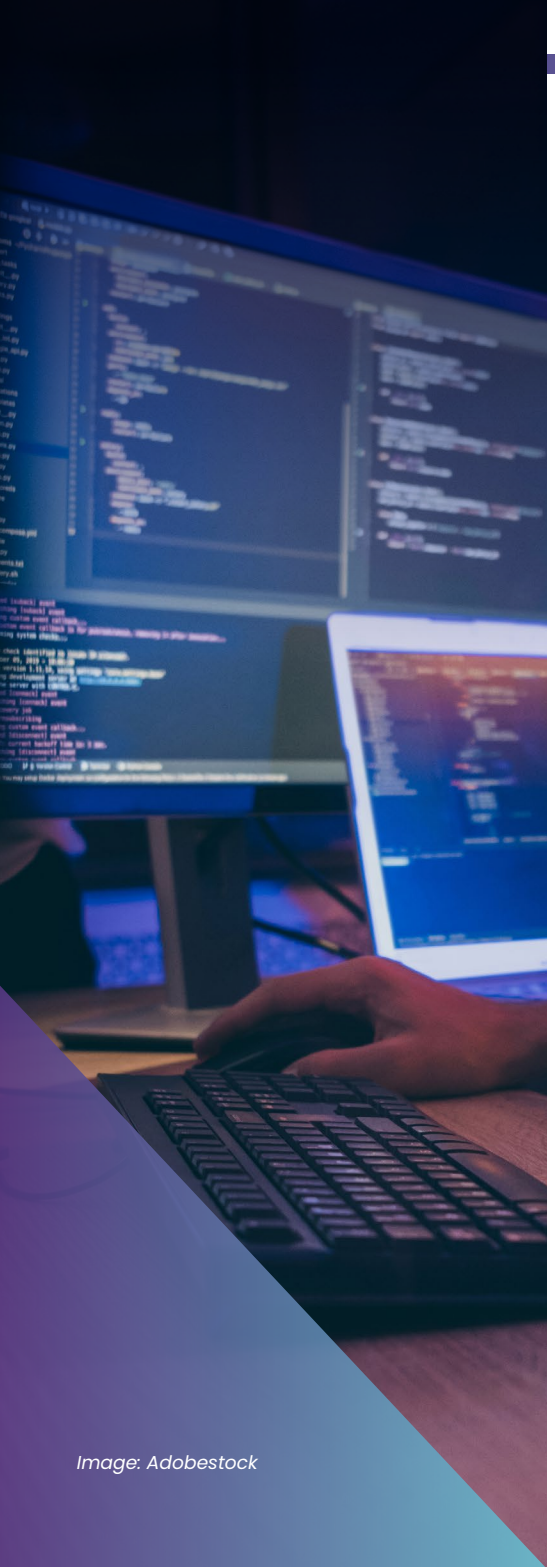
Change is often thought to be difficult in organizations and it often fails. Part of the reason for this is that the mindset needed for managing a slowly changing organization is very different from that needed for radical digital transformation. Manager appointments and employee recruitment have been based on the expected contribution to stability and reliability.

This is compounded by organization processes, practices and culture that support slow change. Silo structures, risk intolerance and long approval processes are not helpful here, for example.

Working better

Technology-based change requires engaged participation in improvement from all employees. New processes and work activities will need to be developed and refined when new technologies are introduced in the workplace. Innovation and continuous improvement activity will support this with appropriate creativity and motivation.

New technologies also require new skills. A learning mindset, with a willingness to learn and take responsibility for personal skills development, is needed along with organization management of skills development.



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Working with society

The ethical implications of digital transformation are important for society—we should all act ethically in our use of technology. For organizations, ethical issues are also important commercially. Unethical behavior has negative financial consequences, either through lost sales or legal penalties. While ethical mindsets have always been desired, digital transformation creates frequent new ethical dilemmas that require earnest attention to the societal impact of technology and its application.

Working with technology

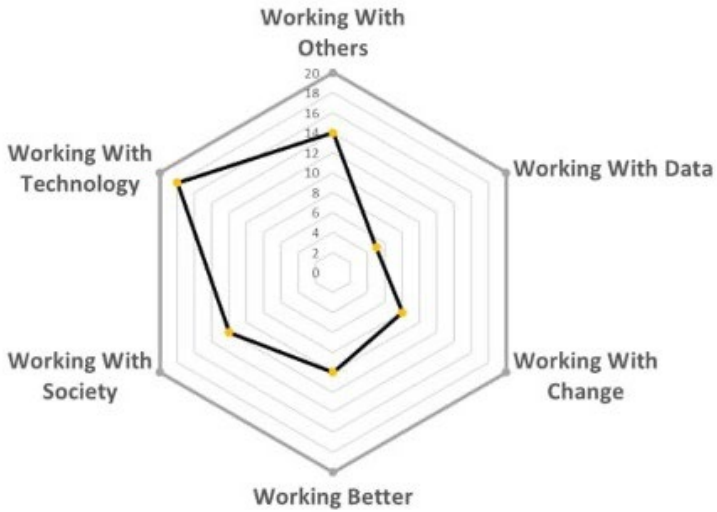
Competence and confidence with information technologies throughout the organization usually needs to be improved for digital transformation. This requires a good understanding of the technologies the organization is using now and a good level of appropriate technical skills. Discretion and caution as far as cybersecurity and data privacy are concerned is essential. Awareness of and curiosity about the technology the organization might use in the future will promote acceptance of technological change.

Organizations must actively enable these elements, providing training and education.

Tool: The digital mindsets radar chart

Consider your strength in each of the digital mindset categories and rate it out of 20. You can easily visualize and share your assessment with a digital mindsets radar chart like the one shown to the right. The chart allows you to plot your own individual digital mindset and your organization's digital mindset.

First, assess your own digital mindset. Then, develop your own plan to address the areas where there is more room for improvement. Finally, implement your plan—it will better prepare you for your own career future, making you more valuable to your organization.



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The next step is to apply the framework to your organization, considering whether your culture and practices support or constrain digital mindsets amongst employees. Removing your organizational mindset barriers will strongly contribute to digital transformation success.

Are you a good digital leader?

Most organizational leaders struggle with digital transformation. While this isn't the sole reason that digital transformation projects fail at a rate of up to 70%, there's a big difference between a good leader and one who will steer your project into a digital dead end.

Organizations are usually designed to do what they already do well—this is necessary to survive. Understandably, their priority is achieving performance objectives that allow them to succeed today, providing jobs and returns to owners and shareholders. In the past, change was relatively slow and managers and leaders were appointed based on their skills in maintaining the status quo.

At the same time, organizational structure was based on achieving reliable levels of quality and productivity. Activities were divided into specialist silos and assigned to those with a high level of specific capability. Organization culture supported this orientation. Doing the same things well every day was, rightly, highly valued, while activity which diverted attention away from achieving short term targets was frowned upon.

Against this background, it is not surprising that most senior leaders of organizations struggle with the introduction of large-scale change. They were not appointed to lead it and have little relevant previous experience. The members of their senior management team and the people who report to them have similar challenges. Further, the organization objectives, structure and culture directly conflict with radical change.

Operation and transformation

Much has been written on the characteristics of effective digital transformation leaders. They usually concentrate on elements that are important in managing change, including being innovative, risk taking, a visionary and an effective communicator. These are all important elements for radical change, but insufficient for ensuring an effective transition in an organization that must continue to successfully operate during the transition. In addition, they don't give enough emphasis to how the technology will impact performance.

Image: Adobestock

These were our concerns at the University of Waterloo when we looked at how we should develop digital transformation leaders. We reviewed the research in this area and what others had written and then developed our own simple model that integrates leadership of change with daily operational good performance. We identified the following areas as encompassing the range of capabilities needed:

Innovative: Digital transformation requires development and implementation of new products or services, processes and business models. Organizational leaders need to be oriented towards doing this themselves and, importantly, with others. After initial implementation, innovation is critical in exploiting the change.

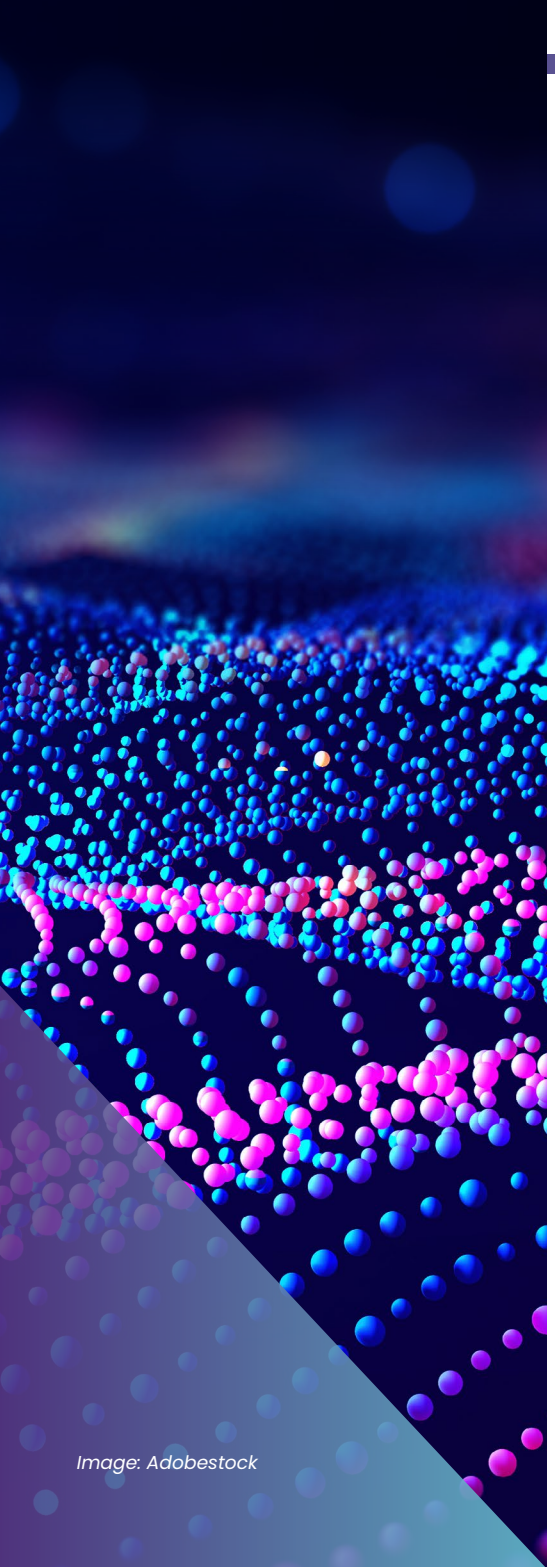
Systems: Systems thinking involves understanding complex systems and the relationships between the elements within them—how the system fits together and functions as a whole. When digital transformation takes place, it is usually within a system. Leaders need to understand this in determining the impact that transformation will have in the organization, both in terms of existing daily operations as the transformation takes place, and after the implementation period is complete. This is critical in successfully introducing technological change in an existing operation.

Visionary: A visionary leader is someone who can imagine the future and excite others to work with them to create it. Visionary leadership is usually thought to be essential for effective digital transformation in creating the vision, focusing the organization's efforts on it, and motivating the workforce to achieve it. Visionary leadership is necessary to overcome the inertia of a traditional organization.

Performance: Digital transformation should be designed to achieve a high level of performance, either within existing operations or within new operations. Maintaining emphasis on the performance objectives of the change being introduced, as well as the performance objectives of ongoing operations, requires a dual focus, which is difficult and often creates tension.

Collaboration: Innovation usually requires collaboration to achieve the combination of capabilities that can develop, implement and exploit ideas. In digital transformation this means combining business, technical and human knowledge with design, development and implementation. Leaders need to create an environment that encourages innovation throughout the organization.

Compassion: Digital transformation will only be successful if people in the organization are supportive of the changes being made. If employees lack trust that their welfare will be a priority as changes are made, they will not provide that support. Compassionate leadership is essential.



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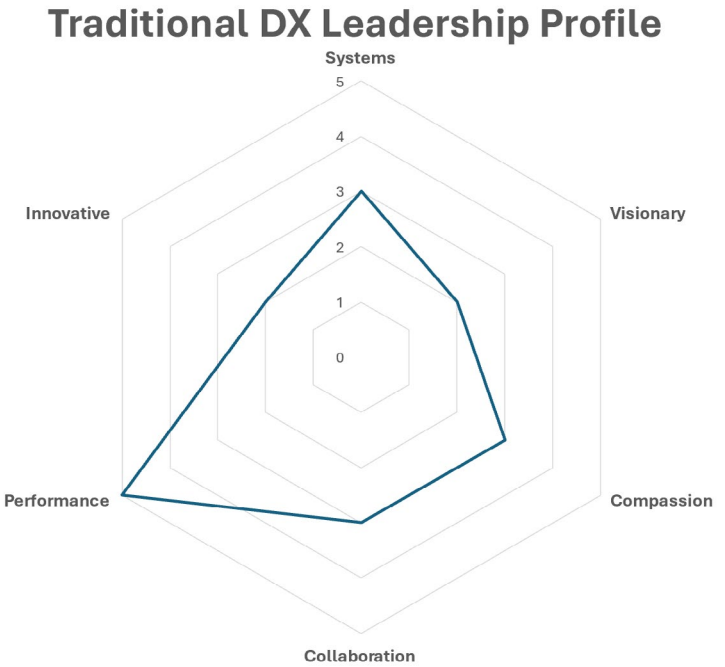
Tool: The DX leadership profile

The DX leadership profile allows you to evaluate the leadership capability of your organization as it undertakes digital transformation. Simply rate the performance of the above categories on a five-point scale and plot the leadership profile of your organization leader, the senior management team as a whole, or anyone with managerial responsibilities.

Here are a few common profiles that illustrate how to apply the tool. All organizations are different, and your own profile may not match the examples.

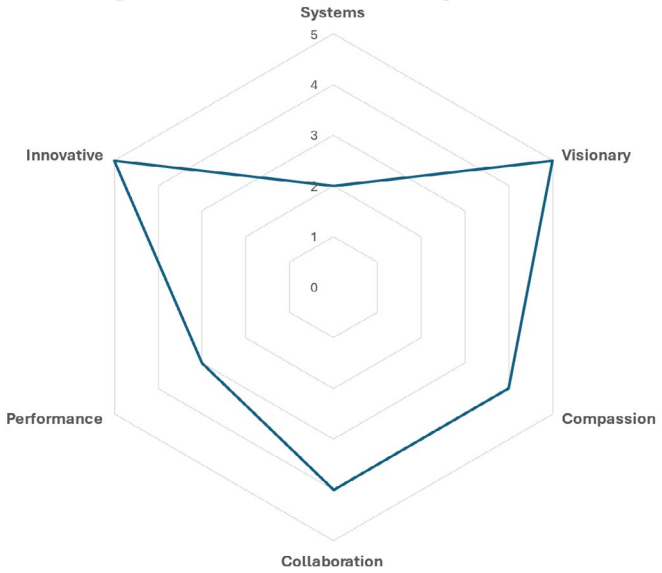
First is an example of a traditional organization focused on day-to-day operations—the traditional DX leadership profile. For this organization, digital transformation will require significant leadership development and change. The current leadership is highly focused on achieving short-term performance goals, does not have a strong vision, and while they are open to collaboration, compassion, and a systems approach, these attributes are not given strong emphasis.



Next is a profile implied by much of the discussion on digital transformation leadership. The popular DX leadership profile emphasizes capabilities that are usually thought to be important in management of change, and minimizes short-term performance. Systems focus is a significant challenge in this profile and there is room to improve collaboration and compassion.

Image: Adobestock

Popular DX Leadership Profile



Finally, take a look at the ideal DX leadership profile. This aspirational profile combines capability in ongoing business performance with leadership of radical change. Most leaders or leadership teams will not match the ideal profile, but they can and should make plans to address the areas of weakness, such as leader development, recruitment and accessing short term resources.

The DX Leadership Profile analysis tool will help you consider your own organization. The chart is based on your own judgement of your strengths and weaknesses. Its best application is as a focus for discussion amongst the members of your leadership team. Consider it at a team meeting and agree on your own profile. Then create a plan of the work you'll do to improve. The next chapter will offer some suggestions.

Ideal DX Leadership Profile

Image: Adobestock

How to be a better digital leader

COVID-19 accelerated the pace of IT-based change for almost all organizations and individuals. While consumers shopped, socialised, worked and learned more online, organizations saw more changes in their products and services, processes, supply chains and relationships with customers and employees.

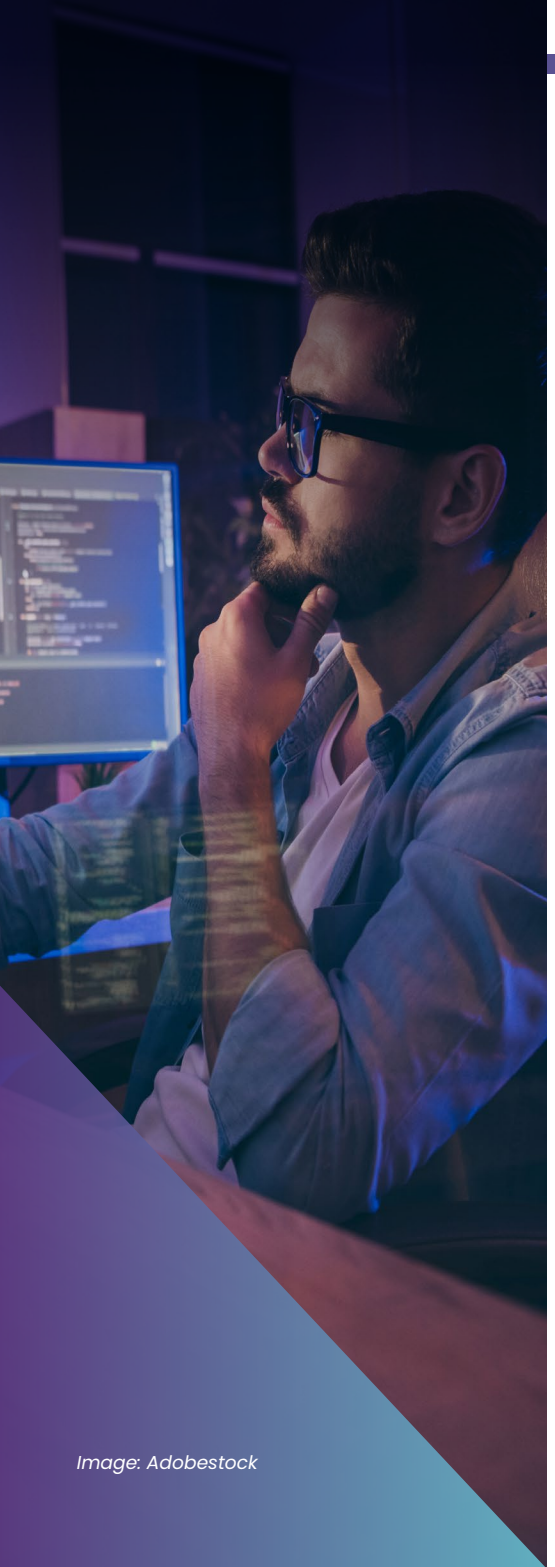
These changes have increased the urgency of meaningful digital transformation. Our research at the University of Waterloo showed that prior to the pandemic, most organizations were facing significant barriers to moving forward with the radical change digital transformation required. These were human changes– including skills shortages, the need for cultural change and the capabilities of senior managers. They were also technical, including integrating old and new technologies.

The urgency to address these challenges has been heightened by the easing of the pandemic. Much of the technology-based change that took place is here to stay and will continue to progress, as indicated by Gartner's forecast of a 12.3 percent increase in software expenditure (mostly due to data analytics and business intelligence) in 2023.

Effective leadership is critical for digital transformation, and engineering executives may have to leave their comfort zone to succeed.

The two fundamental problems for leaders

A fascinating recent study from the Boston Consulting Group emphasises the importance of improving organizational digital transformation capabilities. BCG surveyed transformation leaders on the success of their efforts against their expectations and registered significant declines over the period 2020 to 2022. The survey recorded declines in digital transformation value realization (down from 73 percent to 45 percent), increases in cost overruns (from 15 percent to 31 percent), increases in timeline delays (up from 19 percent to 69 percent) and a decline in leader engagement (down from 53 percent to 38 percent). There was also a slight decline in employee buy in.



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Optimistically, we may expect some improvement in these statistics with the pandemic easing, but they are still of concern. They may also show the impact of the modest acceleration in technology-based change that occurred over the past three years. They appear to indicate that organizations are ill-prepared for an expansion of their digital transformation efforts. Without a substantial improvement in transformation capability, most will fail.

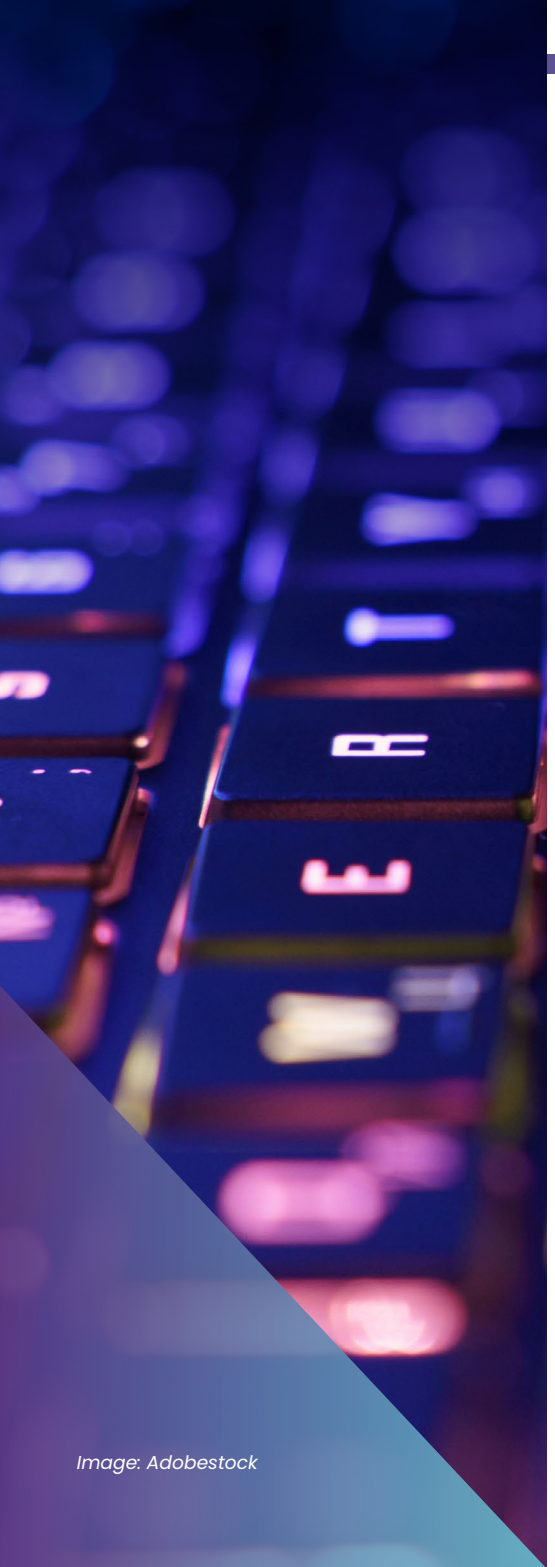
We have reviewed many industry and academic studies of technology-based change in organizations and spoken with many transformation leaders to help us design our Digital Transformation Certificate program. Unsurprisingly, there are a wide range of challenges, both technical and human. When viewed together they reveal two fundamental problems: most organizations are not designed for radical change, and most organization leaders are not prepared to lead it.

Confidence in the face of disruption

Consider the hypothetical example of Suzanna Veich, a CEO of a major food producer. Before the pandemic her company had been investing in information technology in many areas, including in creating greater supply chain visibility and automating some production processes.

The pandemic significantly increased disruption in the food industry. Demand increased as more people ate at home, tastes changed as consumers became more health conscious and were influenced by inflation in food prices, supplier costs increased, the raw material supply chain became more erratic, supermarkets were demanding integration with their new systems, labor costs rose, and labor shortages were disrupting production processes.

Suzanna knew that IT-based solutions could help her address many of these challenges, but she wanted to make sure that her investment would be in the most strategically important areas and that the implementation would be successful. She had never led a change on the scale needed and lacked confidence in her ability to do so. Suzanna's position is like that of many other senior organizational leaders in most other sectors.



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Leading leaders out of their comfort zone

Leadership of most organizations today is focused on achieving short-term performance objectives, which demands managing reliable, repeatable processes. This requires a high level of skill and a conservative culture that values gradual change and risk aversion. Organizational and process design, including common forms of the division of labour and siloed departmentalization, support these organizational aims. It is important to emphasize that today's organizations have evolved to their current state because this was appropriate for their market—in the past.

Over the last 20 years information technology has played an increasing role in organizations. In some sectors this has happened more quickly than others. Some have already been dramatically altered, while others have seen more gradual change. The pandemic accelerated technological change in most sectors and led many CEOs into situations like Suzanna's.

Change in most organizations will only be successful if it deals with this reality. Existing senior leaders, most of whom have never managed a radical change and who have been valued for their reliable, safe management now need to act a long way outside their comfort zone. How do we help them do that?

Three means to organizational change

There are three main aspects to the approach that is typically taken to help senior leaders with organizational change. First, they need to develop their own vision for the future, combining understanding of the world outside their organization, their internal capabilities, technical knowledge and the societal and environmental impact.

Second, they should create a transformation roadmap to apply the vision, which can be modified as needed. It should include human and organizational changes, sustaining and continuing the transformation in the future.

Third, they can increase their probability of transformation success using models and templates as well as case study examples that demonstrate good practices.

Image: Adobestock

Confidence is key

It is critically important to understand the extent of the change in leader practice that is needed for digital transformation to be successful. Confidence in applying knowledge is critical and should be the focus of the training leaders receive. Simply providing models and tools, without overcoming the confidence barriers to their use, is insufficient to facilitate digital transformation.

Success in digital transformation is now critically important to national economies and so to the quality of life of citizens. It is essential that organizations overcome the challenges they face with digital transformation today, and that starts with more effective leadership.

Empowering all employees

Successful digital transformation depends on the people involved. It's not a new business concept, as managers have long understood that the relationship they have with their employees has a significant impact on overall performance. Companies with positively motivated employees have better performance than those that are demotivated. The extent and impact that employee motivation has on performance varies between companies.

In slowly changing companies, negatively motivated employees will have less impact than in those that are changing quickly. In the slowly changing organization, work is largely repeating things that have been done before and management activity is focused on directing and managing work. This is reflected in the Scientific Management principles established by Henry Ford and still often used today. For example, most jobs are made up of a narrow range of tasks, requiring relatively little skill, while a smaller number of professionals and managers provide direction and control. Employee participation and empowerment are weak because the form of work organization doesn't require it.

Interest in a new form of work organization, Lean manufacturing, grew in Western countries in the 1990s, after it was recognized that it achieved much higher levels of performance when applied in Japan. This system required higher levels of employee participation and empowerment than Scientific Management, because of the flexibility, teamwork and continuous improvement needed to make it work. Failure to achieve its employee aspects is a frequent cause of failure to transition from Scientific Management to Lean. While

Image: Adobestock

it was initially focused on manufacturing, elements of Lean models have been introduced in most industry sectors today.

We have also seen growth in the use of Agile approaches to work organization that enable more nimble response to rapid market and technological change. The Agile system also requires higher levels of empowerment, innovation and continuous improvement. Again, the system drives the role of the employee and how they are managed. Success in the human elements of this system is varied too and reflected in the success achieved with the Agile approach.

Employees and digital transformation

Human elements are often cited as reasons for the failure of digital transformation activity. McKinsey reports that 70% of digital transformations fail due to employee resistance. Endava and IDC also report that 56% result in staff frustration and 50% lead to higher attrition, respectively. Only 21% of employees are engaged at work, according to a Gallup survey.

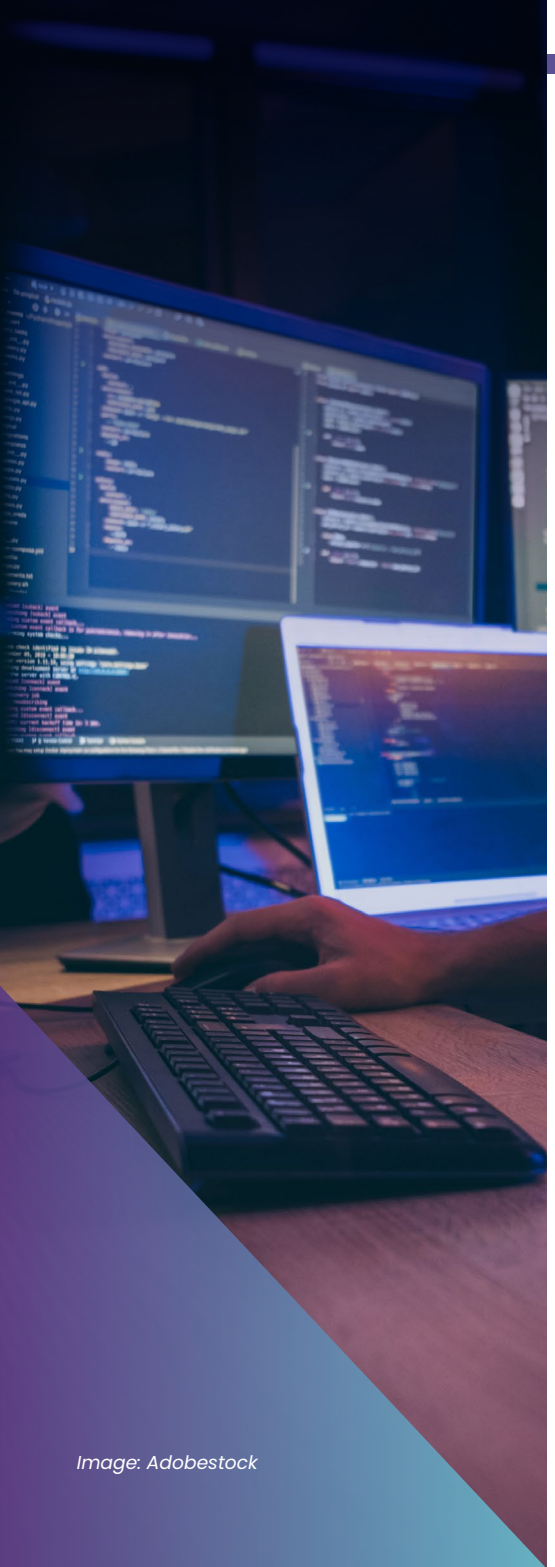
In companies that are digitally transforming, the role of employees is fundamentally important. Digital transformation often requires significant changes in the activities of employees. Working practices can change, making jobs more stimulating or boring, giving employees more or less control or discretion over their work activity. Jobs can become more or less well paid or secure and skills requirements can increase, decrease or change altogether. For employees, the prospect of significant changes in their working lives can be a source of fear.

Digital transformation usually requires that employees are motivated towards its success. Their cooperation is necessary to specify, implement and sustain new technologies, working roles and practices. They must be enthusiastic to participate in continuous improvement.

Success in digital transformation, in most cases, requires significant change in the form of work organization.

Employee relationships and digital transformation

For digital transformation to be successful, employees should be willing and active participants. They should feel confident about their own ability to transition due to the presence of good education and training.



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Trust between the employee and the organization should be based on the confidence that organizational decisions on digital transformation will be made transparently and with concern for employee welfare and quality of working life.

Involvement in continuous improvement and innovation is important to implement and exploit new technology. It is also important because it gives employees the ability to influence the changes that are happening around them. Processes should exist that allow this to happen, while also ensuring that improvement is consistent with organizational objectives.

The employee relationships necessary for digital transformation are usually significantly different than those that exist in many organizations today.

The Digital Transformation Employee Relationship Maturity Model

The Digital Transformation Employee Relationship Maturity Model helps organizations understand their current employee relationships and to plan activity to establish the relationships required for digital transformation.

The model has three levels:

- The Traditional level is based on relationships commonly found in Scientific Management operating systems, but which may also linger in Lean and Agile systems.
- The Progressive level represents what organizations pursuing a Lean or Agile model aspire to but don't always achieve. It is a step towards the relationship necessary for digital transformation success, but is not enough.
- The Transformative level represents the relationship needed for success in digital transformation.

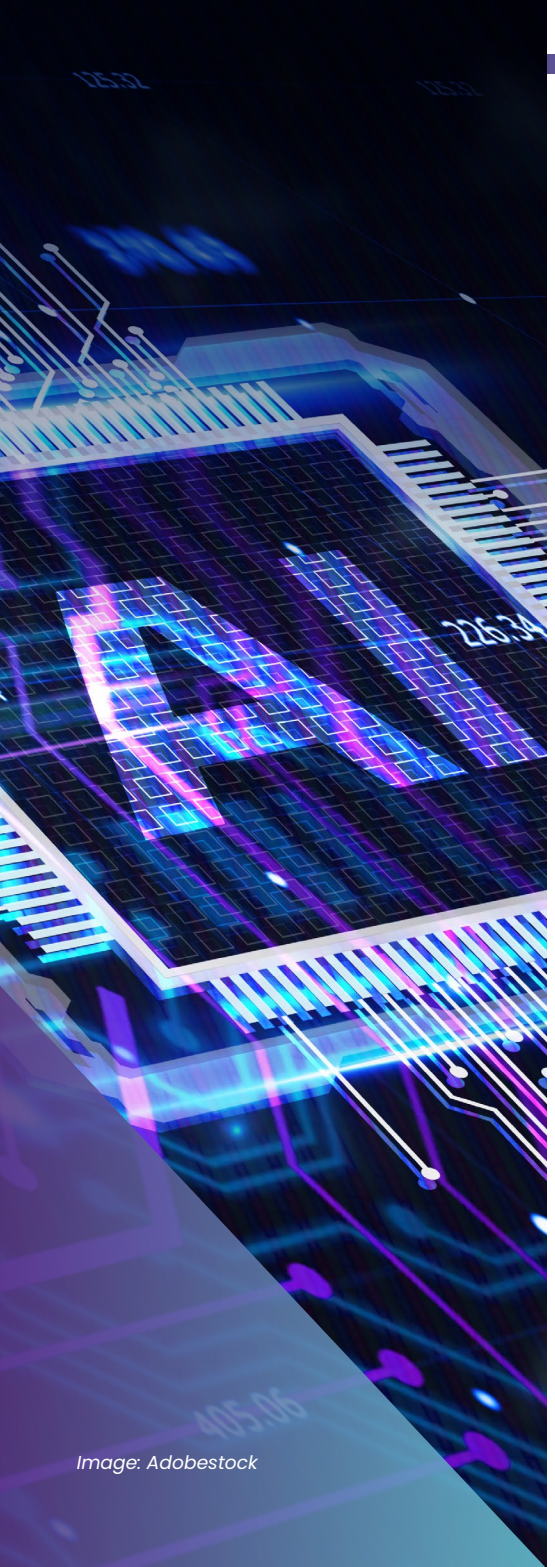
The model is intended to be used by a group as a means of developing common understanding of, and commitment to, the plans you develop for change. Your management team should analyze your current state and consider the model to identify the areas you need to develop. The action plan your team develops will depend on your own conditions.

Image: Adobestock

	Traditional	Progressive	Transformative
Training	Minimal training for employees	Training is provided where required for job skills and to support flexibility	Training and education encouraged for job and non-job knowledge and skills
Job roles	Employee job roles are narrowly defined	There is flexibility of job role within employee teams	Employees are confident that all necessary support will be provided to move to new digital roles when necessary
Transparency	Employees are informed of major senior management decisions and initiatives	Employees are consulted regularly about major senior management decisions and initiatives	Employees participate in deliberations on major senior management decisions and initiatives
Participation	Employees rarely participate in continuous improvement activity	Employees are encouraged to share ideas for process improvements with their manager and occasionally participate in improvement activity	Employees regularly participate in continuous improvement and innovation activity, using effective organization processes
Manager relationships	Relationships between employees and managers are often adversarial	Relationships between employees and managers are usually cordial	Strong, mutually supportive relationships between employees and managers
Employee advocacy	There is significant mistrust between managers and employees	Employees believe managers will act in their interests if they can	Employees are confident that their interests will always be fully considered and efforts will be made to advance them in all managerial decisions
Technology changes	The impact of technological changes on employees is a minor element in decision making on technological innovation	The impact of technological changes on employees is a major element in decision making on technological innovation	Decisions on innovation in the organization are made with the objective of effectively combining their human and technological elements

Conduct your own analysis by reviewing the categories in each row and circling the most appropriate description from the Traditional, Progressive or Transformative columns. You should only circle one description per row. This will require a candid approach from all involved. Once you've completed the exercise, the column with the most circles will reveal your organization's dominant relationship approach. Consider how to develop your action plan to move towards the Transformative level.

The Digital Transformation Employee Relationship Maturity Model can be applied to the organization as a whole or in individual parts.



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A reflection on responsible digital transformation

The fourth industrial revolution is radically changing not just our industry, but our entire world. How we are governed, the strength and nature of our economy, how and where we live, our domestic life, healthcare, education, financial systems, international relations, quality of working life and many other areas will be very different within our lifetimes. It is a revolution.

These changes are driven by how we are using increasingly capable information-based technologies that are designed, implemented, maintained and modified by engineers. More than ever since the original industrial revolution, the decisions engineers make and the advice they give are impacting people's lives.

I've made a career of understanding the digital transformation of industry, and I've spoken to many manufacturers about how to level up their technology and unlock the benefits of Industry 4.0.

But there's one aspect of digital transformation that's often neglected, brushed aside in favor of conversations on the exciting technological and business opportunities. The digital changes that engineers and manufacturers are helping to bring about will fundamentally alter our society, and they must plan for these changes in a responsible and holistic way—or we'll all pay a steep price.

The outsized role of engineers in digital transformation

The changes in society wrought by the first industrial revolution were dramatic. From predominately rural lives, people went to work in factories, moved from the country to the city and would eventually vote in elections. Free trade replaced protectionism, education became compulsory and the roles of women and men in family units were transformed. These changes happened over an 80 year period, in just a few countries.

The changes we are seeing today are much faster, bigger and global.

Engineers have always understood the importance of their ethical behavior, knowing that bad decisions can impact people's lives or even result in their deaths. I believe that ethical behavior was easier for engineers in the past than it is today. Guidelines and regulations would often be available to help engineers make good decisions, but today's rapid technological change means these guidelines don't always exist.

Image: Adobestock

More than ever before, engineers need to analyze the impact of their work and make their own ethical judgements.

The efforts of manufacturers to respond to the fourth industrial revolution and digitally transform their operations is not an easy one. Up to 70% of these efforts fail, since they require a wide range of skills from throughout the organization. Digital transformation is not possible without the technical, process and project management skills of engineers. They understand what the technology can do and how it can best be used in existing or new organization processes, and they have the experience of managing technical projects needed for successful implementation. Engineers are a critical element in the impact that technology will have, in the workplace and beyond.

Economic prosperity is tied to digital transformation

The application of technology in digital transformation can take many forms, influencing products and services, processes and business models. The success of these applications will determine the future performance of the organization. Bad decisions may lead to its demise. As the pace and scale of technological change increases, this becomes more critical and frequent. We have already seen many well-known companies fail for their inability to adapt.

While it is normal and economically healthy for some organizations to decline and new companies to take their place, in the globally integrated economy the new companies won't necessarily appear where the old have failed—some places will be enriched by the fourth industrial revolution while others will decline.

This means local and national economic prosperity depends on effective digital transformation for existing companies, and the creation of a fertile environment for the creation and attraction of new ones. Economic prosperity depends on the extent of national digital transformation effectiveness. The role of engineers in this is critical.

The huge human impact of digital transformation

For organizations that survive, the decisions made about technology will also impact how people work. Their job descriptions, job flexibility, stress levels, physical and mental exertion and overall quality of working life is directly impacted by these technology decisions. The jobs people will have in the future are being created today.

Image: Adobestock

It is therefore critical to understand the human impact of technological transformation. Not only for the sake of the humans whose working lives will be affected, but for the sake of maintaining a cohesive organization. Engineers must consider this factor to an even greater extent than they have in the past.

The decisions made within an organization will be important outside it too, in the local community. Changes in job numbers, pay levels and job security will impact workers and their families, along with the businesses and organizations that rely on the money they spend.

Business volatility, driven by more rapid technological change, doesn't just impact the individual organization but extends to the wider community. In the past, slow change in businesses was easier for communities to adapt to. Today, fast change places stresses on the network of institutions and elements that make communities whole, secure, vibrant and economically successful. Engineers are at the front line of organizations' responses to digital transformation and the resulting community impact. It's not a responsibility to take lightly.

Navigating digital transformation for a better future

While digital transformation is local, it is also national. How organizations respond to the fourth industrial revolution locally will be aggregated nationally and reflected in economic performance and national standards of living.

Most of the wide-ranging changes taking place today have uncertain outcomes—we don't know what our form of governance, relationships with other countries, working lives, education, financial systems and beyond will be like in the future. Engineers have the skill and knowledge to influence these outcomes for the better. The advice they give and work they do will significantly impact our future world.

Engineers have always carried a heavy responsibility. As technology changes continue to accelerate, and as industry digitally transforms itself in response, that weight will only increase. Engineers must navigate these changes to ensure they result in better lives for people today and in the future, from the workplace to the community to the nation and the world at large.

PRODUCTSPACE

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What Engineers Need to **Move Fast**

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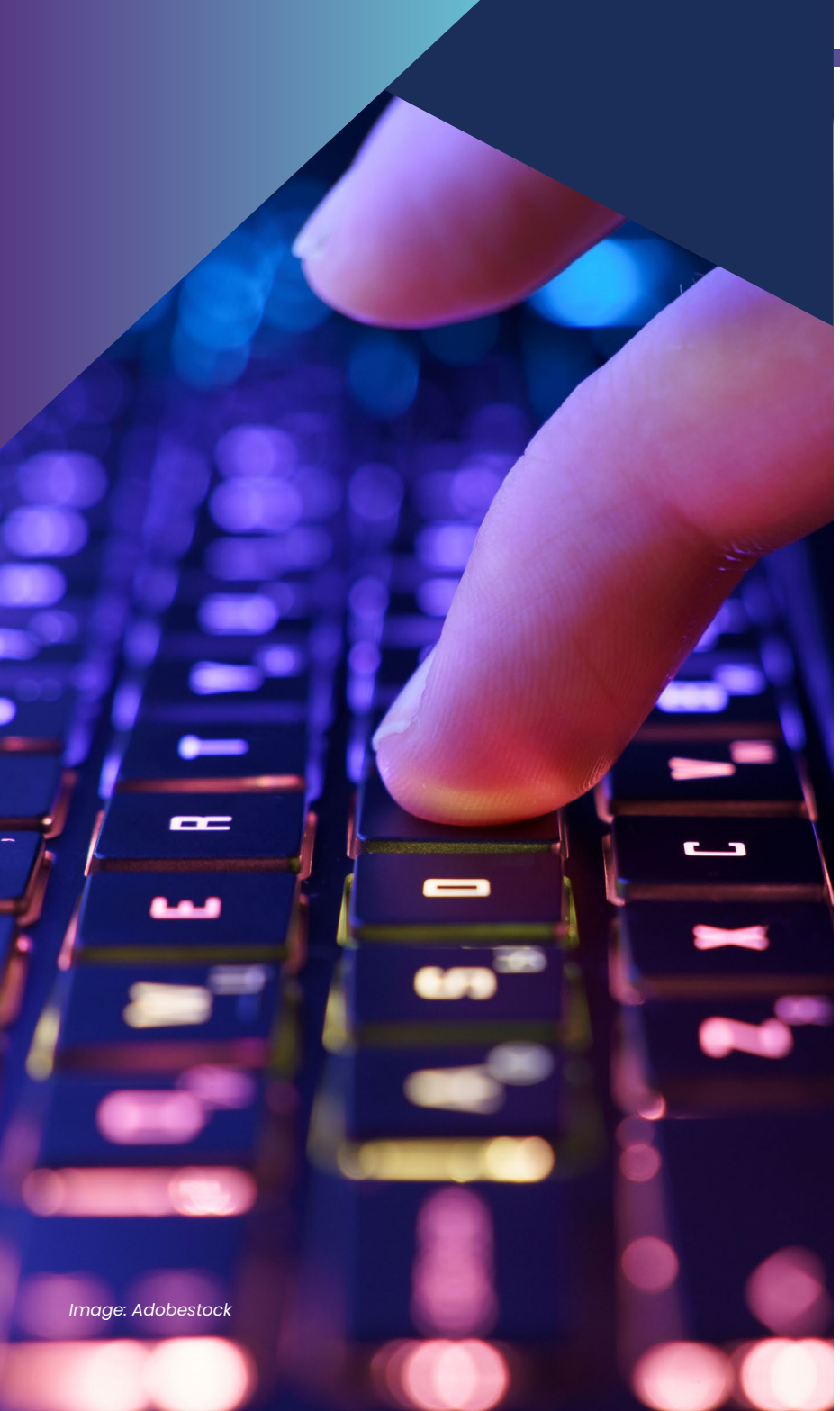

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CONCLUSION

The futures of most organizations, the people who work for them and the communities in which they are based depend on effective digital transformation. Today, most digital transformation projects fail, at a substantial financial and human cost. I hope that this book can help increase the probability of success.

It's crucial to understand the drastic nature of the changes required. Most organizations are designed to reliably do tomorrow what they did today, and their leaders often lack experience in radical transformation. Successful digital transformation requires them to change, but not alone. Digital transformation will only work if everyone in the organization participates in it.

Our skills as engineers are only valuable when they achieve their intended results. The technology-based changes that are transforming companies today usually require the use of an engineer's technical skills, but these must be combined with skills in a wide range of areas to transform an organization.

I implore you once again to take advantage of the exercises provided in this book. These tools make it easier for engineers to work with others in the organization to design and implement technological change. With this toolkit, your digital transformation strategy will be better aligned with your business strategy and it will prioritize achievable human and organizational change.

I hope that this book will contribute to securing the future of your organization in the fourth industrial revolution. I'd love to hear about the changes you make and your experience in applying the toolkit. If you have suggestions for changes, please share them. We are always trying to make it better.

Best wishes,
Peter Carr

Author and instructor of the Watspeed Digital Transformation Certificate Program, University of Waterloo
Author of the series "Digital Transformation 101" on Engineering.com