Capgemini engineering

DIGITALIZATION
OF OPERATIONS

Three steps to get your strategy right

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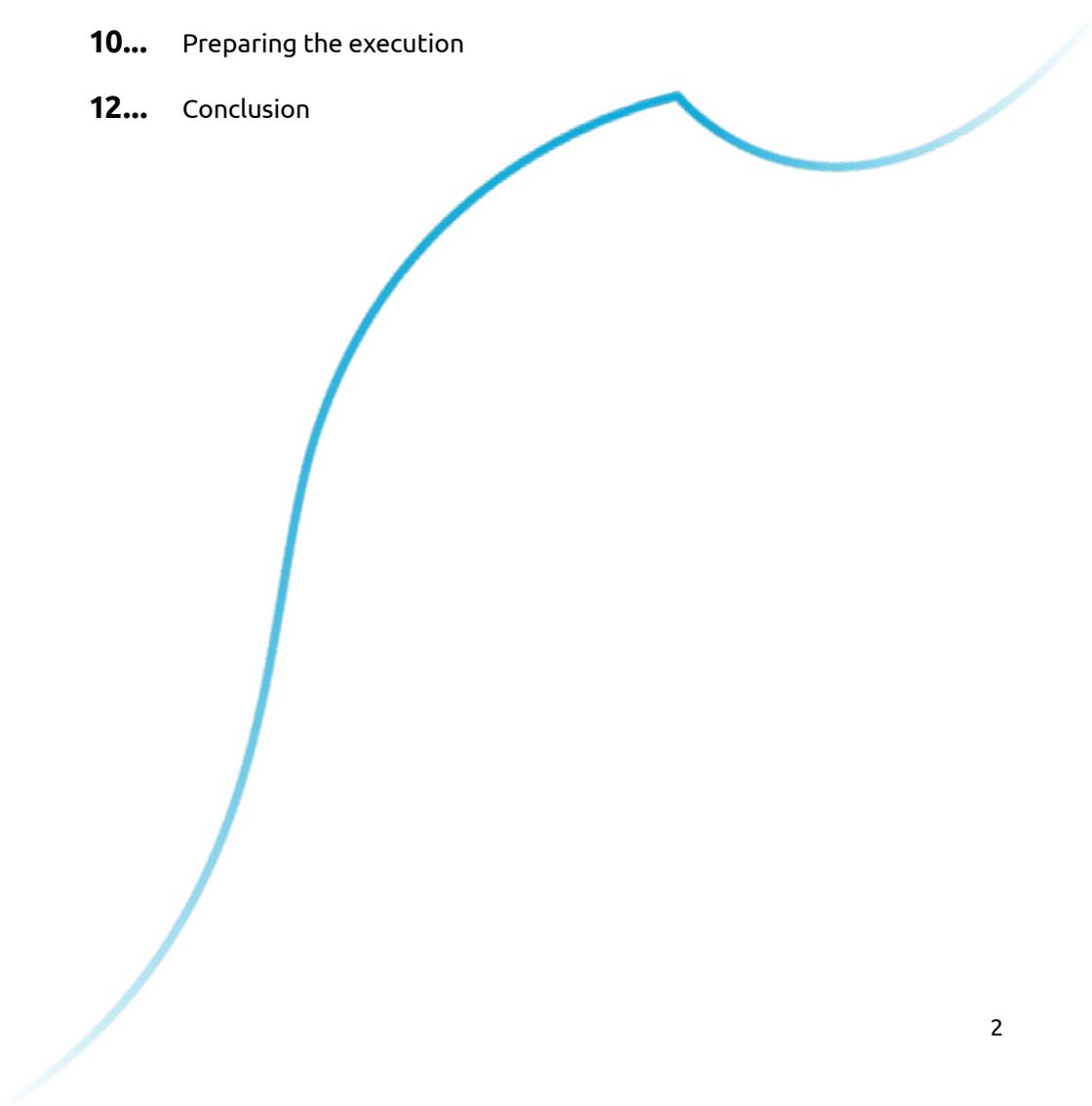
Introduction

Today, there is no doubt that companies, regardless of their industry, need to embrace digital transformation to remain competitive in a fast changing environment.

The challenges vary depending on the field of activity, but a few global trends are impacting the manufacturers' business and operating models. Demand is volatile and hard to predict. Product customization and the pressure to reduce the time to market are forever growing. Extensive product mix, increased number of Stock Keeping Units (SKUs), and reduced lot sizes are stressing globalized supply chains, which have shown low resilience during the COVID-19 pandemic.

The manufacturing plants and their operating models need to transform to become modular, flexible, multi-product, and multiprocess systems and be prepared to support life cycle changes and reconfigurations.

Many leaders are looking at both mature and emerging technologies, wondering which will work better for their challenges. They are looking for solutions that are agile and reliable, which will deliver the promised benefits and will do so, fast.

These leaders need a strategy that represents their operating model and leverages the application of selected digital technologies that will yield the most benefits and better fit with their companies' current digital maturity. They also need a comprehensive digital transformation roadmap to guide them during the execution of the strategy.

Like in any other journey, the most important premise is to have a clear understanding of the destination. It's the goal that the company pursues and will mobilize a significant amount of resources to attain it. This has to be specific, so it's meaningful and understood by the organization. It's not just about producing smaller batches, delivering faster, and reducing inventory levels. Instead, it has to be a more detailed specification of what business functions and processes within the operating model will be transformed, how they will be executed in the future model, and what combination of current and future digital capabilities will support the new way of working to achieve these business goals.

In this paper, we explain our methodology to elaborate on a digital strategy that is founded in the company's business strategy, future operating model, and current digital maturity. The methodology consists of three steps:

- Setting the future vision

- Elaborating the operational digital strategy
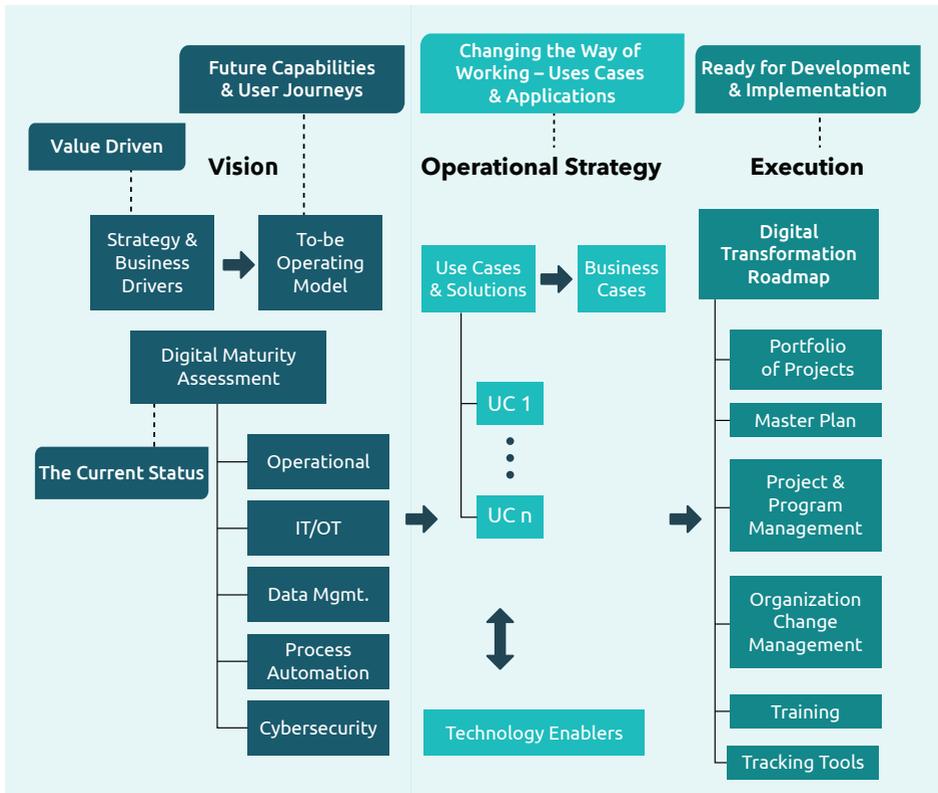
- Preparing the execution

Figure 1: Capgemini Engineering World Class Center (WCC) for Advanced Manufacturing. Approach for digital transformation roadmap of manufacturing operations

Setting the future vision

Most companies have their mission, vision statement, and business strategy. These can be found in the annual report along with market trends, goals, and objectives for the years to come. These are essential inputs to design the digital transformation, but they need to be processed to envision the future operating model.

The strategy, the business drivers, and the status of the current operations (i.e., the current operating model) have to be distilled to target the relevant KPIs. The future operating model encompasses the digital capabilities that the company should reinforce and acquire to remain competitive in the future.

The following diagram shows an example of those capabilities for pharma companies clustered between common, core, and strategic ones. If the company should develop a few or most of these capabilities, it is a strategic decision to be made while defining the future operating model.
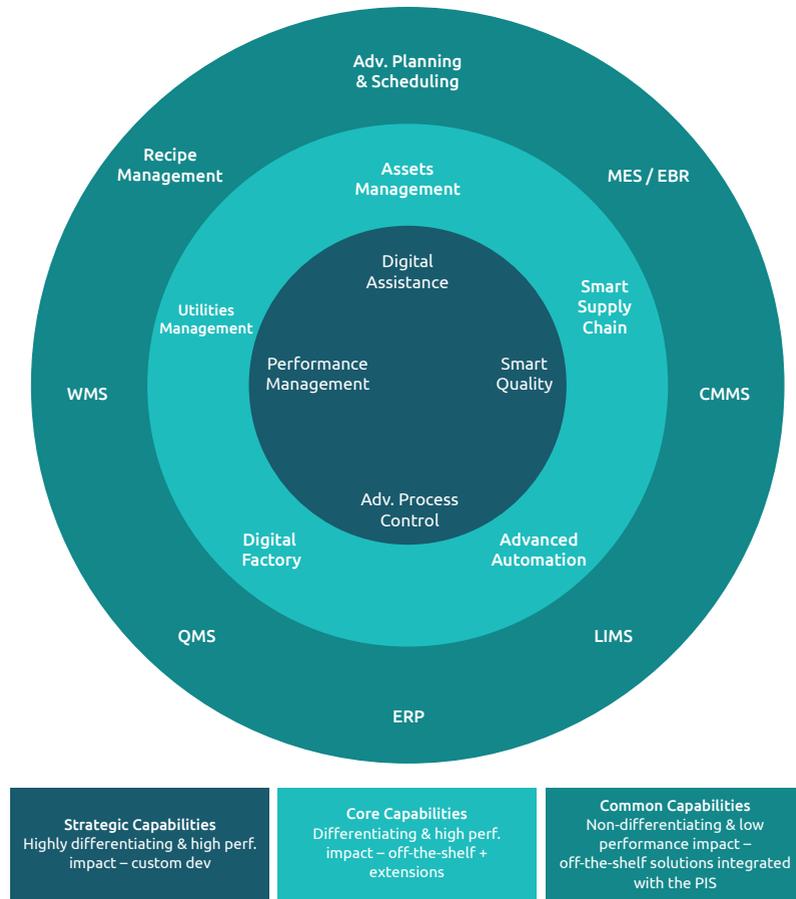
Figure 2: A view of business applications and digital capabilities for the pharma manufacturing operating model

Strategic Capabilities
Highly differentiating & high perf. impact – custom dev

Core Capabilities
Differentiating & high perf. impact – off-the-shelf + extensions

Common Capabilities
Non-differentiating & low performance impact – off-the-shelf solutions integrated with the PIS

A combination of top-down and bottom-up strategies would be the best way to create a compelling to-be operating model. Considering the executive and shop floor intelligence, the transformation initiatives will support the business strategy better, address the pain points, and leverage current capabilities.

The approach also incorporates methodologies such as Design Thinking and Lean Manufacturing and involves subject matter experts from different areas.

The capabilities can then be drilled down to the level of the user interactions, business functions, systems, and applications that need to be created or transformed to obtain the desired results. The definition of the future operating model must leverage the vision from the different stakeholders from different areas of the manufacturing value chain. Thus, it is guaranteed that the operations are transformed with a holistic and user oriented approach.

While a solid vision of the to-be operating model is required, the transformation also has to be founded in the current digital maturity.

In general, digital maturity has numerous frameworks that companies can use to assess their maturity level. IT infrastructure, resources, and the culture of the organization are a few of the criteria used to evaluate the generic models as these are enablers for scalable implementation during transformation. The design of the future operating model will depend on the current digital readiness of the company.

Operational, to map the relevant areas, resources, and business functions within the value chain so they can be linked to the current digital capabilities.

IT/OT, to frame the current state of automation and information systems in the reference model for each ISA 95/88 level. The assessment includes the capturing of the current status of information systems (ERP, PLM, planning, custom applications, etc.), industrial information systems (MES/MOM, PCS, SCADA, etc.), control systems (machine controllers, PLCs, sensors, etc.), communications infrastructure, and networks, on-premises and to the internet, and how all these IT/OT systems are supporting different business functions.

Data management, since one of the promises of digital technologies is to transform companies into business-driven data-enabled organizations, it is necessary to investigate the status of the existing data management capabilities to ensure that a coherent data strategy is incorporated into the future vision of digital operations. To ensure the relevance of the existing data-centric services to the manufacturing operations, the process of data collection, access, analytics, quality, integrity, and the platforms and tools used need to be scrutinized.

Advanced process automation, to leverage advanced manufacturing technologies across the E2E value chain processes to drive performance and efficiency. It focuses on advanced robotics and cyber physical systems as the primary enablers where the physical part that performs the physical process is connected through the Industrial network to the cyber part that performs the computational processes. This provides and uses data that is available for different services.

Cybersecurity, as the complexity of the Industrial networks increases and more data-driven services and applications are implemented, guaranteeing secure, connected manufacturing operations becomes critical. It is imperative to protect the data and to provide reliable, highly interconnected manufacturing systems. Threats come from many different vectors. Our assessment incorporates and analyzes current policies and IT security assets against the four main types of attack vectors: network related, software related, human, and physical.

1.	ACATECH, 'Industrie 4.0 Maturity Index. Managing the Digital Transformation of Companies – UPDATE 2020', available from: https://en.acatech.de/publication/industrie-4-0-maturity-index-update-2020/

Elaborating the operational digital strategy

At this step, it's time to deep dive into the to-be operating model by redefining the way of working through use cases and applications.

Elaborating on the previous view for pharma manufacturing companies, the following diagram shows some specific use cases that can be considered in different capabilities. The generation and improvement of use cases and business applications are seen as the new digital lean and the way that companies continuously innovate their operations.
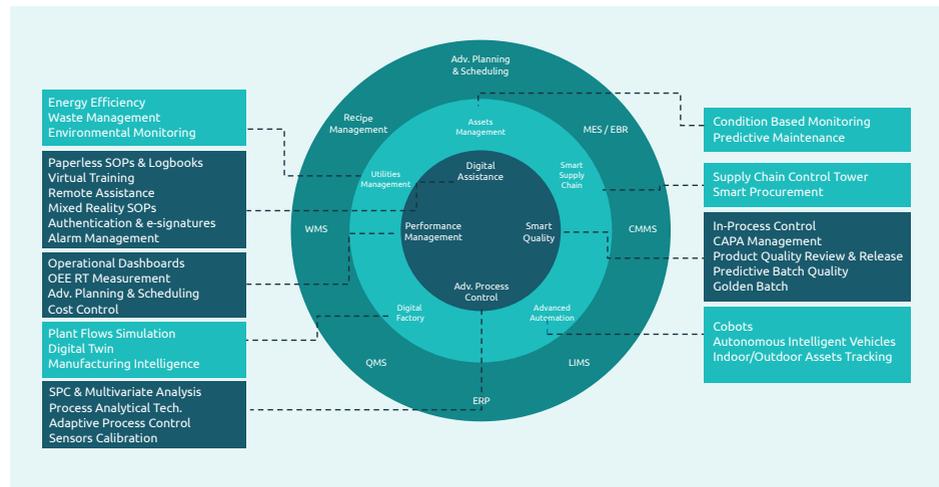
This analysis is fed with the output of the previous step to design more detailed user journeys and business services. The functional requirements and capabilities are broken down and positioned over the IT/OT and digital architecture to define the missing building blocks, the integration patterns, and the conceptual data model.

The functional requirements represent the actions performed by the application, together with the result from these actions for the users, which constitutes the business value to be captured. Then, some use cases are grouped as long as requirements and users can be clustered, thus making the full picture and the business value clearer for every stakeholder.

To define the solutions, look at the current digital maturity, together with the available technologies that can be leveraged. It is at this point where deep tech and innovation meets the operational strategy to design a blueprint of the most effective solutions for the selected use cases.

Technology in itself is a commodity; the really important thing that can bring a competitive advantage to a company is how we can obtain maximum performance using innovative methodologies to create value from the technology.

The solutions will be most likely made of the interplay of several technologies leveraging and upgrading the existing digital capabilities. Since the array of vendors and alternatives is huge, deep digital and advanced manufacturing experts are required to design innovative solutions that integrate with the current infrastructure. This is a key factor in making the development and implementation faster and in generating the expected benefits.

Every use case and solution blueprint needs to be validated with enough evidence that it will yield the expected benefits. By having the selected use cases together with the blueprint of the architectural components, it is possible to perform the value analysis and calculate the solutions' Total Cost of Ownership (TCO).

All this is fed into the business case models, which allow the company to make informed decisions from a financial perspective.

It has to cover every aspect of the solution life cycle – from development, implementation, change management, regulatory and compliance needs to risks and opportunities, maintenance, etc. Then the comparison between the different use cases can be made using metrics such as Return on Investment (ROI), payback period, or Net Present Value (NPV) to combine priorities and dependencies and elaborate a master plan for the transformation roadmap.

Preparing the execution

In the third step, the selected use cases and solutions are broken down into workstreams. The digital transformation program is split into projects and all the planning activities are integrated into the roadmap.

As part of the roadmap, Proofs-of-Concept (PoC) are planned to test the feasibility and the business value for less mature technologies or highly complex solutions. Also, Minimum Viable Solutions (MVS) are developed following an agile approach to speed up the implementation and minimize risks. The scale implementation constraints and requirements are incorporated early in the PoCs and MVSs.

In a company that has a digital transformation program already in place, there are many pitfalls that it has to overcome, such as:

Weak governance processes: The transformation has to integrate strong governance and change management processes and tools. Many companies struggle with their internal processes, culture, and organization to implement digitalization at scale.

Unclear business outcomes: It happens when the initiatives are not well linked to the business model and cannot guarantee the benefits.

Budget cycle: Sometimes, companies with a structured portfolio of digital projects have to subordinate the launching and implementation of these projects to the approval of the yearly budget to continue improvement.

Complex and long pilot projects: Poorly scoped projects, narrow vision, lack of success criteria and agile development approach, etc., are the reasons for the stalling of pilot projects.

Regulations: Especially in some highly regulated industries, quality and compliance activities have to be considered in the roadmap and enough resources allocated to them.

To overcome the implementation roadblocks, roadmap planning should include:

- The definition of the portfolio of projects, priorities, and timing – what projects to start with, capabilities that need to be built first, solutions that have to be piloted before implementing at scale

- The analysis of the required resources and training needs – identify the champions that will broadcast the organization's strategy for the transformation, inspire and liaise with the different stakeholders, acquire the competencies and skills required to operate the new processes and solutions, and secure the investments

- Benefits to employees and organization – the governance model and change management processes to ensure consistency throughout the implementation, to manage the perception of the transformation within the organization by communicating what the transformation roadmap will do, how it affects users across areas, and how the new digital capabilities are beneficial to employees and the overall organization

- Depending on the type of initiative, the governance model will have to incorporate what needs to be standardized across the organization as well as the elements that can be decided at the local level, such as:

  - Global governance: methodologies, tools and platforms, reporting, etc.

  - Core solutions that are developed centrally and should be applied to all sites in the organization

  - Custom solutions, specific for a site or a group of sites

The appropriate metrics and tracking tools to monitor and control the program execution: Beyond monitoring the progress of every project in the portfolio, the transformation metrics have to connect with the business drivers and benefits that were targeted during the definition of the strategy.

Conclusion

The term Industry 4.0 was first introduced in 2011 and high expectations have been created since then about the growth and adoption of 4.0 technologies.

A BCG study in 2018[2] showed that increased levels of digital maturity significantly improve competitive advantage. It also showed that only a limited number of companies are ahead in the digital transformation, and the gap between champions and laggards continues widening.

Looking at the same phenomena, McKinsey coined the term 'pilot purgatory' to refer to a majority of the companies that are struggling to move from the pilot phase of digital solutions to the use-at-scale stage.

On average, only 30% of companies are already scaling[3] and getting benefits from their digital investments. It seems that despite the huge array of technologies available, companies are finding hurdles to incorporate them into their manufacturing operations.

Industry leaders must be fully aware of the importance of preparing well to transform their manufacturing operations. To do so:

- The future operating model has to align with the strategy and business drivers that will make the company succeed, if the company's goal is to raise the bottom line (by cost reduction, efficiency improvements, etc.) or to generate growth through new sources of revenues

- What digital capabilities should be acquired, which digital use cases and applications will support the operations, and how to integrate them with the current IT/OT architecture are all key questions to address while designing the operational digital strategy

- Make sure that the necessary resources and competencies are identified and will be available, and that the change process is carefully managed, so the current culture and organization do not eat the new strategy up

2.   BCG, 'Digital Maturity is Paying Off', 2018, available from: https://www.bcg.com/publications/2018/digital-maturity-is-paying-off

3.   McKinsey, 'Digital Manufacturing – escaping pilot purgatory', 2018, available from: https://www.mckinsey.com/business-functions/operations/our-insights/how-digital-manufacturing-can-escape-pilot-purgatory

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