ITIL®4

Create, Deliver and Support

Contents

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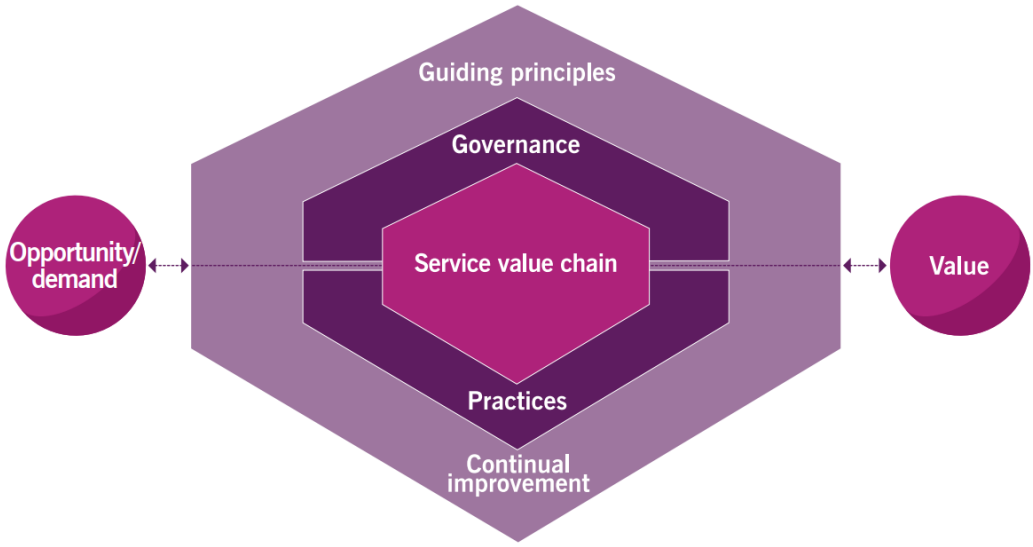
ITIL Foundation recap

The key components of the ITIL 4 framework are the ITIL service value system (SVS) and the four dimensions model.

The ITIL service value system

The ITIL SVS represents how the various components and activities of the organization work together to facilitate value creation through IT-enabled services. The core components of the ITIL SVS are:

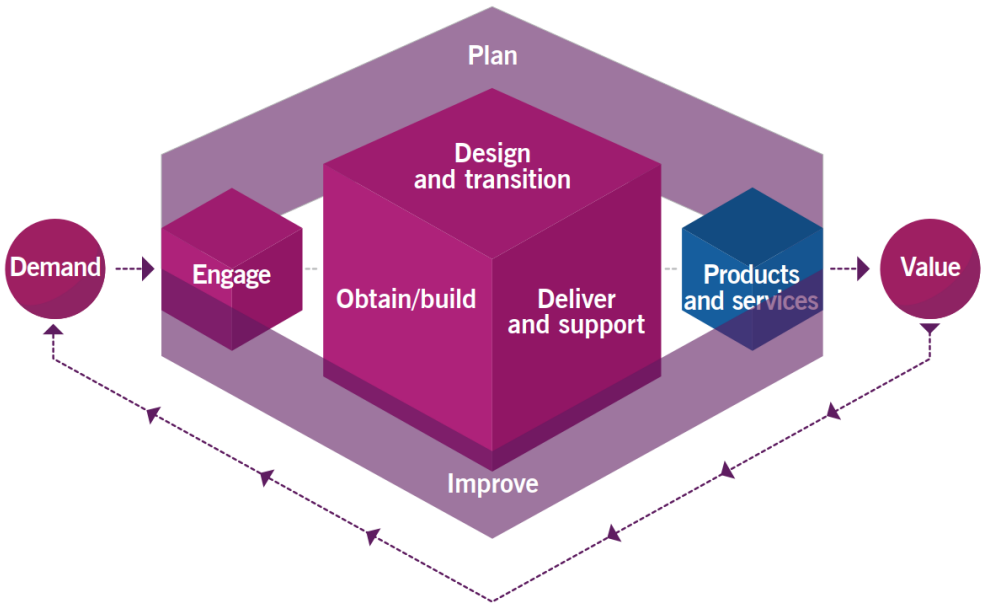
- ITIL service value chain
- ITIL practices
- ITIL guiding principles
- Governance
- Continual improvement



The ITIL service value chain

The central element of the SVS is the service value chain, an operating model which outlines the key activities required to respond to demand and facilitate value realization through the creation and management of products and services. The ITIL service value chain includes six value chain activities which lead to the creation of products and services and, in turn, value. The activities are:

- plan
- improve
- engage
- design and transition
- obtain/build
- deliver and support.



The ITIL practices

Practices are sets of organizational resources designed for performing work or accomplishing an objective. The ITIL SVS includes 14 general management practices, 17 service management practices, and three technical management practices.

General management practices	Service management practices	Technical management practices
Architecture management	Availability management	Deployment management
Continual improvement	Business analysis	Infrastructure and platform management
Information security management	Capacity and performance management	Software development and management
Knowledge management	Change enablement	
Measurement and reporting	Incident management	
Organizational change management	IT asset management	
Portfolio management	Monitoring and event management	
Project management	Problem management	
Relationship management	Release management	
Risk management	Service catalogue management	
Service financial management	Service configuration management	
Strategy management	Service continuity management	
Supplier management	Service design	
Workforce and talent management	Service desk	
	Service level management	
	Service request management	
	Service validation and testing	

The ITIL guiding principles

The ITIL guiding principles are recommendations that can guide an organization in all circumstances, regardless of changes in its goals, strategies, type of work, or management structure.

The seven ITIL guiding principles are:

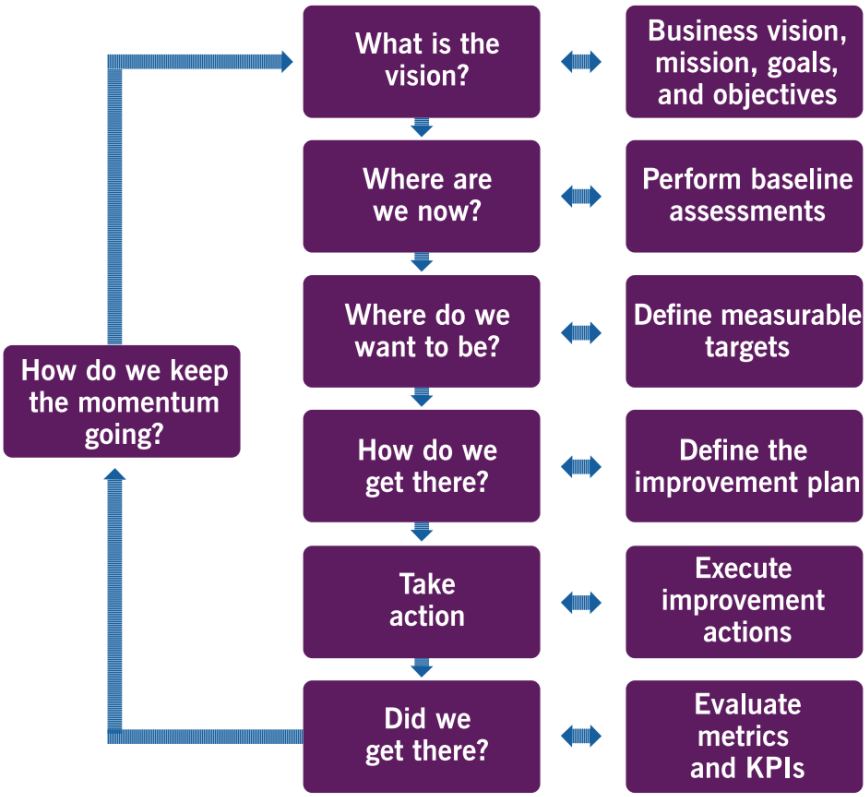
- **Focus on value** Everything that the organization does needs to map, directly or indirectly, to value for the stakeholders.
- **Start where you are** Do not start from scratch and build something new without considering what is already available to be leveraged.
- **Progress iteratively with feedback** Do not attempt to do everything at once.
- **Collaborate and promote visibility** Working together across boundaries produces results that have greater buy-in, more relevance to objectives, and increased likelihood of long-term success.
- **Think and work holistically** No service, or element used to provide a service, stands alone.
- **Keep it simple and practical** If a process, service, action, or metric fails to provide value or produce a useful outcome, eliminate it.
- **Optimize and automate** Resources of all types, particularly HR, should be used to their best effect.

Governance

Governance is the means by which an organization is directed and controlled. The role and position of governance in the ITIL SVS will vary depending on how the SVS is applied in an organization.

Continual improvement

Continual improvement is a recurring organizational activity performed at all levels to ensure that an organization's performance continually meets stakeholders' expectations. ITIL 4 supports continual improvement with the ITIL continual improvement model.

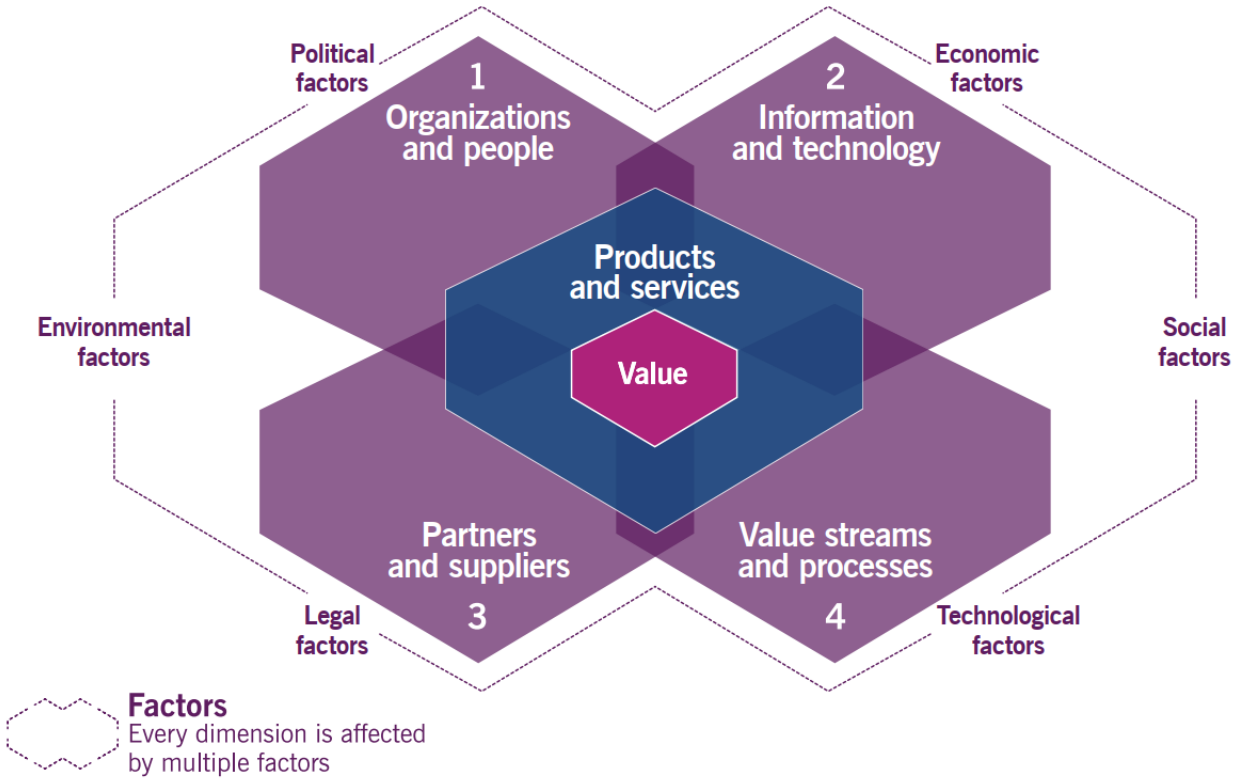


The four dimensions model

To support a holistic approach to service management, ITIL defines four dimensions that collectively are critical to the effective and efficient facilitation of value for customers and other stakeholders in the form of products and services.

- organizations and people
- information and technology
- partners and suppliers
- value streams and processes.

The four dimensions represent perspectives which are relevant to the whole SVS, including the entirety of the service value chain and all ITIL practices. The four dimensions are constrained or influenced by several external factors that are often beyond the control of the SVS.



1 Introduction

Value

The perceived benefits, usefulness, and importance of something.

Service management is about co-creating value. Technology is used to support value co-creation, but defining value can be challenging in the IT industry. In the past, much of the focus has been on cost effectiveness, basic functionality, or innovation. Currently, however, speed and flexibility are the differentiators between valuable and less valuable services. This may shift in the future to areas such as security, human centricity, increased automation, etc. Moreover, as the definition of value is continually changing, it should be continually revised and clarified.

ITIL 4 takes a holistic approach to building and modifying technology-enabled services from demand to value. This publication is about utilizing service management, adapting and adopting best practices, and using the ITIL service value system (SVS) framework to facilitate value co-creation in organizations. The publication is a practical guide for those who work within the broad scope of technology-enabled services. It provides clear guidance on how to collaborate and coordinate efforts to design, build, and support integrated and effective products and services, building from ITIL Foundation.

ITIL 4 describes a service value chain of six activities. These activities can be combined in various ways to create value streams. This publication covers the integration of these activities in order to enable the creation, delivery, operation, and continual improvement of technology-enabled products and services. It is important to understand that there is no uniform approach to successful service delivery. Context, requirements, and resources vary across organizations. Success in service management requires pragmatism and creativity, not doctrine and dogma.

This publication describes not only how value streams can be built and managed holistically but how continual improvement iterations and feedback loops can be included in value streams. It explores areas such as development, testing, knowledge, customer and employee feedback, new technologies, sourcing, and ways of managing work. In so doing, it reflects new ways of approaching service management.

Previous knowledge regarding IT and service management processes does not need to be discarded. Much of this knowledge is still useful and can be refocused on the wider context of practices. In response to an evolving world, IT and service management need to be used appropriately, flexibly, and in new ways. Service management today requires an open mindset and more collaborative ways of working. As the practices and approaches for the co-creation of value are constantly evolving, IT, digital, and service professionals need to keep up to date by developing their skills, knowledge, and definitions of excellence. This publication therefore focuses on individual and team professionalism, culture, and service mindset, and will examine the value and methods for ensuring sustainability.

2 The evolution of professionalism in IT and service management

This chapter provides guidance for professionals in IT and service management who are required to build and maintain a broad professional portfolio. The content of this chapter may be familiar, as it relates to organizational structures, people, communications, and the importance of being aware of new opportunities.

These particular areas are emphasized in ITIL 4 because they are as important for success as processes, practices, and technical knowledge. To be successful in the provision of IT and digitally enabled products and services, it is important to develop a good understanding of and practical skills in a broad range of guidance.

2.1 Organizations, people, and culture

2.1.1 Organizational structures

Organization

A person or a group of people that has its own functions with responsibilities, authorities, and relationships to achieve its objectives.

Service relationships require many and varied interactions between individuals and groups both within and between organizations. Individuals and organizational structures:

- interact with information and technology
- participate in value streams and processes
- work with partners and suppliers.

There are many potential organizational structures. An early and crucial decision involves selecting the one that will allow and encourage individuals to create, deliver, and support products and services. Some organizational structures are hierarchical, whereas others more closely resemble a network or matrix. A common approach involves grouping people functionally: by their specialized activities, skills/expertise, and resources, although this can lead to individuals working in isolation with little understanding of what anyone else is doing. In contrast, cross-functional structures (which may share a focus on a product or service) can leave the organization without a comprehensive overview of their portfolio and may result in duplication of effort.

Current organizational thinking favours self-organizing structures that work towards common objectives. Unfortunately, not every team can take an impromptu and Agile approach to self-organization.

Types of organizational structure include:

- Functional These are typically hierarchical arrangements based on organizational control, lines of authority, or technical domain. These arrangements determine how power, roles, and responsibilities are assigned and how work is managed across different levels. The organization may be divided into internal groups based on functional areas, such as HR, IT, finance, marketing, etc.
- Divisional Divisionally based organizations arrange their activities around market, product, or geographical groups. Each division may be responsible for its own accounting, sales and marketing, engineering, production, etc.
- Matrix Reporting relationships are organized as a grid or matrix, with pools of people who can move across teams as needed. Employees in this structure often have dual reporting relationships; for example, both to a line manager and to a product, project, or programme of work.
- Flat Some organizations reduce hierarchical reporting lines because they are seen as barriers that hinder decision making. As the organization grows, these structures become a challenge to maintain.

The key differences between the various organizational structures can be described using the following characteristics:

- Grouping / teaming criteria (function/product/territory/customer, etc.)
- location (co-located/distributed)
- relationships with value streams (responsible for specific activities or fully responsible for the end-to-end value stream)
- team members' responsibility and authority (command-and-control or self-driven teams)
- sourcing of competencies (level of integration with teams external to the organization).

Historically, organizational structures have been functional and hierarchical in nature, with military-style lines of command and control.

In the digital service economy, agility and resilience are vital for an organization's success. Organizations must adopt new ways of structuring their resources and competencies. Common approaches include:

- the faster and more flexible allocation of resources to new or more important tasks. Matrix organizational structures are adept at allocating or reallocating resources to different value streams, projects, products, or customers. This is often combined with outsourcing arrangements to ensure an increase of resources and competencies when necessary.
- permanent, simple multi-competent teams that are assigned to work exclusively on a product. This may result in occasions when teams are unoccupied, but it ensures a high availability of teams for the development and management of products.

In order to adapt to more flexible and responsive ways of working, such as Agile and DevOps, many organizations have adjusted their organizational structures. This includes ensuring that a leader's role is closer to that of a 'servant'. It also involves creating cross-functional teams, which can be achieved by applying matrix and flat structures.

Organizational structure changes should be managed carefully, as they can cause major cultural challenges within the organization if handled badly. It is useful to refer to the ITIL guiding principles and the organizational change management practice for guidance.

2.1.2 Using the ITIL guiding principles to improve the organizational structure

The ITIL 4 guiding principles are valuable references when planning to improve organizational structures. It is useful to consider the following:

- **Focus on value** What is the key driver for changing the structure? It is important to ensure that this is reviewed and referenced at each stage of the transformation.
- **Start where you are** The cultural aspects of the organization should be considered. For instance, what is the relative maturity of the current organizational structures? Value stream mapping and RACI matrices can be used to understand current roles and responsibilities.
- **Progress iteratively with feedback** The transition/transformation should be simplified into manageable steps to ensure that it is possible to adapt to changing requirements.
- **Collaborate and promote visibility** It is important to ensure that all stakeholders are engaged throughout the change process. A 'disagree and commit' approach, in which every stakeholder discusses their concerns with the rest and is then expected to come to an agreement, can help changes to progress quickly. Leaders should adopt an 'open-door' policy to become easily accessible. Organizational changes must be clearly defined and openly discussed to facilitate transparency.
- **Think and work holistically** Collaborating with all the appropriate leaders/managers will ensure that potential risks are understood and managed. It will also help to communicate a consistent message about the risks and the progress that is being made towards transformation.
- **Keep it simple and practical** It is important to reduce the complexity of the organization as much as possible so that the flow of work and information is uninhibited. Efficiency and effectiveness can be improved by reducing the transferrals of work. Where possible, teams can be encouraged to be selforganizing by making decisions and taking actions within certain criteria without the need to check with management.
- **Optimize and automate** Where possible, tasks should be consolidated or automated to reduce waste. Human intervention should only occur when it contributes a defined value.

2.2 Building effective teams

2.2.1 Roles and competencies

Roles and jobs

A role is a set of responsibilities, activities, and authorizations granted to a person or team, in a specific context.

A job is a position within an organization that is assigned to a specific person.

A single person may, as part of their job, fulfil many different roles. A single role may be contributed to by several people.

Traditionally, roles in IT and technology followed specific technical competencies. These roles, which were clearly defined, were situated within the development and operational areas and included programmers, business analysts, tech support, designers, and integrators. More recently, organizations have been struggling to build career paths for their employees because roles and job requirements are constantly changing.

The new workplace requires greater flexibility and the ability to constantly adapt to new requirements and technologies. In IT and service management, this involves a wider definition of skills, competencies, and areas of work, reflecting the changes in teams and organizational structures. The transformation from hierarchical structures to matrix-managed cross-functional teams has expanded the definition of roles. As a result, individuals are now expected to transfer more readily between roles.

In addition, there is now an expectation that professionals in IT and service management will possess a wider range of business competencies, supported by demonstrable skills, experience, and qualifications. Many of these are transferable business skills that have been obtained from other areas of work and used successfully by IT professionals for years. However, they have only recently been recognized as being of equal importance to technical skills and qualifications.

As the technology industry moves closer to becoming a mainstream business function, generic business and management competencies will increasingly become compulsory requirements for IT and technology roles.

2.2.2 Professional IT and service management skills and competencies

The structuring and naming of roles differs between organizations. The roles defined in ITIL are not compulsory; organizations should utilize and adapt them to suit their specific needs. The ITIL practice guides describe each role using a competency profile based on the model

code	Competency profile (activities and skills)
L	Leader Decision-making, delegating, overseeing other activities, providing incentives and motivation, and evaluating outcomes
A	Administrator Assigning and prioritizing tasks, record-keeping, ongoing reporting, and initiating basic improvements
C	Coordinator/communicator Coordinating multiple parties, maintaining communication between stakeholders, and running awareness campaigns
M	Methods and techniques expert Designing and implementing work techniques, documenting procedures, consulting on processes, work analysis, and continual improvement
T	Technical expert Providing technical (IT) expertise and conducting expertise-based assignments

Successfully performing an activity requires a combination of competencies, each of which will vary in importance depending on the activity. The position of the competency in a competency code illustrates its relative importance. For example:

- In the CAT competency profile, communication and coordination skills are very important, administrative skills are somewhat important, and technical knowledge is useful but less important for the described activity. This combination is relevant, for example, for a relationship manager and a service owner drafting a new or amended service level agreement.
- In the TMA competency profile, technical knowledge is very important, method design skills are somewhat important, and administrative skills are useful but less important for the described activity. This combination is relevant, for example, for a change manager and a service owner initiating an improvement of a change model.

Understanding a role's competency profile helps to:

- identify the best candidates (or groups) to perform the role
- identify gaps and plan the professional development of team members
- define requirements to newcomers and create job and role descriptions
- align the organization' s workforce and talent management practice with industry competency models and professional development programmes.

Only a few activities and roles demand technical skills and knowledge. For the majority of competency profiles, communication or administrative competencies are the most important. Once the high-level profile is understood, industry competency models, such as the European e-Competence Framework (e-CF) or the Skills Framework for the Information Age (SFIA) can be used to detail the requirements and to plan professional development.

Some examples of the skills and knowledge needed in service management are:

- Communication The ability to establish good working relationships with a variety of stakeholders at several levels using a variety of communication techniques. This includes verbal and written communication, the use of various types of media, and the adoption of appropriate language and tone. Good communication is a vital skill which encourages positive interactions with colleagues, customers, managers, staff, and other stakeholders.
- Business and commercial Most technology environments use a mixture of supplier and commercial relationships. Service managers utilize their commercial skills to specify, buy, negotiate, and manage such relationships. Procurement and contract management skills, in particular, are in high demand. Budgeting and financial management are also key service management requirements, as is the ability to write and sell a business case. There is also a need to produce promotional materials to advertise the service, either in an internal or external capacity.
- Relationship management Developing as a key skill set, this involves acting as a point of contact and liaison, capturing demand, and demonstrating value between business, customer, and supplier groups. Service managers may also function as the active liaison and synchronizer of information, feedback, demand, and progress between parties. Additionally, relationship managers convey requirements and feedback to the relevant groups to ensure a smooth flow of information and actions between groups.
- Leadership Beyond team or line management, leadership involves the ability to influence, motivate, and support individuals in their work. Leadership does not simply come from managers. Great leaders are those individuals who show initiative, take ownership, and empathize with and inspire others to get things done. When building teams, it is important to include individuals who possess these skills to act as leaders and create a great working culture.
- Market and organizational knowledge As a result of the reduction in distinction between IT and business roles and teams, those in technology roles have a greater need to understand the business and market sector of their organization. For example, such individuals should be aware of the developments in the market regarding competitors, relative costs, and opportunities.
- Management and administration Successful service management also requires good people management, delegation, documentation, and logistical skills. Much of the work involves bringing people together, agreeing on actions, and providing useful and practical documentation. Good managers are invaluable when building successful teams as they can hire the appropriate people and manage and develop their employees' careers.
- Developing innovation A business and entrepreneurial mindset is becoming more of a requirement, even within internal service management organizations. This is required to identify new ways of working, delivering services, and solving problems. It may involve exploiting new technologies, creative and innovative thinking, or customer interactions.

2.2.2.1 Generalist or 'T-shaped' models

In the past, individuals were typically viewed as either generalists or specialists. Today, this viewpoint does not reflect the outcomes that organizations expect and need. Organizations are looking for people to be T-shaped, pi-shaped (π), or comb-shaped (Ш), as outlined below:

- A T-shaped individual is an expert in one area who is also knowledgeable in other areas. For example, a developer or tester who possesses knowledge of accounting.
- A pi-shaped individual is an expert or near-expert in two areas and knowledgeable in other areas. For example, someone who can both design and develop but also possesses good testing skills.
- A comb-shaped individual is strong in more than two areas and knowledgeable in other areas. For example, someone who can gather requirements, design, and develop and who has a good knowledge of the adjacent areas.

In the past, Pi-shaped individuals were usually senior staff who had developed their skills over time by working in different domains. However, this has changed: new hires may be skilled in multiple areas but not be specialized in any. Many individuals take a proactive approach to developing their skills and knowledge. T-shaped individuals tend to be inquisitive; they like to learn new skills and will acquire them whenever opportunity allows.

Although a clear focus on one competency creates deeper understanding, it can be dangerous to have only one area of expertise. This is because, in the rapidly evolving technology industry, an individual may find that their area of expertise is no longer relevant.

2.2.2.2 Developing a broad set of competencies

There is no single path to achieving proficiency in the competencies required for service management. Many training and certification programmes are available, for instance in technical products and for specific skills like business analysis, programming, and risk management.

Other ways of gaining and recognizing a wider set of competencies as part of service management include:

- building job descriptions that clarify each of the non-technical requirements for the role
- developing recruitment and onboarding skills
- recognizing non-IT experience in job applications; for example, team management, procurement, and contract management
- ensuring that skills matrices include appropriate soft skills, such as communications, leadership, and innovation
- reflecting and rewarding the full scope of required competencies in staff performance management, appraisals, and reward programmes
- ensuring that all staff and management are given opportunities for training and development outside traditional technical and process management, such as for management, leadership, team building, negotiation, report writing, business case preparation, relationship management, presenting, business administration, budgeting, marketing, and selling
- encouraging continuing professional development (CPD) programmes that recognize and develop all of the above at a practical level

- encouraging employees to investigate new ideas, tools, ways of working, etc.; for example, many organizations provide CPD points for attending events relating to their industry, workshops, conferences, etc. Individuals should be encouraged to develop their skills in broad and diverse ways
- managing role-based and competency-based models and schemes to develop and recognize training, experience, qualifications, and testimonials that help to provide evidence of an individual's competency levels
- role-based models have clearly defined job descriptions with integrated career progression paths; they are useful in the development of job-related career paths and in building the appropriate skills, but there can be challenges in maintaining these when roles and skills change regularly
- competency-based models are focused on generic competencies and are useful when developing a holistic approach to skill acquisition. These can also be useful in supporting talent management, although it can be difficult to map to exact roles
- hybrid role-based and competency-based models combine the job-related and talent-related aspects of the models.

2.2.3 Workforce planning and management

In today's talent-based economy, the workforce itself is arguably the most important tangible asset of most organizations. Despite its importance, this asset is often not carefully planned, measured or optimized.

Society of Human Resource Management (SHRM).

The purpose of the workforce and talent management practice is to ensure that the organization has the right people with the appropriate skills and knowledge and in the correct roles to support its business objectives. The practice covers a broad set of activities focused on successfully engaging with the organization's employees and people resources, including planning, recruitment, onboarding, learning and development, performance measurement, and succession planning.

A good workforce planning strategy should identify the roles, together with the knowledge, skills, abilities, and attitudes associated with them, that keep an organization functioning. It should also address the emerging technologies, leadership, and organizational changes required to progress the organization's growth and success.

Fundamentally, workforce and talent management is a set of specific approaches for recruiting, retaining, developing, and managing employees. Workforce planning involves understanding how employees can be used to meet an organization's business goals. This can include determining how many employee hours are needed for a project and identifying the skills the employees will need to ensure that the organization meets its goals and continues to improve its performance.

Workforce planning is a competency that is highly desired by managers. However, the impact of current and future vacancies on the organization's ability to execute its strategy often goes unrecognized, and there is also a tendency to allocate insufficient time to its implementation.

2.2.3.1 Capacity planning

Successful service delivery requires an understanding of the competencies needed and the amount of each resource required. In many organizations, the project management office is responsible for identifying and scheduling the resources needed for development, testing, release, and deployment. The support, training, and user resources needed for deploying and maintaining services is, however, often missing.

There must be enough time allocated for resolving incidents, requests, and problems, as well as for building and testing changes and their subsequent release/deployment. The service level targets for the time taken to resolve an issue should be organizational targets, not service desk targets. Accurate forecasts can be developed for incoming incident, request, and problem volumes. Regardless of whether it is applications, infrastructure, service desk, desktop support, or any other team (including service consumers), the challenge is ensuring that enough people with the required skills, abilities, and competencies are available to complete all the different stages from design through to support of services.

The workforce and talent management practice requires a service value network with service value chains and clearly defined inputs, outputs, and outcomes. The workforce must also be motivated and engaged in order to achieve high customer value. Management is responsible for ensuring that staff are trained, engaged, and valued so that they are more likely to remain with the organization.

Consequently, the increasing use of automation will require a realistic understanding of the resources required for the successful delivery of services. In the past, individuals could be either generalists or specialists. However, as methodologies like Agile and DevOps become more prevalent, roles are becoming increasingly blurred. Regardless of an organization's size, a variety of competencies are needed to fulfil different roles according to the prevailing circumstances. As a result, new operating models are needed for the successful development, testing, deployment and release, operations, and support of services.

For example, employees may fulfil a variety of distinct roles for individual releases and deployments, and developers and operations staff may take a more active role in resolving incidents. Realistic and achievable schedules will require better forecasting and an understanding of the competencies available to achieve the organization's goals.

2.2.4 Employee satisfaction management

The true potential of an organization can only be realized when the productivity of individuals and teams are aligned, and their activities are integrated to achieve the goals of the organization. Employees' morale and engagement can influence their productivity and retention, as well as customer satisfaction and loyalty (happy and satisfied staff are needed for happy and satisfied customers). Organizations should therefore keep employee satisfaction under frequent review in order to understand how well they are meeting the changing needs and expectations of their staff. Employee satisfaction surveys can measure many attributes, including leadership, culture, morale, organizational climate, organizational structure, and job activities.

It is sometimes useful to manage surveys via a third party to maintain confidentiality. Employee satisfaction surveys should be used to baseline their current satisfaction levels and to identify actions that will increase their commitment and trust; these directly impact on the ability of an organization to achieve its goals. Although surveys are a common means of collecting and managing employee feedback, other methods are available, such as casual meetings, regular one-to-one meetings and appraisals, reviewing sickness and attrition levels, staff morale metrics, and other informal communications.

The key elements in collecting employee feedback are:

- Confidentiality Employees should feel able to speak their minds without fear of negative consequences.
- Support and understanding Honest feedback will only be given when employees trust their managers to respond reasonably. Employees should feel that their opinions will be listened to and taken seriously.
- Call to action Employees need to know that their comments will be acted upon. It is important to initiate activities, e.g. to explain a decision that an employee does not support. Employees may not be forthcoming in the future if their opinions were ignored the last time they gave feedback.

2.2.4.1 Feedback types

Employee surveys can be run locally or at an organizational level. The information may be obtained in a variety of ways, from formal annual surveys to more informal and irregular feedback discussions.

Regular one-to-one meetings are a good source of feedback, depending on the relationship between parties; they can also provide more detail than surveys. As an alternative, unstructured meetings, which may include conversations in less-formal settings (for example, in a coffee shop, corridor, or during a journey) can often be the best way to secure honest information.

It is important to review sickness and attrition, as high levels of sickness or staff movement can indicate poor morale. Increasing rates of absence and staff turnover can indicate issues within the organization's overall culture.

Staff-driven metrics are where an organization allows their teams to submit their own morale indicators. This involves team members discussing and agreeing on a score that reflects their overall morale. These metrics are useful as they provide a system for measuring a team's overall opinion, although this can be challenging in teams with strong or influential individuals.

Collecting feedback

It is important to be timely when presenting the results and actions that arise from a survey.

The top four motivation factors for people at work are achievement, recognition, responsibility, and interesting work. They should be accounted for when preparing actions for increasing employee satisfaction.

- Take the personal and emotional out of criticism by discussing the facts of outcomes rather than offering opinions of a person or their skills.
- Use a mixture of open (opinions, emotions, attitudes) questions and closed (data, stats, facts) questions.
- Regularly conduct and improve surveys. They should not be a big event that individuals dread.

Giving feedback

- Do not tell others what you think of their skills. Instead, describe your experience of their work.
- Use specific examples as part of a bigger story.
- Be constructive, holistic, and positive. This will result in a more practical response compared to negative feedback.
- Only provide feedback; do not try to resolve problems.

2.2.5 Results-based measuring and reporting

Continual improvement relies on reporting data together with outputs from various sources to identify whether an objective has been achieved or will or will not be achieved. Organizations similarly use measuring and reporting to drive improvement activities and then track progress against the stated objectives. Business ecisions are often made with insufficient or irrelevant data. The availability of reliable metrics should support good business decision-making, because they can clarify facts and experience to drive positive change.

It is important to set appropriate objectives and related metrics, as metrics drive behaviour. Incorrectly calibrated metrics can lead to inappropriate behaviour in order to meet targets. The targets may also be inappropriate for the overall business or customer experience.

It is also essential to develop good metrics that relate to the overall business; the difference between outputs and outcomes must be clear.

2.2.5.1 Results-based approach

A results-based approach focuses only on the outcomes of employee actions; for example, customer experience, successful releases/deployments, sales per month, or the time taken to resolve an issue. This type of approach tends to be viewed as a fair and objective method of measurement. It is most appropriate when individuals have the skills and abilities needed to complete their work and can recognize and correct their behaviour.

The results-based approach is also effective for improving employees' performance. It motivates individuals to improve their skills and competencies in order to achieve the desired results. It also works when there is more than one way to achieve the desired outcomes, which is often true in IT. This approach encourages individuals to use the appropriate methodology to achieve the desired outcomes for their customers. In addition, it provides greater autonomy for employees to use their information and resources.

According to Fredrick Herzburg,1 achievement, responsibility, interesting work, and recognition are the four top motivational factors for people at work. Organizations can leverage this to increase employee satisfaction and engagement, which benefits not only the employees but also the customers and the organization as a whole.

Organizations will often integrate multiple factors into their performance management systems. For example, a results-based approach may be more applicable to regional retail managers, who focus on setting and achieving quarterly sales goals, than for baristas, who focus on making drinks and engaging with customers.

When setting and measuring individual performance goals, it is important to:

- arrange a face-to-face meeting and agree on a set of individual goals
- ensure that the goals are measurable and documented, which will make it easier for the individual to track their progress
- express the goals in specific terms
- adapt the goals to the individual
- adjust any goals that prove to be unrealistic.
- When measuring an employee's performance, it is important to:
- ensure that the individual ' s goals are aligned with those of the team and the organization
- measure both team and individual performances
- include both qualitative and quantitative measures
- allow measures to evolve to ensure that there can be changes in behaviour that drive continual improvement.

Good performance measurements and assessments allow management to initiate improvements and monitor their progress.

2.3 Developing team culture

2.3.1 What is team culture?

Culture can be described as a set of values that are shared by a group of people, including their ideas, beliefs, and practices, as well as their expectations with regard to how individuals within the group should behave.

Every organization and social system has a culture. Culture makes human actions predictable, so an understanding of it is a useful management tool.

Culture is a critical factor in the creation, delivery, and support of products and services. Moreover, it provides distinguishing features to service organizations and promotes its value proposition. Service provider organizations focusing on value creation will display these common characteristics:

- a focus on value, quality, and operational excellence
- client, customer, and consumer orientation
- investment in people and communication/collaboration tools
- strong team composition within a structured organization
- continual alignment with the vision, mission, and strategic objectives.

These, or similar, characteristics are expected to be shared by every member and team within the organization. However, specific cultures may be developed at the team level which support the values and principles of the organization but reflect the realities specific to the team. Culture is a difficult concept to grasp because it is generally unspoken and unwritten. It nevertheless influences the dynamics between individuals.

There are widely accepted models for describing cultures and managing cultural differences. For example, culture can be characterized by such characteristics as:

- communication (low context or high context)
- evaluation (direct or indirect negative feedback)
- persuasion (principles versus application)
- leadership (egalitarian or hierarchical)
- decisions (top-down or consensual)
- trust (task-based or relationship-based)
- disagreement (avoidance or escalation of confrontation)
- scheduling (linear or flexible timing).

In a successful organizational culture, teams understand both how they work and where their work fits within the context of the organization’s mission, goals, principles, vision, and values. Team members define their team’s rules and principles within the company’s overall culture. Teams must ensure that they have the information needed

to successfully perform their roles in support of any agreed strategy.

Team members should understand that a high percentage of the problems they face as a team will relate to how they interact and relate to each other. The team's challenge, as individuals and as a team, is to remove the barriers to success.

2.3.2 What does cultural fit mean and why is it important?

Cultural fit

The ability of an employee or a team to work comfortably in an environment that corresponds with their own beliefs, values, and needs.

An employee who is deemed a good cultural fit is more likely to enjoy their work and their workplace, be happier, commit long term, and be more productive and engaged. A good cultural fit benefits both the team member and the team.

A diverse approach supports good culture as it allows the team or organization to see their work from a broader perspective. Each person brings their unique combination of experience, perspective, skills, and knowledge to the team. The team is greater than the sum of its individual parts.

When hiring for cultural fit, it is important to be aware of bias. It is human nature to gravitate towards likeminded individuals with a similar personality or beliefs. However, this produces homogenous teams and a culture that is less likely to grow or bring the advantage of a variety of perspectives.

2.3.3 How to develop and nurture good team culture

It is possible to grow and evolve a team's culture over time. First, this requires identifying the team's current culture and deciding what the desired future outcome is. Change requires ownership and action as a united team. This is a lot easier with good leadership and supportive management. The ITIL guiding principles and the continual improvement model can be very useful tools for implementing change.

The following are simple guidelines for a positive team culture. However, these recommendations should be reviewed and adapted to fit regional, national, and organizational characteristics. Some of the recommendations may be unsuitable for certain organizations.

2.3.3.1 Incorporating vision into the team culture

An important consideration when developing a strong team is to ensure that team members are focused on the collective effort rather than on themselves. A unifying purpose is important when building a strong team. This is aided by encouraging a holistic view of the objectives of the overall organization and of how the work of the team supports it.

The team culture cannot be forced upon individuals. Instead, individuals must be responsible for their own roles within the team culture. The most important task of any leader, therefore, is to clearly communicate the vision and how it will be achieved by the team. Team members

need to understand how their contributions fit into the bigger picture, providing them with a sense of purpose and of belonging.

Leaders should continually reinforce the team vision by instilling a sense of purpose to help them develop and increase productivity.

2.3.3.2 Regular meetings

Regular meetings make a big difference to team culture. They build relationships between team members, encourage productivity, and focus on the need for improving team performance.

Meetings should be scheduled in advance and attendees should be acquainted with the agenda beforehand.

There must also be clearly defined roles for meetings; for example, one person leads the meeting while another takes notes.

Meetings should focus on the discussion of problems and possible solutions. They need to be efficiently managed, and detailed discussions should be avoided unless necessary.

2.3.3.3 Create leaders

A great team culture prioritizes mentorship over management. Leaders play an important role in forming the culture of the team. Communication must be clear so that each team member has the same understanding of the objectives and issues. Working arrangements should be flexible enough to allow each employee to work in their most effective way but not so flexible that they become difficult to manage.

Team members should be mentored on giving constructive feedback that encourages productivity rather than hindering it by causing embarrassment. Leaders and managers should facilitate and participate in improvement efforts alongside team members. Leadership skills are best learned through example: good leaders give individuals their time and support, remembering that everyone has something to offer.

2.3.3.4 Encouraging informal teams

Informal teams often work more efficiently than formal ones, because issues frequently fall across organizational reporting lines. Informal teams encourage employees to tackle concerns themselves instead of escalating every decision to senior management.

2.3.3.5 Cross-training employees

When employees understand how the various areas of the organization work, they are more likely to make decisions that benefit the organization rather than just their own department or group. It is important to provide employees with opportunities to learn about other roles within the organization. Some organizations go as far as switching employee roles on a daily, weekly, or monthly basis, including managerial roles. Top executives, for example, should spend a few days working on the front lines with customers or directly with the product. Such experiences will provide them with a new appreciation for and understanding of front-line employees.

2.3.3.6 Integrating socially

It is important to take the time to get to know employees personally. People work and support

each other better if they understand each other as individuals, helping to identify their strengths, bolster their weaknesses, and develop their latent skills. Great leaders understand how to utilize the talent around them. They learn how to motivate their team to go beyond what is expected of them. This requires an approach that is sympathetic to local culture: it does not need to be intrusive.

2.3.3.7 Providing feedback

Proactive and constructive feedback is one of the best ways to help a team continue to improve. Feedback does not need to be provided in a formal or complicated format. In fact, feedback is often more effective when it is informal and part of an ongoing conversation.

Everyone is different and, consequently, the method for delivering feedback should be customized for each individual. This is another reason why it is important to develop relationships with team members. When an individual trusts another, they are more likely to support their suggestions.

2.3.3.8 Promoting a culture of learning

It is important to promote a culture where each individual is encouraged to continually develop their skills. A culture of learning can be achieved by providing access to regular training and personal development. Online learning has made this even easier, as individuals can learn when it best suits them. Opportunities for team members to take on new responsibilities should be created.

Employees should be encouraged to take up training opportunities. Together with being given sometimes challenging (but achievable) goals, training helps generate feelings of progress that prevent team members from becoming complacent or bored in their positions. The learning of new skills also adds value to the team and workplace. Individuals with access to the tools and methods they need to be successful in their careers will be more engaged, which will create a stronger work environment. A great team culture is great for business.

2.3.4 A continual improvement culture

A culture of continual improvement is important because it improves customer experience, embeds good practice, reduces costs, improves operational efficiency, develops employee experiences, accelerates delivery, removes waste and repetitive tasks, and reduces risk.

The challenge with continual improvement is that it does not happen by itself, or simply because there is a process or workflow defined for it, or because there is an improvement register in place. It needs regular attention.

Sometimes an organization may insist that their staff engage in continual improvement but discover that it does not provide valuable or useable content. Careful thought must therefore be invested in identifying individual and organizational needs and then finding learning/training opportunities that are suitably tailored to requirements.

The real benefit of continual improvement comes when the organization has a culture that supports, promotes, and empowers all parties to commit to it in their daily work. Continual improvement should not be thought of as a tool or process to be used occasionally. Instead, it should be embedded in the culture of the organization, and thus promoted, supported, and expounded daily by the management and leadership of the organization. The success of continual improvement initiatives should be celebrated across the organization. Understanding how to build and maintain such a culture requires careful planning and

awareness of the current ways of working.

Some organizations have a positive culture, which is noticeable even when entering their offices and meeting their employees. In many cases, this has gradually evolved due to the influence of the approach of key individuals.

Often, the culture changes when key people change. Successful organizations recognize and embed the elements that drive a successful culture, regardless of the influence of individuals.

Generally, a successful culture involves a number of management supported activities, such as: expected behaviours, professional attitudes, positive language, supportive meetings, etc. Managers need to actively show that they follow these principles themselves to build trust. This takes time to develop because some individuals take longer to change and to believe in the approach.

It is essential for all stakeholders to understand the importance of positive attitude, collaboration, transparent working, and a supportive culture. This should encourage individuals to make suggestions, regardless of how unusual a suggestion may seem, so long as the goal is to improve the service.

The key elements of a continual improvement culture are:

- Transparency This encourages openness and trust.
- Management by example This should be displayed by all, especially leaders.
- Building trust The workplace should be a comfort zone where individuals feel supported to suggest, experiment with, and implement new ideas.

The following positive behaviours should be encouraged:

- Recruitment Hire the right sort of people with appropriate skills.
- Onboarding Brand values and expectations should be clearly and practically applied from the employee's first days with the organization.
- Meeting culture Every participant should understand good meeting behaviour, including: timeliness, listening, focusing on the agenda, professionalism, and follow-up.
- Language and taxonomy Taxonomy can be used to drive and enforce positive behaviour, such as removing bias, ensuring common understanding of terms, and encouraging clarity and precision of language.

It should be made clear within the organization that every employee and stakeholder is expected to engage in continual improvement. Clarifying the following will also contribute to the success of a continual improvement initiative:

- How to raise an improvement idea.
- What happens to improvement ideas after they have been raised (are they reviewed and actioned)?
- What are the decision timescales and how will the outcomes be communicated?
- What are the other sources of input (e.g. customers, employees, business management, users, and service management teams)?

2.3.5 A collaborative culture

Collaboration and teamwork are more than empty buzzwords: they require an agreement on the definition of cooperation and collaboration. The behaviours necessary for effective teamwork also need to be defined, recognized, and reinforced.

Cooperation Working with others to achieve your own goals.

Collaboration Working with others to achieve common shared goals.

With cooperation, there is a risk that individuals or teams who are cooperating instead work in silos. As a result, the individual or team goals are achieved but the organizational goals are missed.

From a business perspective, collaboration is a practice where individuals work together to achieve a shared goal or objective.

Cooperation and collaboration are vital for effective and valuable teamwork and service relationships.

Collaboration is especially useful for creative and entrepreneurial work in a complex environment. Cooperation is important for standardized work with a clear separation of duties, especially where people from multiple organizations are working together. Collaboration is typically used in start-ups as the shared idea of the organization's mission unites individuals and inspires them to work closely together. In attempts to adopt a start-up culture for larger organizations, leaders often aim to move to collaborative teamwork, but this often fails.

In a Harvard Business Review article entitled, 'There's a difference between cooperation and collaboration,' it was argued that 'managers mistake cooperativeness for being collaborative', adding that 'most managers are cooperative, friendly, willing to share information – but lack the ability and flexibility to align their goals and resources with others in real time'.

It is impossible to enforce collaboration, because it is based on shared goals and a high level of trust.

Sometimes, it is more realistic to establish effective cooperation within and between teams using aligned, transparent, and integrated goals and metrics. Teamwork automation can be helpful, regardless of the location of team members. Metrics and automation, however, are tools used to achieve a goal, not a goal in itself.

Cooperation and collaboration are based on the individuals' and organizations' relationships and cannot be limited to supporting components, such as controls or tools. Shared principles can be a foundation for effective teamwork and a starting point for its improvement.

2.3.5.1 Align with the type of work

Behavioural science enables us to define the work underpinning the operation of a service or product as either algorithmic or heuristic:

- An algorithmic task involves a person following a defined process that consistently follows a set of established instructions until the work is concluded.
- A heuristic task depends on human inventiveness and involves enabling a person to

discover or learn something for themselves.

The service designer needs to understand the nature of the work on which their service and process depends. For instance, purely algorithmic tasks have predictable process paths with clear inputs, instructions, outputs, and branches at each step. Algorithmic activities can be implemented using a conventional flow based on reassignments and handovers between specialized siloes, supported by established knowledge bases of predefined instructions. However, the rigid structures that drive efficiency gains in algorithmic work can be too restrictive for heuristic or more creative work.

Loose controls should be applied when:

- complex issues need to be navigated
- new solutions are required for unmet business needs
- customers would respond more positively if frontline agents had greater flexibility.

In such situations, employees are enabled to improve the overall outcomes, which might not be possible for managers, owing to their relative distance from the day-to-day work. There cannot be a process or work instruction for every situation, so employees can add value through inventive and responsive heuristic work. Practices such as swarming and DevOps are examples of human-led and cross-functionally collaborative philosophies for work.

2.3.5.2 Learn through collaboration

Many companies benefit from the provision of opportunities for input and enhancement from the employee performing a specific task, even in situations where an algorithmic approach prevails.

In heuristic situations, new insights and solutions will frequently emerge during a project. Nevertheless, unless these new solutions are recorded for future application in equivalent situations, the work may be needlessly duplicated at a later time.

Collaboration frameworks should be used to capture, refine, and re-use any knowledge acquired. Consequently, it may even be possible to move some heuristic tasks into the algorithmic domain, removing repetitive or unproductive work from the system and allowing individuals to undertake more challenging and engaging heuristic work.

2.3.5.3 Servant leadership

Servant leadership

Leadership that is focused on the explicit support of people in their roles.

Effective leadership is important for the achievement of objectives, regardless of the organizational structure. For instance, servant leadership is more effective than command-and-control leadership in intellectually challenging work that requires agility and high velocity.

Servant leadership is an approach to leadership and management based on the following assumptions:

- Managers should meet the needs of the organization first and foremost, not just the needs of their individual teams.

- Managers are there to support the people working for them by ensuring that they have the relevant resources and organizational support to accomplish their tasks.

Servant leadership can often be seen in flat, matrix, or product-focused organizations. However, this approach can be applied to any organizational structure. The servant style of leadership inspires individuals to collaborate with the leader to become more cohesive and productive.

2.3.6 Customer orientation: putting the customer first

The need for everyone involved in the provision and consumption of a service to act responsibly, consider the interests of others, and focus on the agreed service outcomes is critical to the success of a service relationship.

This can be called service empathy: a term which is often used in the relatively narrow context of user support and the related service interactions with the service provider's support agents. However, service empathy should be expanded to all aspects of the service relationship.

Service empathy

The ability to recognize, understand, predict, and project the interests, needs, intentions, and experience of another party, in order to establish, maintain, and improve the service relationship.

Organizations and individuals involved in service management need to demonstrate service empathy. However, this should not be confused with the ability to share the feelings of others. A service support agent is not expected to share the user's frustration but to recognize and understand it, express sympathy, and, vitally, adjust support actions accordingly.

Service empathy is one element of a service mindset. A service mindset includes shared principles that drive an organization's behaviour and define their attitude towards the relationships affected by a service.

Service mindset

An important component of the organizational culture that defines an organization's behaviour in service relationships. Service mindset includes the shared values and guiding principles adopted and followed by an organization.

A service mindset is an outlook that focuses on creating customer value, loyalty, and trust. An organization with this outlook aims to go beyond simply providing a product or service, it wants to create a positive impression on the customer. To do this, an organization has to understand and improve the customer's experience. For more on service mindset, refer to ITIL Drive Stakeholder Value.

From a service provider perspective, service mindset is also known as customer orientation. A customer oriented organization places customer satisfaction at the core of its business decisions.

Customer orientation

An approach to sales and customer relations in which staff focus on helping customers to meet their long-term needs and wants.

Management and employees align their individual and team objectives around satisfying and retaining customers. This is in contrast with a strategy where the needs and wants of the organization or its specific targets are valued over the requirements of the customer. Customer orientation has been studied comprehensively beyond the IT world. Essentially, it means observing the wishes and needs of the customer, anticipating them, and then acting accordingly.

Business relationship managers, service and support staff, and service owners are the roles that should be most aware of the customer's needs. Customer-oriented strategies should encompass a training component for all employees.

Insight into the customer's needs and the working practices of competitors can help to clarify customer orientation. In addition, a well-constructed customer survey can provide in-depth knowledge about how the organization has performed and how they may perform in the near future.

Organizations should consider the following when improving customer orientation:

- It is important to focus on value by considering customer needs and expectations, rather than focusing solely on formally stated requirements.
- Every customer is unique and has specific needs. These must be understood, prioritized, and communicated clearly to employees.
- The service, product, or maintenance process should be linked to the customer needs, which are based on a clear definition of the customer experience.

2.3.6.1 Customer experience

Adopting a customer-oriented strategy is key to success. Customer orientation puts the customer at the heart of every transaction. It shifts the organization's focus from the product to the customer, meaning the organization must have a thorough understanding of the customer's needs and expectations. Organizations must be able to deliver the strategy throughout the various stages of the service and customer lifecycle. From trainee to CEO, every employee in the organization must be completely committed to the strategy. Everyone has a part to play when it comes to customer service and retention.

The following steps can help an organization become customer oriented:

- **Create a value proposition (VP) that sells the organization and its services** This should be a simple statement of what is delivered to the customer and how it provides value. It should define, at a strategic level, the expected benefits the customer is being promised in return for their loyalty.
- **Map the customer and user experience journeys** This involves looking at the whole end-to-end experience of the service organization, as seen from the customer or user's perspective. Touchpoints (defined as any event where a service consumer or potential service consumer has an encounter with the service provider and/or its resources) need to be understood, defined, and tuned to meet the needs of the service consumer.
- **Recruit user-friendly individuals** Hire people for their attitudes and train them in the necessary skills. Empathy, good communication, and problem-solving abilities are very valuable.
- **Treat employees well** How your employees feel at work has a major impact on how they deal with customers.

- **Train individuals and teams** All parts of the organization should gain a full understanding of the customer, product, and industry they support. Formal training and on-the-job coaching must also focus on soft skills: communications, teamwork, positive influencing, writing, business understanding, and administration.
- **Lead by example** Senior managers must embrace the customer-service concept and meet with users and customers periodically. Companies with the best customer-oriented culture value servant leadership, where senior managers exist to provide guidance and direction, but employees are empowered to make decisions on their own.
- **Listen to the customer** An honest appraisal of progress from customers is critical. This can be achieved by conducting surveys, having direct meetings, and gathering customer comments. Feedback is vital and should use a broad set of inputs and channels. Balanced scorecards of metrics can measure performance across a range of customer experience elements to drive improvements (e.g. key business outcome delivery, customer satisfaction, net promoter score, SLA performance, and service availability).
- Em**power staff** Ensure that customer-facing teams have the authority to implement requests, make changes, or resolve common customer complaints without further escalation.
- **Avoid a silo mentality** Encourage different departments and functions to work closely together.
- **Design for humans** Effective design of collaboration and workflow requires each interaction to align to the needs of the agents involved. Such a design should account for the information needed by each party at each step of the task. The service designer needs to gain a good understanding of the experience of everyone involved.

2.3.7 Positive communication

There are areas where technology can achieve results that humans never could; routine and repetitive tasks, for example, can be delivered by machines. Nevertheless, most working projects, teams, initiatives, and organizations require productive and positive interactions between individuals to succeed. Human interaction and communication are where real people still stand apart, ahead of the machines.

The ability to communicate effectively is a key business skill and is fundamental to success within service management. Good human communication is about being effective, efficient, responsive, and professional.

Effective human communication is enhanced by establishing positive relationships that avoid unnecessary issues and stress, and it can form the basis for the successful delivery of services. In many cases, it requires a recognition of the intellectual and emotional needs of the people engaging in the communication. Service management, sales, and customer support roles depend upon building positive relationships which include trust, empathy, proximity, and shared goals.

Service management professionals require the ability to manage relationships with colleagues and team members to achieve business goals. They also need to be able to build and maintain effective and positive relationships with customers.

It is important to follow a project or service operation’s plans. Good communication ensures plans are followed and do not fail due to missed or mixed messages, inadequate information, or unclear and contradictory expectations.

Changes are inevitable in today's fast-moving world, and certain individuals can inspire and drive others to enable change to occur. People in this sort of role need to question issues and suggest improvements. They also need to be able to see a situation from different perspectives, and to react quickly to negate potential issues.

Good communication enables all this to happen and is good for business.

2.3.7.1 Communication principles

Individuals at work need to communicate regularly and effectively with others, which requires a rounded set of communication skills. Some people are naturally better communicators than others. Regardless, every stakeholder needs to achieve a basic level of competence and effectiveness in communicating.

Communication requires an acknowledgement of the perspective of others. Good communication requires people to be flexible enough to use appropriate content and tone to achieve the desired objective.

The fundamental principles required for good communication can be summarized as follows:

- **Communication is a two-way process** Successful communication is an exchange of information and ideas between two or more parties.
- **We are all communicating all the time** People convey messages about their mood, attitude, and emotional state through the use of language, tone of voice, body language, dress, and manners.
- **Timing and frequency matter** Successful communication needs to consider the best time to make contact.
- **There is no single method of communication that works for everyone** It is important to recognize and utilize different preferences and methods.
- **The message is in the medium** Choose a method of communication that is appropriate for the importance of the message that is being communicated. A minor point may be communicated via messaging or email.Big issues or questions require direct discussion and should not be carried out via email.

Understanding, recognizing, and implementing these principles is essential when building positive relationships with colleagues, customers, and stakeholders. Good communications help to get the job done, ensuring a pleasant and rewarding exchange for all concerned.

2.3.8 Challenges

Changing an existing culture, especially with people who are autocratic and not very collaborative, is challenging and requires bravery, commitment, and persistence. In addition, there is a need for ongoing and visible support from senior managers and leaders from across the organization. Transparency, for example, can often be mistrusted and misunderstood, particularly in environments where individuals, owing to previous bad experiences, feel uncomfortable about sharing information.

Managers need to lead by example to show that they are serious about the need to change and to be open and transparent, as well as to share ideas and information. In order to build trust, everyone needs to follow through on their promises. All ideas should be visibly reviewed, responses given within agreed timeframes, and the participants thanked and rewarded.

The chances of successfully developing a new culture can be improved by using tried and tested methods from the body of knowledge around organizational change management.

2.4 Summary

The service management domain is changing in fundamental ways. It is transitioning away from a mechanistic point of view to using highly empowered and self-organizing teams. Consequently, organizations are grappling with the integration of multiple ways of working.

Successful organizations think holistically about the four dimensions of service management (organizations and people, partners and suppliers, value streams and processes, and information and technology) when designing and operating products and services. They are able to create a culture of cooperation and collaboration, often breaking down silos and aligning or sharing goals across multiple teams. Such organizations are alert to employee morale and satisfaction, recognizing that internal stakeholders are as important as external ones.

3 Using information and technology to create, deliver, and support services

3.1 Integration and data sharing

Service design frequently relies upon integration between multiple systems, and in such cases it is important to understand the different levels at which integration may be modelled. For example:

- Application Applications are made to interact with each other.
- Enterprise Integrated applications are aligned to provide value.
- Business Existing business services are aligned.

A number of integration methodologies have evolved over time, each having specific goals which are important to the success of the integration. Selection of an integration methodology requires the consideration of multiple factors, including reliability, fault tolerance, cost, complexity, expected evolution, security, and observability.

Good integration enables and reinforces the processes which underpin the delivery of value. For integration to be effective, it must be based on a clear understanding of the stakeholders affected by the integration, and designed to support their work methods and needs.

The nature of integration varies. Some situations simply require a one-time hand-off from one system to another; for example, a one-time call to a control system to change a parameter. Others require an ongoing, two-way process of alignment between two systems; for example, where a support agent might collaborate with an external supplier's representative when each uses a separate ticketing system.

When data is passed from one system to another, it is important to ensure that compliance is maintained with regulatory obligations, such as privacy, security, and confidentiality.

3.1.1 Integration topologies

Integration design requires an understanding and consideration of the different topographical approaches to integrating multiple systems. There are two generally accepted topologies: point-to-point and publish–subscribe.

Point-to-point integration involves directly linking pairs of systems. This may be suitable for simple services with a small number of integrated systems. There are, however, drawbacks with this approach:

- The number of connections grows quickly in proportion to the number of integrated systems, requiring n(n – 1) integrations to be implemented. A bi-directional integration effectively counts as two separate integrations.
- The number of different integration protocols and methods may be high, which increases the complexity.

Publish–subscribe is an alternative topology in which messages are published by systems to an event broker, which forwards the message to the systems that have been designated as its recipients. This approach offers better scalability, and the looser coupling reduces the

complexity of implementation (the publishing system does not even need to be aware of the subscriber). Reliability, though, may be a challenge, particularly when the publisher is unaware that a subscriber has not received a message.

The broker architecture may be in the form of a bus, in which the transformation and routing is done by adapters local to each integrated system (or hub and spoke), where it is centralized. The bus model is not constrained by the limits of a single hub and as such is more scalable.

3.1.2 Integration approaches

Where a service implementation is dependent on multiple integrations, it is important to consider the delivery approach for those integrations.

Big bang	A 'big bang' approach involves the delivery of every integration at once. This has potential benefits for testing because the entire system is in place prior to a live roll-out. However, as with software development, integration projects delivered using this approach can become excessively large and complex, which can lead to issues with, for example, troubleshooting. As a result, the approach is suited to simple service implementations with fewer integrated systems and simpler, lower-risk integration.
Incremental delivery	Incremental delivery is a more Agile approach for the integration of multiple components in which new integrations are introduced separately in a pre-defined order. It reduces the scale of each individual delivery into production, thus enabling troubleshooting and resolution of post-deployment issues. This approach can be used in most circumstances. Nevertheless, because the overall service remains incomplete until each integration is in place, service testing may require extensive simulation to account for undelivered elements. There may also be a heavy regression test burden.
Direct integration with the (value) stream	Direct integration allows individual integrations to be deployed as soon as they are ready, in no predetermined order. This provides greater agility and enables rapid initial progress, as with incremental delivery. The approach may necessitate significant simulation to facilitate adequate testing. Global tests of the entire service, and even of the subsets of functional chains within it, can only be run late in the service implementation.

3.2 Reporting and advanced analytics

Advanced analytics is the autonomous or semi-autonomous examination of data or content using high-level techniques and tools. These go beyond traditional business intelligence to discover new or deep insights, make predictions, or generate recommendations.

Some advanced analytic techniques are:

- complex event processing
- data/text mining
- forecasting
- graph analysis
- machine learning
- multivariate statistics
- network and cluster analysis

- neural networks
- pattern matching
- semantic analysis
- sentiment analysis
- simulation
- visualization

Data science, predictive analytics, and big data are growing areas of interest among researchers and businesses.

In many organizations, there is a vast amount of raw data but very little useful information. Data on its own is useless; but information can provide answers. Information is data that has been transformed into meaningful insight, statistics, reports, forecasts, and recommendations. For example, daily sales figures per product/service sold and customers invoiced are data; sales trends, customer purchasing preferences by location, industry sector, and overall ranking of products/services by profitability are information.

In order to transform raw data into valuable information, it is important to follow a process. This process is known as data analytics.

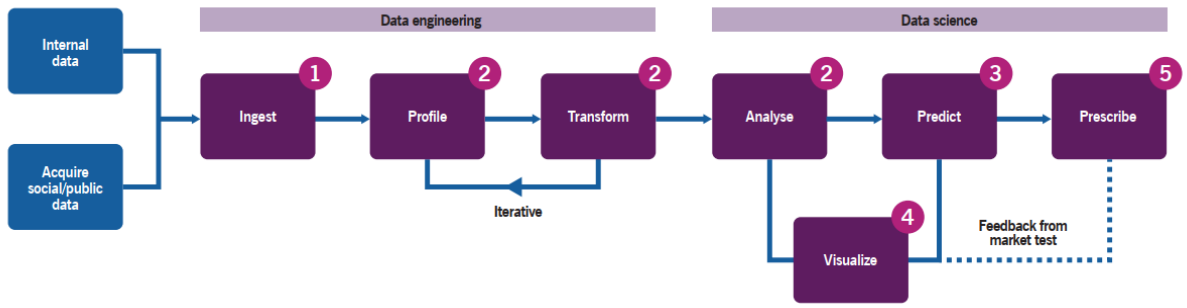
3.2.1 Data analytics

Data

Information that has been translated into a form that is efficient for movement or processing.

Data analytics is the method of examining data sets, often using specialized software, in order to draw conclusions about the information they contain. Data-analytics technology and techniques are widely used in industry. For example, they enable organizations to make informed business decisions and help scientists and researchers to verify or disprove scientific models, theories, and hypotheses.

In data analytics, there is a typical path that organizations follow in order to get the most from their data.



- **Data engineering** Data is processed using programming languages (e.g. Python, R, Java, SQL, or Hadoop) and made ready for analysis.
- **Data science** Data is analysed and insight gained by using tools such as R, Azure ML, or Power BI.

3.2.2 Big data

Big data is a term that describes large volumes of structured, semi-structured, and unstructured data. To extract meaningful information from big data requires processing power, analytics capabilities, and skill.

Analysis of data sets can discover correlations within the data. For example, it can unearth business trends, pinpoint health issues, and prevent fraud. Scientists, business executives, doctors, and governments often find large data sets overwhelming, but big data can help to create new knowledge once field experts have brought their expertise to the process.

The cost of running their own big data servers has encouraged many system administrators to seek more scalable, cost-effective solutions. However, it has been found that the cloud can be used for storage and processing of big data. Cloud storage involves digital data being stored in logical pools. The physical storage spans multiple servers, and the physical environment is typically owned and managed by a hosting company.

These cloud storage providers are responsible for ensuring the data is available and accessible and that the physical environment is protected and operational (see the infrastructure and platform management practice guide for more information).

The more complex the data, the bigger the challenge of finding value within it. Understanding and assessing the complexity of data is important when deciding whether a particular solution is appropriate and for mapping out the best approach.

The following criteria can be used to assess the complexity of an organization’s data:

- Data size Gigabytes, terabytes, petabytes or exabytes. Volume is not the only consideration, as data should also be organized into thousands or millions of rows, columns, and other dimensions.
- Data structure Data relating to the same subject but from different sources may be provided in different structures.
- Data type Structured data, like the entries in a customer order database, may vary by alphabetical, numerical, or other data type. Unstructured data can exist in many forms, including freeform text, conversations on social media, graphics, and video and audio recordings.

Query language Database systems use query languages for requesting data from the database.

- Data sources The greater the number of data sources, the higher the probability of differences in internal data structures and formats. Occasionally, data may be submitted with no specific format. Data from different sources must be harmonized to in order to be accurately compared.
- Data growth rate The data may increase in volume and variety over time.
- There are four steps to generating useful dashboards and reports:
- Connection to the various data sources Data may be stored in different databases, in a data centre, in the cloud, etc. A connection must be made to the platform used to store the data.
- Data extraction, transformation, and loading (ETL) The goal is to create one storage

space complete with the compatible and valid version of the data from each data source.

- Querying the centralized data User queries must be performed rapidly and efficiently.
- Data visualization The results of the queries run on the ETL data from the different data sources are displayed in a format that users can consume according to their needs and preferences.

3.3 Collaboration and workflow

3.3.1 Collaboration

The ever-increasing adoption of an Agile approach to managing work, particularly within software development, has triggered a related uptake in the use of tools and methods that support it.

Tool or method	Explanation
Making work visible	The use of physical boards and maps, colour, and graphics to visualize the work on hand, display how the team plans to handle it, and plot and record its journey through the workstream. Although many IT work management systems contain large quantities of data, very little can be easily viewed or consumed. Bottlenecks may not be noticed until it is too late to resolve them. Work or issues that are hidden from view may be delayed or left unresolved either because no one is aware of them, they fall outside allotted areas of responsibility, or few individuals possess the knowledge or have the availability to fix them.
Working in topic-based forums	Although email still predominates in the workplace for the management of work, its characteristics of personal folders, duplicated messages, and lost attachments hidden within vast, nested email chains mean time is frequently wasted in the search for important information. Good collaboration tools utilize a forum approach, where individuals and teams can take part in direct discussion. They facilitate topic-based areas, mini projects and campaigns, etc., which are available only to the individuals involved in the discussion. This helps to improve efficiency and avoids wasting time by searching for documents.
Mapping workflows	Teams and projects utilize a model in which their work is presented and used in a visible format. Work packages, timescales, people, and outputs are shown as tangible and easily accessible elements. The work is made available for others in the organization to see. This transparency can lead to greater communication and collaboration across teams, averting a common challenge within big organizations. Issues and problems do not follow the typical reporting lines of organizations, so there is a constant need to improve collaboration by checking for gaps, omissions, or potential blockages that can go unnoticed between or across teams.
Working in small teams and sprints	This is a key element in Agile and DevOps, where small integrated teams work on discrete packages of work as end-to-end value streams. Tools and cross-team methods should dynamically reflect the nature of these teams, which are often in operation for a finite period of time as part of a matrix resourcing model or due to flexible ways of managing issues, such as swarming. The relevant teams may only require light documentation, approval processes, and stages in order to achieve their goals.
Using simple feedback mechanisms	Communication does not need to be overly formal or complicated. In fact, there is usually a greater chance that the communication will be noticed, read, and actioned if it is simple and easy to comprehend. The collection of customer and employee feedback should be instantaneous and intuitive.
Collaboration and ‘social media’ features	Certain social media features are being adopted by work-based tools. Many individuals are already used to features such as ‘like’, ‘retweet’, or ‘share’, and these can be used in the work environment to provide useful data. Furthermore, emojis can also be used to represent feedback responses.

3.3.2 Tools and capabilities

Many of the tools used for collaboration are designed to resemble interfaces that the user is familiar with from social media, including:

- Communications wall A feature of many social media platforms, particularly those dedicated to communication. A wall can be used as a central area for general communication.
- Topic-based forums and folders These can relate to specific topics with relevance to a varying number of users, from a single specialist up to a large team or topic-based area, projects, operational areas, lifecycle areas, or special interest groups.
- Event surveys Support software usually provides the capability to gather instantaneous customer feedback via a survey. The response to these is often low, although it can be improved through thoughtful survey design that emphasizes brevity and simplicity.
- Portals Actionable portals for requesting services or reporting issues are becoming more prevalent, reducing the inefficient use of email. Good design and user experience is important for successful adoption.
- Self-help Knowledge bases that provide solutions directly to the user can be useful for simple and low-risk issues.
- Social media functions Collaboration tools that provide simple and effective means for users to respond and provide feedback.

3.3.3 Workflow in IT and service management tools

A recent development and improvement in many IT and service management tools is the capability to build, map, and manage process workflows dynamically within the products. This is frequently delivered via a lockeddown development interface, whereby changes to workflow elements can be made without the need for scripts or coding, meaning they can be delivered by less-technical frontline individuals.

The interfaces for these administration tools are usually designed in familiar process-mapping formats with swim lanes and action boxes, decision points, parallel streams, and dependencies. These support collaboration, because they reduce lead times for changes as well as presenting the workflows in simple graphical formats.

3.4 Robotic process automation

Robotic process automation (RPA) is a potential way for organizations to streamline business operations, lower staffing costs, and reduce errors. Through the use of software robots (bots), repetitive and mundane tasks can be automated, allowing resources to be deployed on higher-value activities elsewhere.

Robots can be used to simulate activities that humans perform via screens or applications in order to capture, interpret, and process transactions. This can trigger responses, creating and manipulating data in a consistent and predictable way.

Robots are typically low cost and easy to implement. They do not require the redevelopment of existing systems or involve complex integration within existing systems. The potential benefits are clear, as RPA allows for consistent, reliable, and predictable processes to be implemented in a cost-efficient way. This consistency can lead to fewer errors in key

processes, increases in revenue, and better customer service, which leads to greater customer retention.

3.4.1 Where is RPA used?

The types of process where RPA can yield the most benefit tend to be high volume, error prone, and sensitive to faults. Processes that are rules-based and which do not require complex decision-making are open to this kind of automation.

More sophisticated RPA tools incorporate machine learning and artificial intelligence (AI). These tools replace a rote-based approach for one that can adapt and react to a variety of inputs.

Deploying robots can seem deceptively simple, but RPA can be fragile. Even simple changes to the applications that RPA interacts with can have unexpected consequences. A small amendment may appear simple to a human, but an RPA may not tolerate it. If a change causes failure, it may affect performance or corrupt the data.

The design and development of RPA plays a part in how robust it is when dealing with change. Nonetheless, there are limits. The development of RPA often requires configuration and scripts to define the required inputs and outputs. Although these scripts are straightforward to construct, requiring little in the way of technical expertise, they should be treated as software assets and managed similarly. Testing, configuration management, and change management apply as much to RPA as they do to any other software.

3.4.2 RPA technologies

Generally, there are three types of RPA technology:

- Process automation This focuses on automating tasks that depend on structured data (e.g. spreadsheets).
- Enhanced and intelligent process automation This works with unstructured data (e.g. email and documents). This type of automation can learn from experience and applies the knowledge it gathers to other situations.
- Cognitive platforms These understand customers' queries and can perform tasks which previously required human intervention.

Enterprises are beginning to employ RPA, together with cognitive technologies, such as speech recognition, natural language processing, and machine learning, to automate perception-based and judgement-based tasks that were traditionally assigned to humans. The integration of cognitive technologies and RPA is extending automation to new areas, which can help organizations to become more efficient and Agile as they adopt digital transformation.

RPA software and hardware automates repetitive, rules-based processes that were usually performed by humans sitting in front of a computer. Robots can open email attachments, complete forms, record data, and perform other tasks to mimic human action. They can be viewed as a virtual workforce assigned to middle- and back-office processing centres.

The integration of cognitive technologies with RPA makes it possible to extend automation to processes that require perception or judgement. The addition of natural language

processing, chat-bot technology, speech recognition, and computer-vision technology allows robots to extract and structure information from speech, text, or images and pass it to the next step of the process.

There are several benefits of a successful RPA programme, including:

- Lower labour cost After the robots are deployed, the only costs are related to servicing and maintaining the software.
- Increased throughput As robots can do manual tasks hundreds of times faster than a human, including developing, testing, and deployment of software, the time to market for new products can be reduced, which speeds up return on investment (ROI). Robots are also constantly available throughout the year.
- Increased accuracy Robots are able to achieve near-perfect accuracy, which increases excellence throughout the value streams, value chain, and SVS. This provides a more consistent experience with a standard level of output, deeper insights into business/IT performance and customer experience, and a reduction in the level of human error.

3.4.3 RPA considerations

The implications of application and environment change on RPA should not be underestimated. Without strategic thinking, governance, control, and judicious application to support an overall strategy, RPA risks becoming the legacy application of the future.

RPA implementation should be approached with the same caution as would any service or tool. It needs proper planning, analysis, design, and governance processes, including the following considerations:

- Garbage in, garbage out The use of robots to run key processes is a challenge if there are no standard processes to follow.
- ITIL guiding principles For example, optimize and automate and keep it simple and practical. Identify areas which have the most potential for automation and prioritize automation accordingly.
- Develop the right skills in the right people For example, how to arrange and use RPA efficiently and effectively.
- Determine realistic ROI expectations Design a sound business case and explain costs, risks, and benefits to the board of directors.
- Enable strong collaboration between the business and IT Special consideration should be given to RPA project owners and IT, as neither business area can work independently.
- Execute automation Treat automation as a roadmap with short iterations.

3.5 Artificial intelligence

Cognitive technology is increasingly being used to provide more automation in each phase of the service lifecycle and to enhance the service experience for both the consumers and the people involved in serving them.

It is also increasingly prevalent in related and supporting domains, such as software development and operations.

While AI technologies have existed for decades, a new generation of cloud-based tools has resulted in a significant increase in focus and usage. A number of AI tools are now provided as public cloud services, with a range of options available from both specialist AI providers and major broad-offering cloud vendors. This has significantly improved the accessibility of AI tools, with solutions which might previously have required complex technology and significant financial outlay now available on demand at comparatively low cost via simple API (application processing interface) calls.

There is a huge amount of marketing hype and misapprehension in this area, so it is vital to have a clear understanding of the business goals and desired outcomes from adopting AI and the key components, capabilities, and constraints of any potential solution.

3.5.1 Architectural considerations

The implementation of AI technology tends to require significant investment in hardware, software, and expertise. In the past, expense and complexity limited its uptake, but it has become much more mainstream since the emergence of a new generation of cloud-based services.

AI technology is increasingly available from major vendors, consumed as public cloud services, and all major cloud service providers (CSPs) now offer a range of services to address many different priorities or ‘use cases’.

These services place leading AI offerings at the end of API calls, and hence many organizations are now consuming them to underpin the digital services they deliver to their users.

Additionally, some service management tool vendors now provide AI-driven features as part of their offering, such as conversational tools for end-users and support agents, automated classification or routing, and language tools, such as translation and sentiment analysis.

One benefit of these services is that they are typically designed and configured specifically for service management use cases. This can enable them to deliver more immediate value than a generalized AI tool, which may require additional work to align to the required use cases. The services may either be underpinned by the vendor’s own AI software or harness the technology of specialist AI vendors.

However, an on-site AI implementation may still have significant advantages. AI requires a significant amount of computing power and processing time to function. This may lead to high charges from public cloud vendors who bill on this basis. Hence, particularly at scale or over time, it may be more economical to use dedicated on-site hardware. Indeed, a number of vendors now provide servers and software dedicated to AI.

It is also important to consider portability and the risk of vendor lock-in. If your digital service is dependent on specific AI services provided by a third party, it may be challenging in future to switch to a different provider.

3.5.2 Applications and value

AI technology offers a broad set of new tools to the service designer, and it is possible to anticipate many new innovations in the application of AI in service management. Some examples of common applications of AI in service design and delivery include:

- Process and decision automation The use of AI to determine the appropriate process

branch to follow, based on analysis of the known facts.

- Natural language processing Interpretation of unstructured text for purposes such as translation, summarization, or sentiment analysis.
- Conversational interfaces Enabling customers or service agents to interact with the service-management tooling using normal written or spoken language. A common example being chatbots for automated self-service.
- Predictive analysis Projection of the future state of a metric or situation, enabling proactive decision-making.
- Discovery Identification of useful insights from large collections of information, such as log files, knowledge bases, or previously recorded tickets.

3.5.3 The growth of AIOps

Another emerging technology that will change the way IT services are managed in the future is AIOps and the emergence of AIOps platforms. These platforms were first described by Gartner in 2016,4 referring to the practice of combining big data, analytics, and machine learning in the field of IT operations. The term AIOps was originally derived from Algorithmic IT Operations, although it is frequently synonymously assumed to mean artificial intelligence for IT operations, which, conveniently, is a clearer description of the subject.

Instead of siloed teams monitoring their own parts of the infrastructure, the idea is to collect all the important monitoring data in one place and then use machine learning to identify patterns and detect abnormalities. This can help IT operations to identify and resolve high-severity incidents faster and even help them to detect potential problems before they happen. It can also be used to automate routine tasks so that IT operation teams can focus on more strategic work.

AIOps aims to bring AI to IT operations, addressing the challenges posed by modern trends in the ongoing evolution of infrastructure, such as the growth of software-defined systems. The implications of these new technologies, such as the increase in the rate at which infrastructure is reconfigured and reshaped, necessitates more automated and dynamic management technologies, which may have a significant impact on an organization’s digital services.

AIOps harnesses data platforms and machine learning, collecting observational data (e.g. events, log files, operating metrics) and engagement data (e.g. customer request and service desk tickets), and drawing insights by applying cognitive or algorithmic processing to it.

These insights may be used to drive some or all of a range of common outputs, such as:

- Issue detection and prediction Helping the service organization to respond more quickly to incidents.
- Proactive system maintenance and tuning Reducing human effort and potential errors.
- Threshold analysis Enabling a more accurate picture of the normal range of operation of a system.

Some organizations have also started to use AIOps beyond IT operations to provide business managers with real-time insights of the impact of IT on business. This keeps them informed and enables them to make decisions based on real-time, relevant data.

3.6 Machine learning

Machine learning is an applied form of AI. It is based on the principle of systems responding to data, and, as they are continually exposed to more of it, adapting their actions and outputs accordingly. Where machine learning is used to underpin services, this essentially means that it becomes the basis for decision-making in place of paths which are defined by instructions created by human service designers.

As the complexity of a task increases, it becomes harder to map machine learning to that task. Machine learning is typically best suited to solving specific problems. For example, it can be used effectively to make decisions about data classification on support records, which may subsequently drive additional decisions, such as assignment routing.

3.6.1 Supervised and unsupervised learning

Supervised learning is the most commonly encountered machine-learning approach. It is used where both the starting points (inputs) and expected ending points (outputs) are well defined. Supervised learning can be represented as a simple equation:

$Y = f(X)$

In this equation, X represents inputs, and Y outputs. The job of the machine is to learn how to turn X into Y, effectively building the function defined here by f.

As part of this learning process, a supervisor needs to determine:

- the learning algorithm to be used
- the sample data set used to train the machine. In the context of an IT service this may, for example, be rows of structured data from the system of record (e.g. an IT and service management toolset), each of which covers a ‘known good’ previous decision regarding the outputs made by a human, based on a range of inputs.

A supervised-learning system may initially use existing data to train a system. When the results which the system produces have reached a required level of accuracy, the system is considered adequately trained. Any required manual corrections are then made, and ongoing training can continue to improve the reliability of the outputs, reducing the need for continual supervision.

Supervised learning is well-suited to both classification problems (e.g. identifying emails that are spam) and regression problems (e.g. analysing when a variable metric is likely to reach a specific threshold).

Unsupervised learning also requires input data, but this approach does not use existing output data from previous decisions and there is no supervisor. Instead, the machine learns from the input data alone.

Unsupervised learning is well-suited to ‘clustering analysis’ (the identification of inherent groupings in data) and ‘dynamic baselining’, which is the prediction of future behaviours of a metric based on its past behaviour. In the context of a digital service, unsupervised learning may, for example, be able to detect previously unknown correlations between causes and effects, such as a likelihood that failure Y will occur when failure X occurs.

3.6.2 Benefits and limitations of machine learning

One of the key advantages of machine learning, in the context of IT services, is its ability to derive valuable results from quantities of data (in terms of breadth, depth, frequency of update, or a combination of the three) which would be difficult for humans to process. This can enable improvements in the efficiency or accuracy of decision-making and may enable the automation of entirely new data-driven decisions, which would not have been practical for humans to evaluate (for example, because of the number of data points being too high).

However, the performance of a machine-learning system is entirely dependent on its data, the algorithms used within it, and, for supervised systems, the quality of training. If the input data contains inherent bias, this can directly distort results. This issue has led to some high-profile media coverage, such as when machine-learning systems have exposed and propagated racial bias in source data.

Selecting and implementing the correct algorithm is important and requires a good knowledge of data-science principles and the nature of the data set itself, including such aspects as its outliers. Training a supervised system requires the supervisor to have a clear understanding of which results are actually correct.

Another significant challenge faced by machine-learning systems is the potential for a lack of transparency in the processing of data. In contrast to deterministic algorithmic systems, where the behaviours are defined by humans and can be investigated, the behaviours of a machine-learning system may be difficult to account for, particularly where there are many input parameters.

Deep learning is a subset of machine learning based on artificial neural networks. This learning can be supervised, semi-supervised, or unsupervised, and it relies on computing systems modelled on the biological neural networks found in animal brains. These systems learn by considering examples, gradually tuning the weighting factors driving their processing in each instance.

3.7 Continuous integration, continuous delivery, and continuous deployment

Continuous integration, continuous delivery, and continuous deployment (CI/CD) are descriptive terms for a collection of practices primarily associated with software engineering, which are central to the philosophy of Lean and Agile software development. The adoption of these practices has grown rapidly, and it is important to understand the defining characteristics of CI/CD and the wider context of evolving system development practices when implementing services that are underpinned by software development.

- ***Continuous integration*** An approach to integrating, building, and testing code within the software development environment.
- ***Continuous delivery*** An approach to software development in which software can be released to production at any time. Frequent deployments are possible, but deployment decisions are taken case by case, usually because organizations prefer a slower rate of deployment.
- ***Continuous deployment*** An approach to software development in which changes go through the pipeline and are automatically put into the production environment, enabling multiple production deployments per day. Continuous deployment relies on continuous delivery.

These approaches are supported by the software development and management, service validation and testing, deployment management, infrastructure and platform management, and release management practices. These practices involve specific skills, processes, procedures, automation tools, and agreements with third parties.

They enable the continuous pipeline for integration, delivery, and deployment, which would also affect the design of other practices, such as service configuration management, monitoring and event management, incident management, and others.

CI/CD is, effectively, a practical methodology for delivering software in an Agile manner, consistent with the set of principles defined in the Agile Manifesto:

- Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
- Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
- Business people and developers must work together daily throughout the project.
- Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
- Working software is the primary measure of progress.
- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
- Continuous attention to technical excellence and good design enhances agility.
- Simplicity – the art of maximizing the amount of work not done – is essential.
- The best architectures, requirements, and designs emerge from self-organizing teams.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly.

CI/CD, and the broader principles followed by the Agile movement, are commonly regarded as being the complete opposite of the waterfall approach to service development, which defines the process of system development/implementation as a linear series of phases, with each phase only commenced once the previous step has been completed.

CI/CD is sometimes conflated or confused with DevOps, but this is a simplistic viewpoint. While the establishment of CI/CD is inherent to its adoption, DevOps has a much broader context, encompassing team organization and culture in addition to any specific mechanics for system delivery.

3.7.1 Goals and value measurements

CI/CD has a primary goal of enabling smaller, high-frequency deployments of changes to systems. This is intended to reduce risk (by making each deployment less complex) while simultaneously increasing the velocity of value co-creation (by enabling useful changes to be delivered more quickly to consumers). Small changes are easier to comprehend, consume, test, troubleshoot and (where necessary) roll back.

The Agile movement is founded on a rejection of large, complex projects that have extensive payloads delivered on an infrequent basis. Such projects are seen as ineffective, primarily because:

- the complexity of large production deployments increases the risk of introducing new issues and makes troubleshooting more difficult
- long periods between releases reduce the opportunity to deliver value quickly. This leads to opportunity costs and reduces an organization's ability to adapt its services to new, emergent conditions
- linear development frameworks reduce the opportunity to interact on a regular basis with consumers, increasing the chances that a solution will be delivered that is sub-optimal for the consumer's needs.

CI/CD teams often define their success on their ability to deliver code changes to production systems quickly, efficiently, and reliably. When designing services which are underpinned by the work of software developers practicing CI/CD, it is important to be aware of these goals.

A fundamental part of CI/CD is the optimization of the flow of changes from development to production. CI/CD teams also typically have a strong focus on the identification and removal of bottlenecks that reduce the speed of delivery. This often results in a strong focus on automating aspects of delivery which would otherwise require significant manual effort.

While maintaining a high velocity of deployments is important to CI/CD, teams must also ensure that each change maintains an appropriate level of quality. Validation and testing of each change remain critical, but because they need to be completed quickly, these processes are often automated.

3.7.2 The CI/CD pipeline

A key component of the implementation of CI/CD is the pipeline. This term defines the set of tools, integrations, practices, and guardrails which allow a continuous and substantially automated flow of changes, from their initial design and development through to deployment into production.

This flow is typically broken up into three different stages:

- Build automation (the CI phase) This stage encompasses coding practices, such as version control, and the merging of multiple developers' changes into one branch.
- Test automation In this stage, each change is automatically tested and validated as part of the flow chain from development.
- Deployment automation This stage involves the automation of the actual process of moving code from pre-production environments to the production service.

A significant focus for organizations or teams implementing CI/CD is the reduction of pieces of work requiring manual effort. (If left unchanged, these would impede the flow of the CI/CD pipeline without delivering a proportional amount of specific value.) This kind of work is sometimes referred to as 'toil'. Google's Site

Reliability Engineering5 defines toil as work which exhibits some or all of a set of certain characteristics:

- Manual Work which requires hands-on time from humans.
- Repetitive Work in which the same tasks are repeated over and over again.

- Automatable Work which does not require specific human judgement and so could be achieved by a machine instead.
- Tactical Work which is interrupt-driven and reactive rather than strategy-driven and proactive.
- Devoid of enduring value Work which does not make any permanent improvement in the service, leaving it in the same state after the task has finished.
- Linearly scaling Work which scales up in proportion to the service size, traffic volume, or user count.

When designing and implementing a service which relies on the effective operation of CI/CD practices, it is important to either eliminate or avoid toil. Failing to do so can limit the scalability of the service, and unnecessarily increase the cost of delivering it, particularly as the service grows.

3.7.3 Aligning CI/CD with ITIL

The core aspects of Agile software development and, by extension, CI/CD, are closely aligned with each of the ITIL guiding principles:

- Focus on value Agile development is intended to deliver early and continuous value to the customer.
- Start where you are Agile is built on the concept of continuous, incremental development rather than large releases after lengthy development cycles.
- Progress iteratively with feedback Agile advocates continuous feedback loops.
- Collaborate and promote visibility Good Agile product delivery requires effective visualization of work to all delivery participants, as well as constant interaction with the consumer of the delivered service.
- Think and work holistically Agile development focuses on the big picture of the business and the goals the consumer expects to achieve.
- Keep it simple and practical Agile development is founded on Lean principles. As such, non-productive, low-value activities are regarded as waste and are eliminated.
- Optimize and automate Continuous feedback loops and reduction of toil are fundamental to good Agile practices.

When working with CI/CD processes and the teams responsible for them, individuals and teams should actively seek opportunities to enhance their success.

For instance, rather than starting with the presumption that changes progressing through the CI/CD pipeline need to be controlled, it could be worth considering whether there might be better ways to enable those changes.

Some examples of how this might be achieved could include:

- Taking work away from the development teams and centralizing it in the change function in a way which reduces overall toil (e.g. if development is taking place in a regulated environment, are there checkpoint tasks currently undertaken by developers which could be centralized in the change team?)
- Bringing broader business context to risk assessment, helping to better quantify the risk of specific changes, and, ideally, to find changes that are lower risk and that may have a smoother path though the CI/CD pipeline.
- Relaxing pre-defined controls in favour of ‘guardrails’, thereby allowing individual teams more flexibility to innovate and establish their own change procedures, while still maintaining confidence in the overall safety of the CI/CD process.

3.7.4 CI/CD does not suit every situation

Agile approaches, such as CI/CD, are well suited to situations where there is a high uncertainty about present and future requirements for a service, and where risks associated with errors or failure are of relatively low impact or can be managed quickly. In these cases, the iterative nature of CI/CD enables the ongoing development of the service to respond to, and drive, an increasing understanding of the customer's demands and the best way to deliver value to them.

However, plan-based approaches, such as the waterfall method, may still be more suitable in some situations; for example, where there is a high certainty about the requirements of the service, or where safety demands the use of large-batch deployments which are not well suited to the Agile approach. In practice, particularly in larger and more complex organizations, a service will often depend on multiple elements which are delivered using different approaches.

3.8 The value of an effective information model

As digital transformation progresses, the organizations' business operations continually become more closely aligned with, and dependent on, their technology systems and services. As this happens, information can increasingly become a constraint on the effective delivery of services. Several factors can contribute to this issue:

- The organization may distribute information inconsistently and sporadically across multiple IT systems and beyond (some, for instance, may be kept in physical media, while other critical data and knowledge may only exist in people's heads).
- The quality of the information may be overestimated or unclear.
- Multiple systems, increasingly running on multiple infrastructure types, may be critical to the operation of the organization's services, but exactly how critical they are may not be clear.
- Inconsistent terminology may be used across different parts of the organization.

To combat this type of challenge, organizations are increasingly using an information model with the aim of developing a shared understanding of their information, terminology, systems, and structure.

The value of such a model is multifaceted. It can be a key enablement tool for transforming processes and practices, integrating technologies, gaining an accurate overview of strengths and weaknesses in the service framework, and driving informed decisions at multiple levels in the organization.

Successful results-based measurement requires a clear understanding of the expected outcomes and results, not only for individual systems but for the organization as a whole. Goals must therefore be aligned with those of the organization. They must be agreed, understood, and documented; as must the methods by which their achievement will be measured. Results-based measurements also provide information on the effectiveness and efficiency of the services.

3.8.1 Anatomy of an information model

There is no single definition of an information model, but an effective one will typically consist of several core elements including:

- definitions of key facts, terminology, activities, and practices within the organization
- structural representations of key components of the organization' s technology and business services, and the relationships between them.

The ideal level of detail held within a model will vary, not just between organizations but within them. Areas of business which are undergoing more rapid change or more significant investment, for example, will warrant more detail in an information model than areas which are relatively static.

While some organizations may choose to create an information model from scratch, others may decide to adopt (at least initially) one of a number of established models that focus on technology operations in large organizations.

Two examples of this are:

- Common Information Model (managed by DMTF) A set of open standards setting out a common (and growing) definition of management information across a wide range of IT infrastructure, including modern cloud and virtualization technologies.
- Frameworx A set of 'best practices and standards that, when adopted, enable a service-oriented, highly automated, and efficient approach to business operations'. Particularly focused on telecommunications and managed by TM Forum, it is a widely used framework in that industry.

3.9 Automation of service management

3.9.1 Integrated service management toolsets

Some vendors have been offering integrated toolsets for service management since the 1990s. These toolsets automate records and workflow management and act as engagement and communication tools, with many aiming to support a holistic information model for service management. The majority of these toolsets are designed to automate the service management practices recommended by ITIL, and they are constantly evolving to adopt new technologies.

The most-used functionalities of these toolsets are the systems of record and systems of engagement. These are used to raise, classify, prioritize, escalate, and resolve issues, requests, and changes for items and areas of business and technology infrastructure (including people, IT, departments, services, and functional areas).This includes real-time management of expectations for delivery and fulfilment, approval, escalation, and consumption, as well as other administrative functions around inventory, finance, and lifecycle management.

The value of these toolsets is in the real-time dynamic ability to manage volumes of work, which range from small and simple to complex and large, and to provide reporting and business analytics on performance, trends, improvements, costs, and risks. In addition, the toolsets offer accountability and audit trails on the delivery of work and management of 'service' assets and resources.

Organizations of various size and reputation use these toolsets in some form or another to optimize routine record keeping and demonstrate some levels of accountability, consistency, and control. However, most organizations have only made use of the basic functions in the toolsets (incident management, SLM, inventory management) and ignored the opportunities for multi-functional integration across processes. As such, the opportunity of end-to-end value stream integration that the toolsets provide has rarely been exploited. However, as new challenges and opportunities arise, there is a greater requirement to make use of this functionality and integration.

3.9.2 Service management toolset expectations

Service management toolsets are expected to provide:

- effective automation of workflows, including:
  - combining standardized pre-defined models and flexibility to allow for customization
  - seamless integration of workflows between different practices, value chain activities, and organizations to enable end-to-end value stream management
  - end-to-end automation of product and service lifecycles, covering all stages
- effective inventory, monitoring, and event management, including intelligent discovery, change and event detection, capacity monitoring, consumption, and transactions monitoring for technology solutions used both in-house and by third parties
- effective integration with:
  - other organizations' toolsets
  - other information systems used in the organization
  - other information systems used for service management
  - social networks and communication channels used by the organization and its service consumers, suppliers, and partners
  - a high level of service warranty, including:
    - information security
    - availability
    - performance
    - capacity
    - compliance
    - continuity
    - accessibility
  - conformance to evolving architectural and technical requirements and standards
  - advanced analytics and reporting.

3.10 Summary

In this age of consumer and enterprise automation, investments in IT are critical for the delivery of valuable products and services. The technology landscape is changing rapidly and diversifying into niche domains.

To help navigate this complex ecosystem, organizations are now actively investing in tools to: facilitate the flow of work across multiple functional domains; promote collaboration; aid in advanced analytics and decision making; and progress the automation of repetitive low-skilled work. This in turn frees organizations to invest in advanced service management capabilities that add value to diverse stakeholders.

The use of multiple tools and platforms drives the need for a common information and data model across the organization, as well as the need for effective integration.

4 Value streams to create, deliver, and support service

This chapter provides guidance on how to:

- document a value stream to understand how work flows across the organization
- understand an archetype value stream to create a new service
- understand an archetype value stream to support a live service.

This chapter will help practitioners understand:

- the role of a value stream in the SVS
- the taxonomy of a value stream
- how to describe the steps in a value stream
- how to apply common mathematical modelling techniques to streamline a value stream
- considerations when designing a value stream.

It is crucial that practitioners understand that value streams are simple, but not necessarily simplistic, representations of work. There are many different value streams, because various types of work follow different routes. They can either represent a design or ideal pattern of activity or reflect the actual, observable patterns of activity. The same resources, such as individuals, tools, suppliers, or processes, can appear in different parts of the value stream; for example, a support agent can be part of user engagement, support investigation, and the deployment of a fix to restore service.

4.1 ITIL service value streams

The ITIL service value chain includes six archetypal activities: engage, plan, improve, design and transition, obtain/build, and deliver and support. A useful way of thinking about value streams is as visualizations of journeys through the activities in the service value chain for specific scenarios or types of demand. For example:

- Different types of incident may require different value streams to describe the work required in each case, such as:
- end-user hardware incidents
- major incidents
- cybersecurity incidents.
- Different types of consumer demand may require different value streams, such as:
- a need for a new product or service feature to increase the efficiency of business operations
- a request for a team member to access a product or service
- a request for new infrastructure capacity to keep a product or service operating normally.

4.1.1 Structure of an ITIL service value stream

ITIL service value chain

An operating model for service providers that covers all the key activities required to effectively manage products and services.

s already mentioned, the ITIL service value chain is made up of six archetypal value chain activities. A sequence of these activities is referred to as an ITIL service value stream or, more simply, as a value stream. A value chain can:

- mention one, some, or all value chain activities, depending on the context
- repeat value chain activities, depending on the work in progress.

A value stream is made up of one or more steps. A step comprises one or more actions that accomplish a specific objective. These actions may occur sequentially or in parallel, and they may either be connected to other actions or independent of each other. An action itself can comprise one or more tasks, which may also be either connected or independent.

Value stream

A series of steps an organization undertakes to create and deliver products and services to consumers.

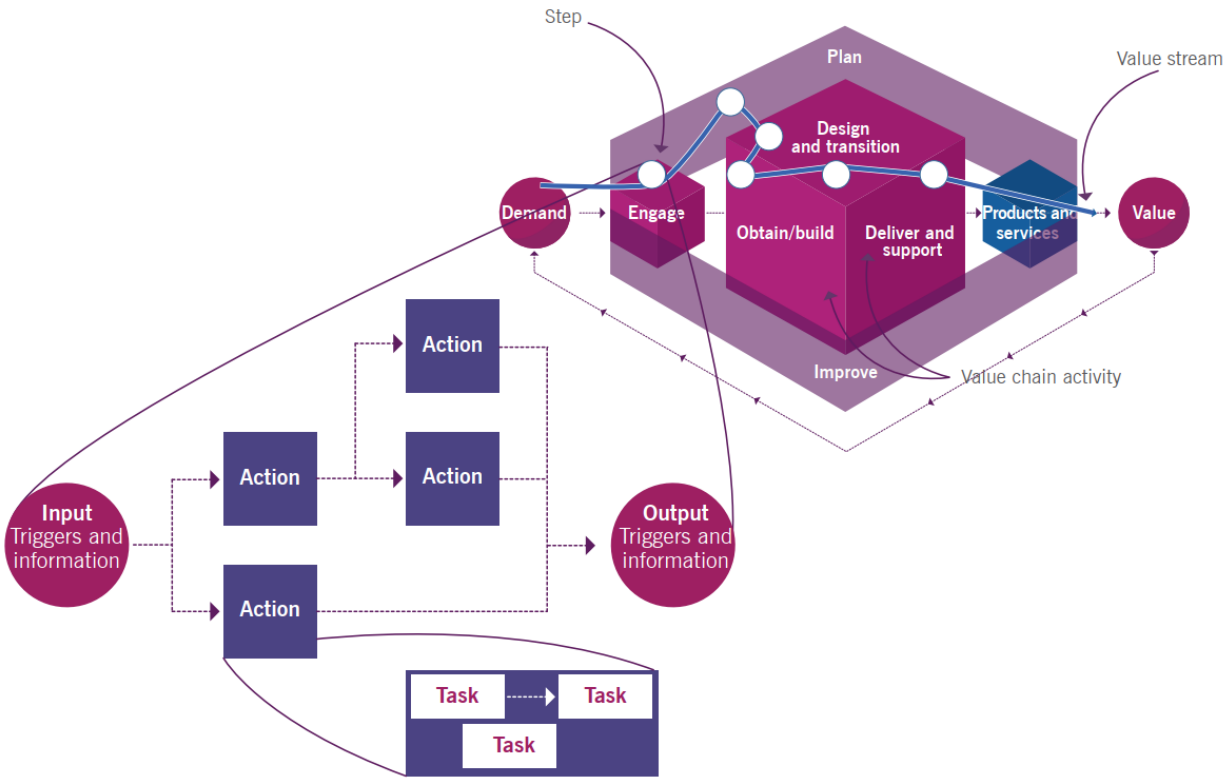
Through the value stream model, the organization processes units of work, which may change depending on the context and the level of granularity. For example, when implementing a value stream to create a new service that is triggered by a consumer request:

- At the value stream level, the unit of work can be defined as the consumer request that needs to be fulfilled, which may change to the service portfolio item that is being created during the flow of activities in the value stream.
- At the step level, the unit of work can be defined as the requirements that need to be assessed, which may change to the design characteristics defined in the service design package during the implementation of the value stream.

Figure 4.1 shows the relationship between value chain activities, the value stream, the steps in a value stream, the actions within a step, and the tasks within an action.

A value stream is initiated by demand; for example:

- an incident generated by a monitoring tool
- a request submitted by a user.



A value stream ends in the creation or restoration of value through functioning products or services. Value streams use information provided by:

- one or more stakeholders (external to the organization performing the step or action) as inputs; for example, a server name or the GPS data sent by a user's mobile device
- another value stream; for example, a value stream to onboard a new team member may use employee ID and other information created when implementing the value stream to hire (or contract with) the new team member.

Value streams use the resources of the service provider and service consumers to generate required outputs, working within the constraints and policies set either by management or governance systems, or by external factors.

A value stream will generate outputs that can be used to create intended outcomes. Outputs can also include information and feedback to be shared with relevant stakeholders to aid in ongoing management or governance activities. In some cases, outputs can serve as input triggers for other value streams within or outside the organization.

4.1.2 Value streams and organizations

ITIL 4 does not equate an organization to a corporate entity. An organization can be a single person (e.g. a self-employed programmer or consultant), a team (e.g. a development or support team acting as a business unit), an enterprise, or even an ecosystem of enterprises working together.

Value streams are fundamentally connected to organizations. Consequently, there can be value streams at every level of granularity and they can be defined for a single person, a team, a business unit, etc. However, it is important to remember that value streams are defined in the context of a system that is established to create value for the organization, its customers, and other stakeholders. A large enterprise can include several distinct

organizations managed with certain levels of autonomy, where it is possible to treat every one of them as an SVS with its own value chain and value streams. However, it is unlikely that self-sufficient SVSs will be established at the level of teams.

The overall goals and expectations for a product or service should be described from end-to-end, that is, from demand to value, rather than simply describing the use of each team in a disparate or un-coordinated set of activities. The value stream will therefore represent work across different teams, impacting different stakeholders, using different processes, tools and people, and sometimes even different suppliers.

ITIL service value streams need to be visualized, with a clear indication of touchpoints, where users interact with the product, service or IT service management professionals. A key advantage of the ITIL value stream technique is the ability to not only identify the multiple stakeholders who are involved but also to see potential points of failure, and explicitly connect value to demand.

The key differences between value streams and processes relate to their focuses and how they are used. Many sets of interrelated activities that transform inputs into outputs could be considered processes. Value streams are focused around the flow of activity from demand or opportunity to customer value. Process taxonomy and management tools and techniques are therefore applicable to value streams. However, many processes are not value streams.

Each step in a value stream could be reframed as a process, or as a value stream. The latter is typical for large enterprises and ecosystems where multiple enterprises are involved.

Example

Passengers on train journeys are likely to interact with multiple service providers, depending on the country and route taken. Some of these service providers are the railway companies that transport people. Other service providers manage the stations, sell tickets, ensure security, dispatch and navigate the trains, etc. Railway travel is a complex ecosystem with many organizations cooperating and collaborating to create a seamless and comfortable user journey. Each of the organizations involved manage their own SVSs, which contain multiple value streams. However, the organizations also contribute to a collaborative value stream, enabling and supporting railway travel. Some of the steps of the value stream are effectively value streams of the participating organizations.

A high-level value stream that adds a new functionality to an IT service may involve a third-party vendor, an internal software development team, a site reliability engineering team, other IT teams, and a user team. Steps performed by the external vendor are likely to be managed as the vendor's own value stream. Steps performed within the organization are formalized and managed as processes of the involved practices or activities within these processes.

Cascading value streams to lower-level value streams and/or processes allows organizations to:

- focus on value for the higher-level value stream, combining value streams and processes of participating parties
- progress iteratively with feedback from other organizations and teams in the value stream
- collaborate and promote visibility into how work flows across the organizations and teams

- think and work holistically by understanding how the wider organization or ecosystem works and benefits from work being done by the participating parties

4.1.3 Value stream considerations

4.1.3.1 Selecting the right perspective

A value stream can be documented from one of two perspectives. It can either be designed to reflect the aspirations of the service provider or it can be explored to document the ways work is being done. After it has been documented, it can be compared against observed behaviours.

Deviations between the design and the observed behaviours are likely to trigger improvements. These may include:

- updating the value stream documentation to reflect actual work patterns
- optimizing the workflow by reducing the time taken to convert demand into value, and automating repeatable work.

4.1.3.2 Start and end points

A value stream always starts with demand and ends with value being created or restored for one or more stakeholder. Thus, it is highly desirable to maintain an outside-in tone or language when documenting the value stream, for example, by:

- reflecting business planning milestones and timelines
- using language relevant to the audience
- framing outcomes and value from the customer or user’ s point of view.

4.1.3.3 Flexibility

A value stream repeats value chain activities, reflecting the context and the environment in which work is performed. A value stream can be as flexible as the organization needs it to be. For example, the organization can add another stage during the work, similar to a waterfall approach, or create iterative loops between value chain activities.

4.1.3.4 Granularity

Value streams are a representation of work, as viewed at a certain level of granularity. For example:

- A value stream that has Agile software development activities can exhibit multiple iterations of work, reflecting the exploratory nature of that approach.
- Alternatively, the value stream can have a higher-level perspective that allows the work to be represented by a single step.

Regardless of how the work is represented, it is critical that the level of granularity is uniform across the entire value stream.

4.1.3.5 Identifying steps

When deciding what constitutes a separate step in a value stream, and what should be included within an existing step, it is necessary to consider:

- the level of detail that would be represented in the value stream. The organization will need to decide whether the value stream will show details of all the actions or simply provide an overview of the work.
- whether hand-offs between individuals and teams could also have an impact on the value stream. Activities that are carried out by different teams are usually best shown as different steps. This can be very helpful for understanding where work is delayed by queues.
- the inclusion of multiple value chain activities, as these could also affect the value stream.

Inclusion of multiple value chain activities

If a step includes both engage and plan activities, it may be reasonable to split it into two separate steps. For example, a single step to determine customer requirements could be split into:

- working with the customer to define their requirements (this maps the engage value chain activity using contributions from service desk, relationship management, etc.)
- assessing the customer requirements (this maps the plan value chain activity, using contributions from business analysis, risk management, etc.).
- Similarly, a single step to implement a hotfix from a vendor website could be separated into:
- downloading the hotfix from the website (this maps to the obtain/build value chain activity, using contributions from software development and management, supplier management, etc)
- deploying the hotfix (this maps to the design and transition value chain activity, using contributions from change management, deployment management, etc.).

Alternatively, if multiple steps are executed by the same group of individuals or resources, it may be better to describe them as a single step positioned in the single value chain activity that best describes the outputs of the combined step. This will help to avoid the impression that work will be waiting in queues between each step.

4.1.3.6 Step order

Although streams often start with the engage activity, other activities can also be the first step. For example, if an engineer notices an incident raised by a monitoring tool (demand), the first step may be to begin investigation (deliver and support); it is unlikely to be contacting potentially impacted customers (engage).

4.1.3.7 Mapping to the service value chain

A step of the value stream can be described as mapping the bulk of its activities to one value chain activity, while the underlying actions and tasks are mapped to other value chain activities. For example:

- A step to assess customer requirements can be mapped to the plan value chain activity but may have an action or tasks called refine requirements with the customer that maps to the engage value chain activity.
- A step to download hotfix from the vendor website can be mapped to the obtain/build value chain activity, but have an action or task called the update workaround that maps to the improve value chain activity.

4.1.3.8 Mapping to practices

The steps, actions, or tasks within a value stream can be mapped to a process or procedure within a practice, depending on the level of granularity. For example, a step to develop deployable code may be composed of actions and tasks that map to the following:

- procedures to execute automated tests
- procedures for running manual tests.

4.1.4 Designing a service value stream

Practitioners are encouraged to adapt the following approach to the needs of their organization or to explore the use of other approaches.

1. Define the use case or scenario for the value stream by describing:

- the demands (preferably in non-technical terms)
- the triggers created by the demand
- the outcomes created by the value stream
- value in the context of the value stream (as value can be created or restored).

2. Document the steps required to traverse the service value chain from demand through to value.
3. Map the steps from Step 2 to the service value chain.
4. If necessary, fragment the steps into actions and tasks.
5. Identify the practices and associated resources that contribute to the successful completion of each step, action, or task, including:

- operational and management teams or individuals
- tools and technology
- information and data (e.g. records, forms)
- any partners and suppliers that create outputs or outcomes using their own resources.

The five steps above should be completed in a collaborative way: as a series of meetings or workshops, for instance. The first stage of documentation is to establish a broad and general understanding, or baseline, of the work needed to respond to demand and generate value.

When a baseline has been established, the value stream can be further explored and optimized by:

- creating simple simulations to test the flow of work
- eliminating work that does not create meaningful outputs, outcomes, or benefits
- shifting work left
- delaying work that can introduce variance in quality, cost, or timeliness6
- introducing feedback loops and escalation mechanisms to improve the quality of the outputs and benefits produced by the value stream
- identifying opportunities to automate steps, actions, or tasks that will accelerate the flow of work
- identifying and managing bottlenecks and constraints, which may include redesigning the value stream around the constraint
- introducing triggers to review and, if necessary, improve the value stream. (Reviews can either be impromptu, such as whenever consumers provide feedback, or scheduled to occur regularly.)

4.1.5 Describing a step of the value stream

When describing a step in a value stream, the following need to be identified and documented:

- **Name of the step** Define what a step is. Decide if the step is to be described in non-technical language. Avoid acronyms and jargon so that those reviewing the value stream can easily understand what it aims to accomplish; for example:
- The phrase ‘register the user incident’ for a value stream step is preferable to ‘log incident ticket using the INC_template’’.
- The phrase ‘document customer’s needs’ is preferable to ‘fill out form TK421 with customer input’.
- **The input trigger(s)** The trigger that will result in the step starting.
- **Information** The information needed to describe a step. This should be obtained either from an external stakeholder or a previous step in the value stream, or drawn from other organizational resources. It is important to explore what information is required to create the defined outputs or outcomes and when the information will be available to the step.
- **Practice contributions** The tools, technologies, individuals, and other resources the organization’s practices contribute for the successful completion of the step.
- **Actions and tasks** What needs to occur to act on the incoming trigger and achieve the required output. Which ones can be executed in parallel and which will require pre-requisites. How long will each action or task will take.
- **Constraints** The policies the step need to comply with. These may be defined by the service provider or by external stakeholders. It is important to explore the resource constraints that the organization may face.
- **Outputs** Why the step exists. The outputs the step needs to provide. The value the step creates for the service provider, its consumers, or other stakeholders.
- **Estimated or target lead time** How long a unit of work should take to complete the step, including time spent waiting in a queue.

4.1.6 Value stream mapping

Value stream mapping has its origins in Lean manufacturing techniques. It is a method of visualizing the flow, from demand/opportunity to value, and planning how that flow can be improved. In Lean, the core idea is to maximize customer value while minimizing waste. Simply, Lean involves creating more value for service consumers with fewer resources. A Lean organization understands the value of a service to the consumer and focuses its key processes on increasing it.

The goal is to provide perfect value to the service consumer through a perfect value creation process that does not produce any waste. To accomplish this, Lean thinking changes the focus of management from optimizing separate technologies, assets, and vertical departments to optimizing the flow of products and services to the consumer through entire value streams that flow horizontally across technologies, assets, and departments.

Value stream mapping is used to gain insight into an organization's workflow and has a prominent role within ITIL. It can be used to identify both value-adding activities and non-value-adding activities in a value stream, while providing insight into opportunities for optimization and automation. Value stream mapping includes assessment (e.g. documenting the current state of the workflow from demand/opportunity to value) and planning (e.g. planning the changes that will be made to improve the workflow).

In many organizations, focusing on an individual process leads to optimizing only the steps in the process within a small scope of control, such as for a single team or department, while overlooking the impact of this local optimization on the whole value stream. Local optimization can create a bottleneck further down the value stream and potentially make the overall performance of the value stream worse, not better.

The elimination of waste along entire value streams, instead of at isolated points, creates processes that require less human effort, space, capital, and time, at far less cost and with fewer defects when compared with traditional business systems.

A value stream map is a great tool for optimizing the complete value chain, not just the local steps. This larger view is in perfect alignment with the guiding principle of thinking and working holistically. Value stream mapping helps organizations by:

- visualizing more than just the single-process level (e.g. assembly, welding, etc., in production), so the flow from opportunity to value is made clear
- making the sources of waste in each value stream more visible
- providing a common language for discussing value streams and processes
- making apparent the decisions that need to be made about the flow, so that they can be discussed (to prevent making ad hoc decisions at lower levels)
- tying together Lean concepts and techniques (to discourage the use of just one or two of them in isolation)
- forming the basis of an implementation or improvement plan. (By helping organizations design how the end-to-end flow should operate, value stream maps become a blueprint for implementation.)
- demonstrating the linkage between the information flow and the material flow.

Value stream mapping was originally developed in a manufacturing context, yet it applies equally as well to the creation and delivery of services, as described in ITIL. Any aspect of the SVS that is part of a service value stream should be included in the value stream map.

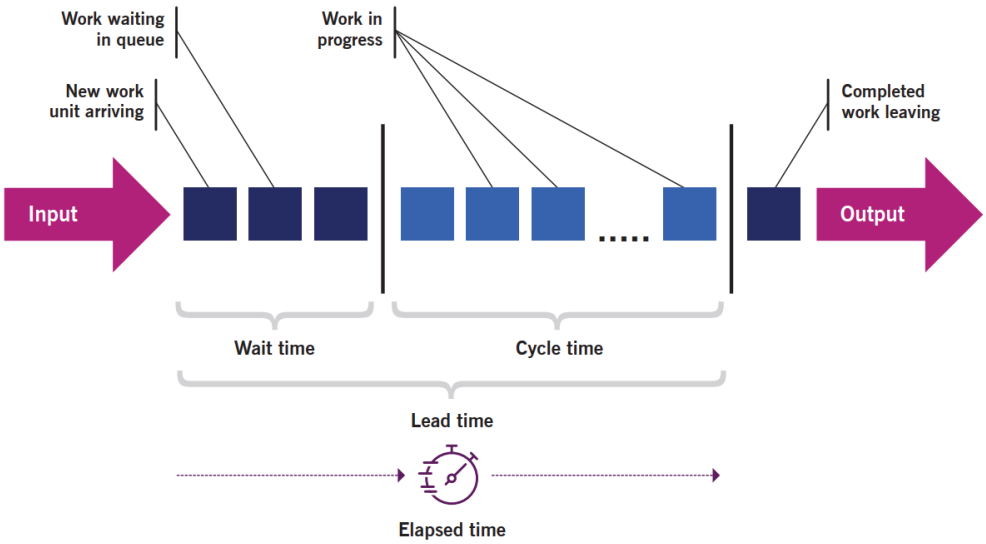
Many different value streams are to be found in IT and service management, and they vary depending on the origins of the opportunity or demand, the required outcomes, and associated value. For example, the flow of activity for restoring a service as quickly as possible, delivering a service at the agreed levels of availability, or dealing with a service change could each be defined in a service value stream map.

The results of value stream mapping can be used in many contexts, such as writing out a business case, defining priorities, optimizing service value streams and practices within the organization, pinpointing bottlenecks in existing practices, and/or gaining a common understanding of issues affecting the organization. However, the most important role of a value stream map is to determine which improvement actions need to be implemented to achieve the desired future result.

4.1.7 Key metrics when analysing a value stream

There are several important metrics which can be defined for any workflow and activity;

Term	Description
Cycle time	The amount of time required to complete a discrete unit of work, converting input(s) into output(s). For example, if it takes five minutes to fill in a new incident form, the cycle time is five minutes.
Wait time	The amount of time a discrete unit of work waits in a queue before work begins. For example, if an incident ticket waits (on average) four hours before work on it begins, the wait time is four hours.
Lead time	The sum of the cycle time and wait time. Lead time represents the total time required to complete a discrete unit of work, from when it enters the process queue to when the process ends.
Process queue	The number of discrete units of work waiting to be operated upon by a process.
Work in progress (WIP)	The number of discrete units of work being operated on, but which are not yet completed.
Throughput	The rate at which work enters or exits the system.



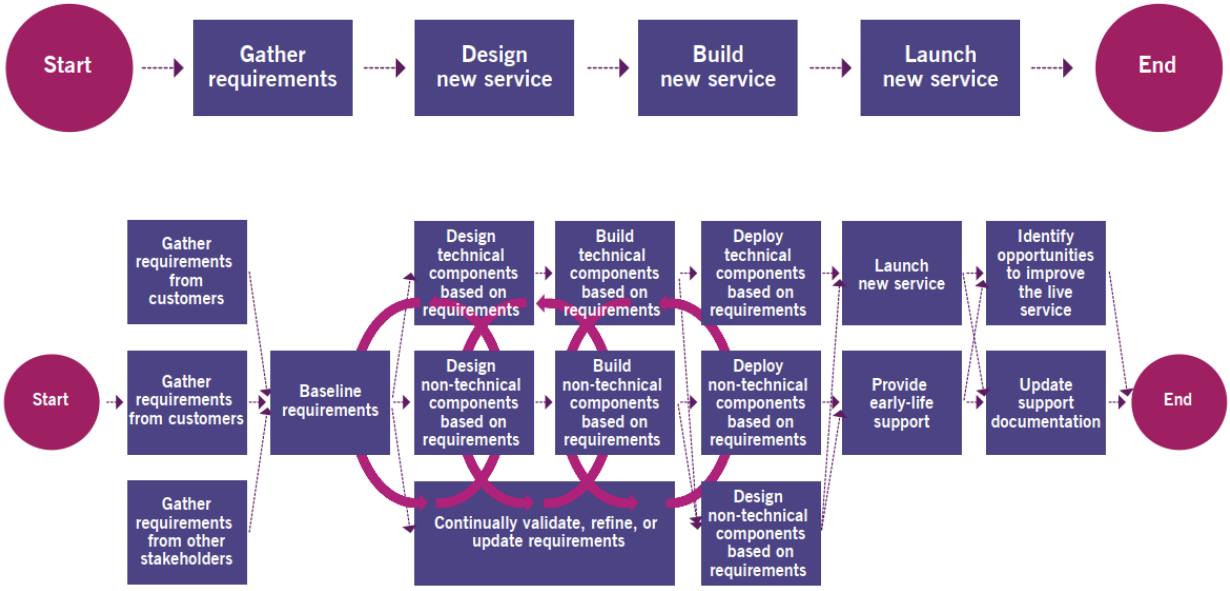
These terms originate from Little's Law, and more information can be found in operations management or queuing theory literature. Little's Law can be simplistically represented as:

Work in progress = Throughput × Lead time or

Work in progress = Throughput × (Cycle time + Wait time)

This mathematical representation works for simple systems. In complicated environments, however, where more than one activity, step, or task is occurring simultaneously, it may be more difficult to apply this model.

The simplicity of the system is also a function of the granularity at which the value stream, activity, or task is being considered. For example, a value stream for a new service might be represented simplistically and at a very high-level.



Regardless of complexity of the environment, Little's Law leads to the following considerations when designing a value stream, step, or action:

- It is advisable to minimize the number of times work is transferred between resources implementing the various steps/actions/tasks, especially if these resources are individuals. Transfers create queues, and queues create waiting times, thereby increasing lead time. Reducing the number of potential transfers is often accomplished by increasing the level of automation, up-skilling staff to increase the range of tasks they can undertake, or reorganizing teams (often referred to as breaking down silos).
- Throughput, especially in the context of external events and triggers, is often not in control of the service provider. However, the use of statistical modelling functions (e.g. Poisson distribution,8 Gaussian distribution, and Pareto distribution) can help estimate the pattern of activity. For example, a supermarket cannot predict the exact number of shoppers visiting each hour of the business day, but it can use statistical models to create estimates.
- In simple systems, wait time can be expressed as a function of cycle time. A new unit of work is cycle time x units of work already in the system. For example, if it takes 10 minutes to complete a unit of work, one unit is currently being undertaken and three units waiting to be undertaken, then:

- the next unit of work to enter the system will spend 10 minutes/unit × (1 + 3) units = 40 minutes in the queue
- the lead time for the next unit of work would be 40 minutes wait time + 10 minutes cycle time = 50 minutes
- Depending on the level of granularity and the nature of the work, cycle time can be assumed to be fixed and predictable.
- To create a more predictable cycle time, it may be necessary to limit the work in progress. This technique is a part of the Kanban method and works well in environments where the throughput (intake of work) is predictable. For example, a team might limit their work in progress to three requests at a time and delay working on any additional requests if the work in progress crosses this limit.

4.2 Model value streams for creation, delivery, and support

This section explores the two common value stream models that can be found in nearly all organizations:

- Development of a new service Organizations often find it necessary to create, modify, or retire services. This value stream reflects the common patterns of work required to create a new service and so usually involves significant effort and coordination across the organization.
- Restoration of a live service In modern, complex IT organizations, failure is to be expected and must be managed quickly. This value stream is concerned with the typical activities that are expected when detecting and resolving failures and how these activities can be leveraged to improve the service.

These value stream models should be adapted to the needs of each organization because the context, complexity, level of granularity, number of steps, inputs, and outputs of each step will be different from those depicted here.

Although these models use the templates from section 4.1, many alternatives exist (e.g. the example target lead time and example roles). These clarify how to use the form and should not be interpreted as prescriptive guidance or standard calculations of activities.

When the following sections refer to resources in the context of practice contributions, they include any or all of the four dimensions of service management:

- **Organizations and people** Skills, management authority, funding, staffing, etc.
- **Information and technology** Tools, databases, data objects, information objects, etc.
- **Partners and suppliers Vendors** that provide products and services to the organization, etc.
- **Value streams and processes** Processes, procedures, templates, etc.

4.2.1 Development of a new service

This value stream archetype explores the activities that organizations commonly undertake to create or significantly modify an existing service. It is indifferent to the nature of the service and can be used to describe a value stream for creating services that are either provided to the customers within the organization or external to the organization.

4.2.1.1 Design considerations

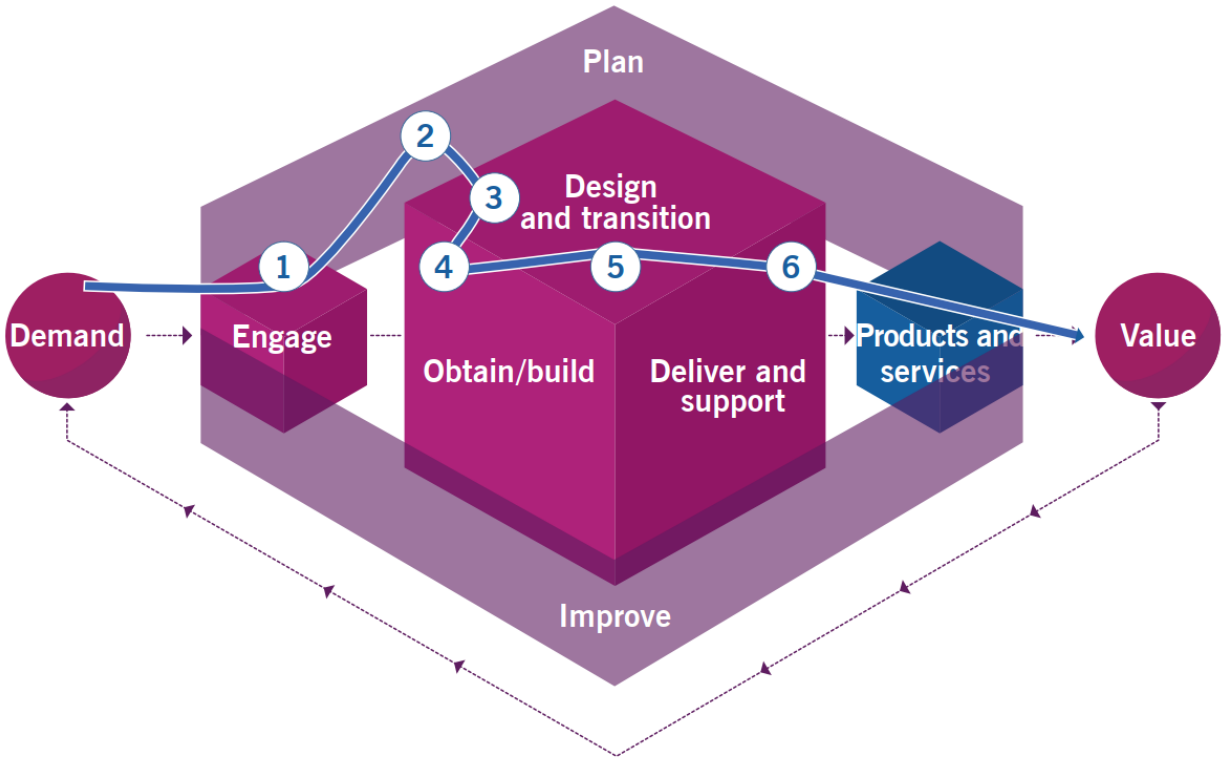
Typical considerations when designing this value stream include:

- Determine how the work will be managed. Will it be in large increments using sequential waterfall phases or in small increments that provide fast feedback and the opportunity to change specifications at short notice (such as an Agile approach), or a mixture of both? It may be necessary to create separate value streams, depending on how the work is managed, and to describe different project management methodologies in each value stream.
- Establish the correct level of oversight to maintain focus on business outcomes rather than outputs.
- Establish the correct level of bureaucracy to ensure effective coordination of activities between the various organizational units and the organization's partners, suppliers, customers, users, and other key stakeholders.
- Join all of the activities from all of the required practices to create a new service, creating an end-to-end, holistic vision for the work.
- Ensure that the organization has a clear understanding of the customer' s intended goals and expectations, and track each of them from start to finish to ensure that the service supports the required outcomes. The organization should avoid introducing conflicts or inconsistencies when translating customer needs into service specifications (whether functional or non-functional).
- Understand the customer's journey from demand to value and define requirements from the customer's point of view rather than relying solely on internal perspectives or the prior experience of team members.

4.2.1.2 The journey from demand to value

This value stream describes the journey from demand in six key steps:

1. Acknowledge and document service the service requirements (engage)
2. Decide whether to invest in the new service (plan)
3. Design and architect the new service to meet customer requirements (design and transition)
4. Build, configure, or buy service components (obtain/build)
5. Deploy service components in preparation for launch (design and transition)
6. Release new service to customers and users (deliver and support).



4.2.1.3 Demand and value

This value stream is triggered by a demand to create a new service. It may be originated by:

- a service consumer: a sponsor, customer, or user. The service consumer can be external to the service provider or a member of the same organization, depending on the context.
- an external stakeholder other than the service consumer, such as a supplier or regulator.
- a staff member of one of the service provider’ s business functions (e.g. sales or marketing), who has sensed a new opportunity. Opportunities external to the SVS can translate into demand for value co-creation.
- members of the organization’ s governing body.

The demand can be recognized in many ways, depending on the context and the tools. Generally, the demand is a request made to the senior managers or their authorized representatives. Note that the subsequent steps of this value stream refer to the requester as the individual or role with the demand for value that initiated the value stream; it does not refer to a role within service request management.

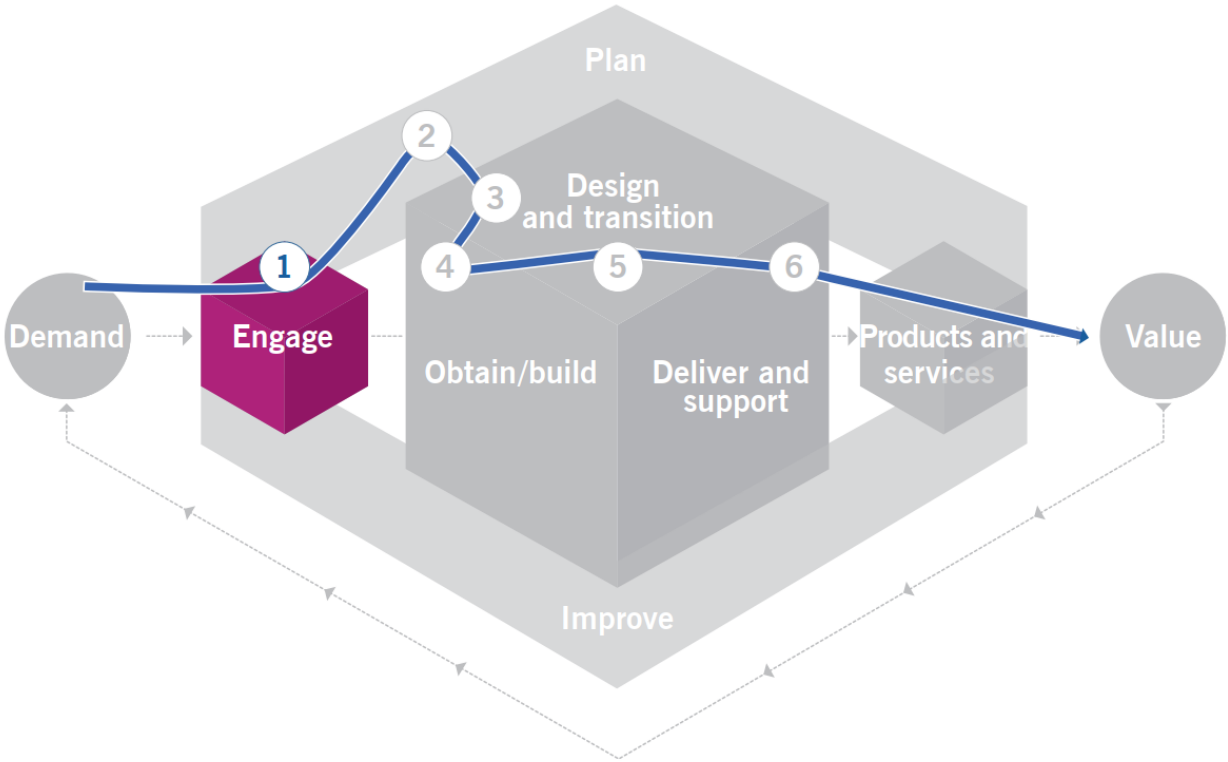
It is important at this stage that the demand articulates both desired outcomes and expected value from the service. A useful technique is to adapt the commonly used Agile software development template for epics and user stories, which breaks down the need as follows:

As a <persona> I want <outcome> so that <value>.

For example:

- As a business development manager, I want to track my sales pipeline so that I can focus on closing new deals.
- As an infrastructure engineer, I want to be able to group monitoring alerts so that I can correlate alerts and eliminate duplicates.

Step 1: Acknowledge and document the service requirements



Any request for a new product or service feature starts by acknowledging and documenting the demand. Generally, business case methods are used to collect and assess requirements. It is important to remember that the objective is to collect enough information to submit a business case.

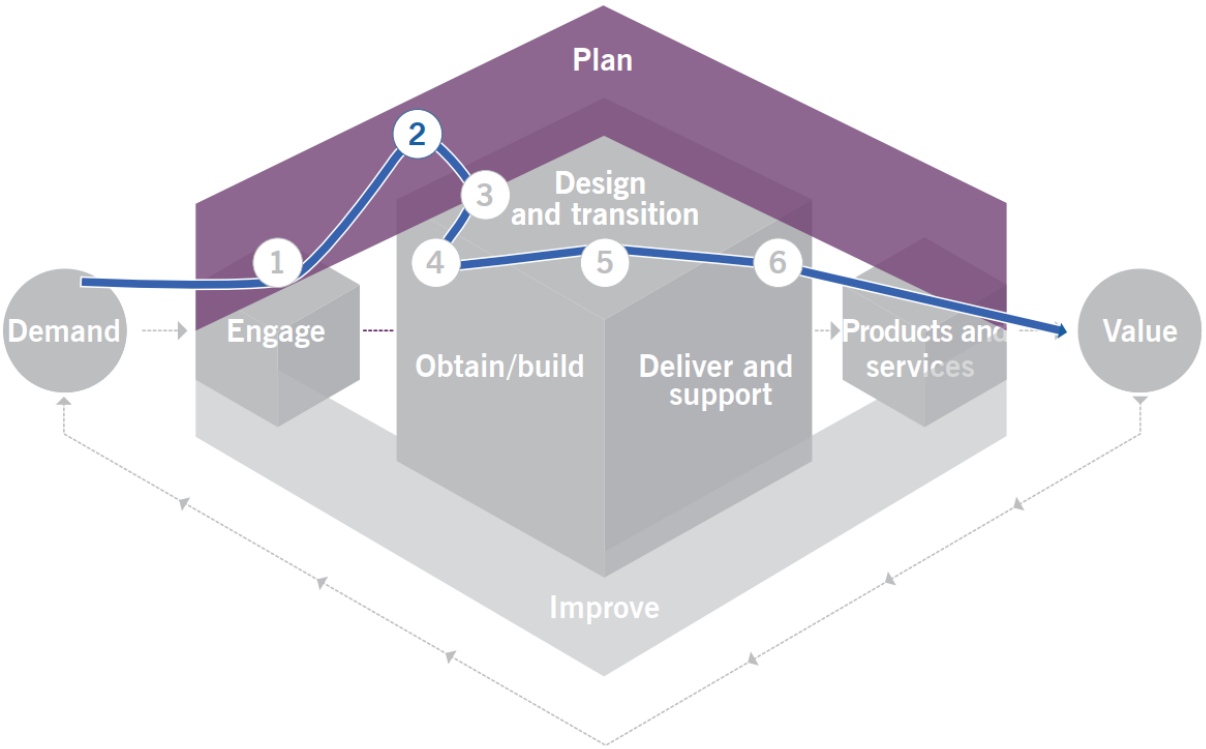
Successful completion of this step requires the organization to engage with the requester and other stakeholders (e.g. marketing and sample users), using surveys and polls to complete the business case template with highlevel information about the requirement, benefits (both quantitative and qualitative), costs, and risks. This information is also

supplemented by high-level estimates from various technical and service management teams, which consider the cost of development, release, operations, and support.

Practices that commonly contribute to this step include:

- **Business analysis** Provides the skills, tools, and other resources needed to document customer requirements, as per the business case, to the depth needed to perform a viability assessment
- **Portfolio management** Provides information on current, retired, and future (planned) services.
- **Relationship management** Provides the skills, information, and other resources needed to manage the requester's expectations and create a rapport with the service provider.
- **Service configuration management** Provides information on currently operational services and service components so as to provide context when describing the demand.
- **Service level management** Provides information on current service levels to provide context when describing the demand.

Step 2: Decide whether to invest in the new service

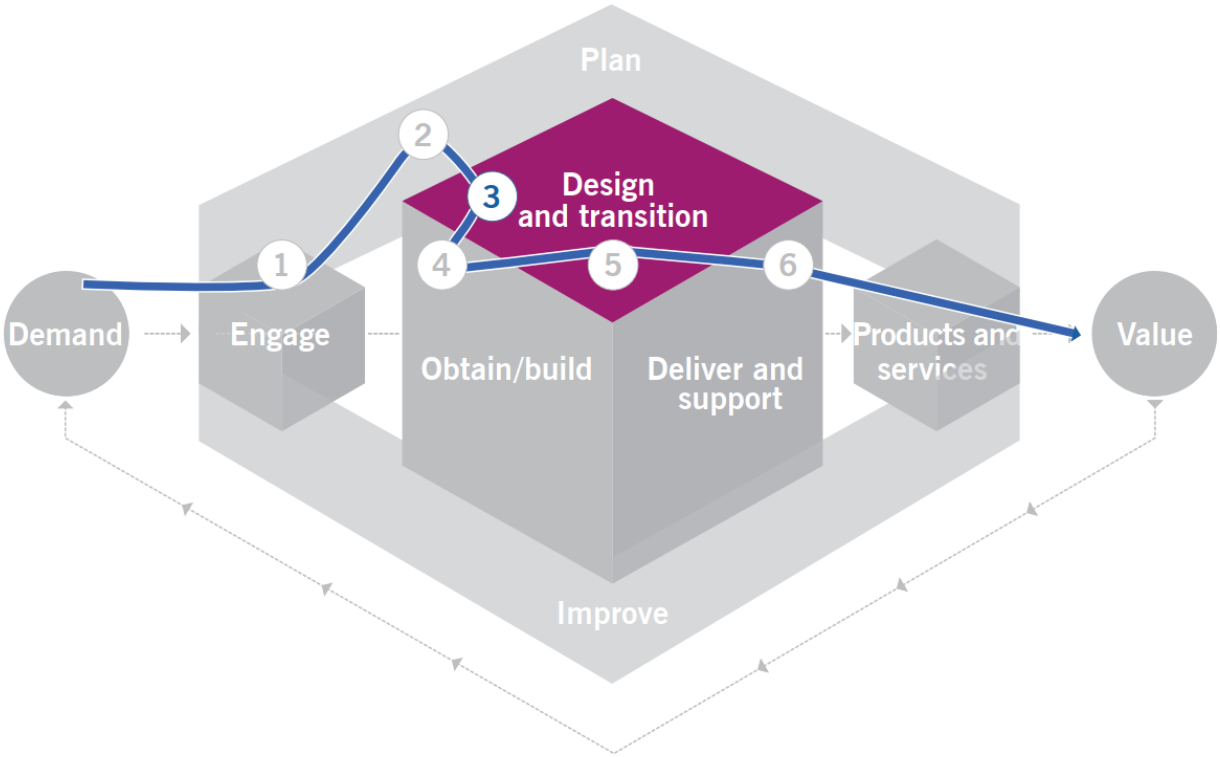


When the request has been refined and documented in the business case, it might be necessary to clarify the initial cost, benefit, and risk assessments so that the organization can plan the work. This would require more detailed discussions with various internal teams, and possibly ongoing conversations with customers and other external stakeholders. When completed, the business case can be considered by the management team, who will then decide whether to grant approval.

Practices that commonly contribute to this step include:

- Business analysis Provides the skills, tools, and other resources needed to work with various specialist teams in gathering additional information and assessments and to perform a viability analysis against the customer requirements that are documented in the business case.
- Infrastructure and platform management Provides supplementary assessments on how infrastructure components of the new service might be engineered and developed, this service's impact on ongoing application management activities. Also contributes as necessary to the business case assessment.
- Portfolio management Provides the resources necessary to allow the service owner to complete the viability assessment and decide whether to authorize the investment in the new service.
- Problem management Provides information on current errors and workarounds that might have an impact on the new features.
- Project management Provides administrative and technical resources to complete the business case assessment.
- Risk management Provides information on current enterprise risks that may be impacted either positively or negatively by the new features.
- Service configuration management Provides information on currently operational services and service components.
- Service design Provides supplementary assessments on how the new service may be designed to meet internal standards and policies around utility, warranty, brand, and other criteria, and contributes as necessary to the business case assessment.
- Service desk Provides supplementary assessments on how the new service might impact current customer and user support channels and contributes as necessary to the business case assessment.
- Service financial management Provides tools and policies to calculate the ROI that new features may provide.
- Service level management Provides information on both the current service levels and the changes the new functionality might introduce.
- Software development and management Provides supplementary assessments on how software components of the new service could be engineered and developed and this service's impact on ongoing application management activities. Also contributes as necessary to the business case assessment.

Step 3: Design and architect the new service to meet customer requirements



Note: this example assumes that the management team has authorized the investment that is needed to fulfil the request for new features. When the decision has been made to modify the existing service, it will be necessary to review it and modify the design to accommodate the new features. For example:

- integrate the account review system with the payments system
- increase the business, service, and technology capacity
- assess the additional infrastructure required to maintain current service level targets around utility and warranty.

There is also a need at this stage to translate the requested features and updated service design into software and infrastructure designs and specifications. This may result in the creation of an initial backlog of epics and user stories, depending on the methods used to develop software and infrastructure components.

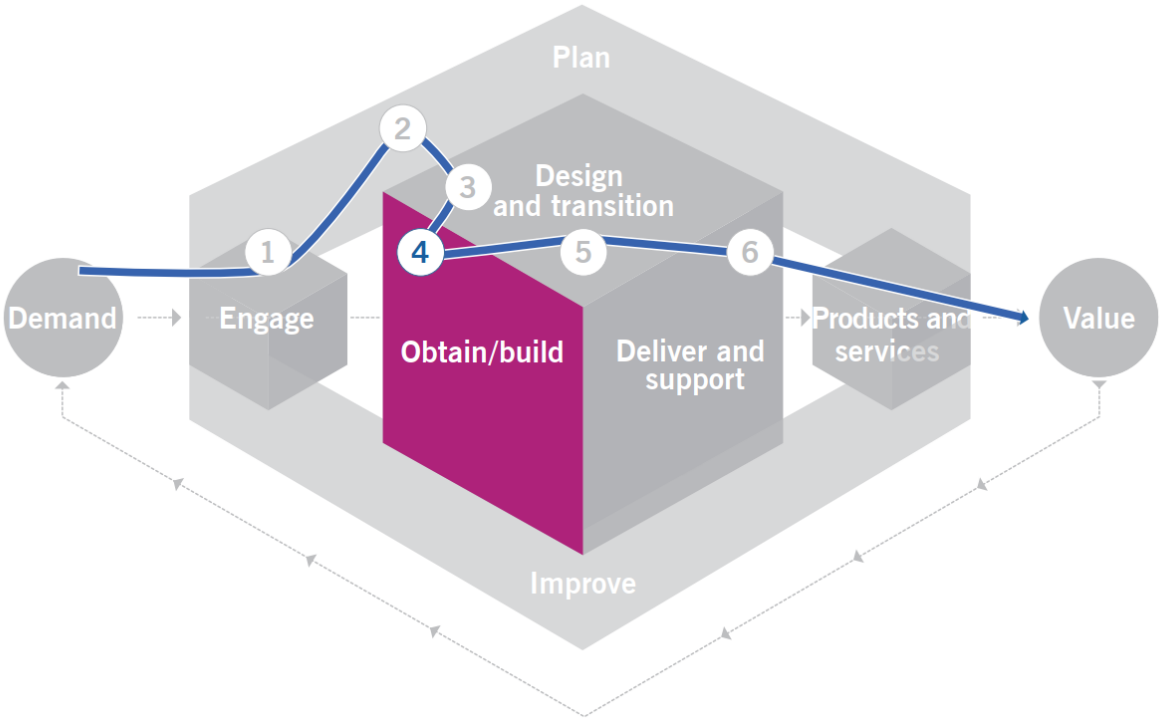
Practices that commonly contribute to this step include:

- Architecture management Provides architectural requirements and constraints.
- Availability management Provides the skills, tools, and other resources needed to describe both the potential demand for the service and the technical, service, and business capacity required to meet that demand (and to document these in the service design package).
- Business analysis Provides the skills, tools, and other resources needed to coordinate the work required and ensures that the outputs are recorded consistently in the service design package.
- Capacity and performance management Provides the skills, tools, and other resources needed to describe both the potential demand for the service and the technical, service,

and business capacity needed to satisfy that demand while maintaining expected levels of performance (and to document these in the service design package).

- Information security management Provides the skills, tools, and other resources needed to design the controls that ensure not only the confidentiality, integrity, and availability of information but that the authentication and non-repudiation of customers/users is aligned with the organization's policies (and to document these controls in the service design package).
- Infrastructure and platform management Provides the skills, tools, and other resources needed to create and refine a high-level design of the infrastructure components required to meet the utility and warranty criteria specified in the service design package.
- Project management Provides the skills, tools, and other resources needed to initiate the project and to identify and plan sufficient resources to complete the tasks that will enable the objectives to be achieved.
- Service configuration management Provides information on currently operational services and configuration items.
- Service continuity management Provides the skills, tools, and other resources needed to design the controls that will ensure that both the availability and performance of the new service are maintained at acceptable levels in the case of a disaster (and to document these in the service design package).
- Service design Provides the skills, tools, and other resources needed to design both the customer experience and user experience when interacting with the new service (and to document these in the baseline service design package).
- Service level management Provides the skills, tools, and other resources needed to set clear businessbased targets for service levels (and to document these in the service design package).
- Software development and management Provides the skills, tools, and other resources needed to create and refine an initial list of epics and user stories in line with the specifications in the service design package.
- Supplier management Assists in interactions with partners and suppliers and in selecting new suppliers to source service components.

Step 4: Build, configure, or buy service components



When the design package has been baselined, work to obtain or build service components can begin. A service component is often technical (e.g. software, servers, storage, or networks). Depending on the nature of the service, however, some non-technical service components (e.g. new team structures, new roles, critical skills and competencies, knowledge-based articles, training documentation, and vendor contracts) may also need to be managed.

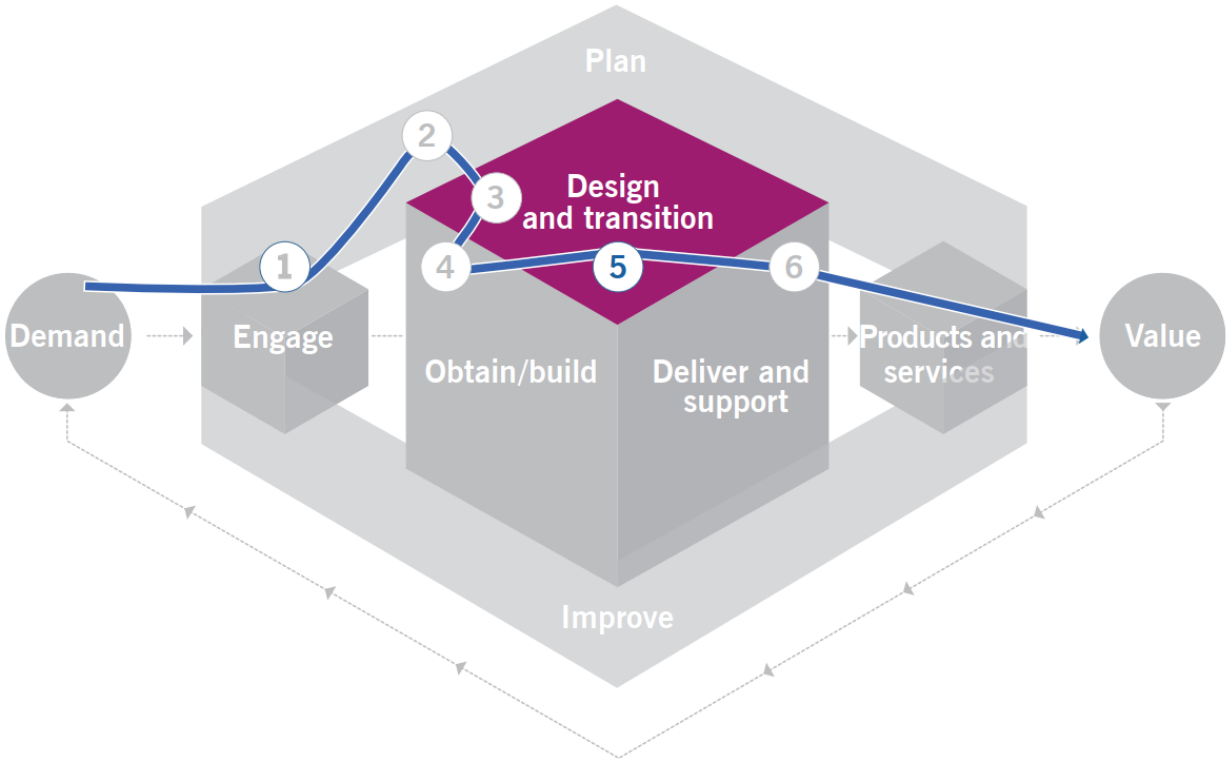
Thus, it is critical to acknowledge and configure both the technical and non-technical aspects of products and services, which can include:

- technical integration between the applications
- modification of existing back-end and client applications
- an increase in the processing capacity and infrastructure
- the updating and communication of training documents for customer support agents and provision of simple scripts to help customers
- the updating and communication of release notes that can be used to promote the new service
- marketing of the upcoming changes to products and services, without committing to specific features
- updating the service design package to reflect agreed-upon changes made while obtaining or building service components.

Practices that commonly contribute to this step include:

- Infrastructure and platform management Provides the engineering skills, tools, and other resources needed to update the infrastructure and to integrate new systems and other infrastructure components into the existing service.
- Portfolio management Provides the skills, tools, and other resources needed to update and communicate changes to the service portfolio as service components are created.
- Project management Provides cross-team coordination of activities, issue and risk tracking, and regular status updates to the project board.
- Release management Provides the skills, tools, and other resources needed to create and communicate the release plan and then to update and maintain it as the development and deployment activities progress.
- Risk management Provides information on current risks and policies with which the new or modified service components need to comply.
- Service configuration management Provides information on current operational services and configuration items, as well as the skills, tools, and other resources required to update service configuration records as service components are created.
- Service validation and testing Provides the technical skills, tools, and other resources needed to document test cases, carry out automated and manual testing, and supply feedback and reports from testing activities.
- Software development and management Provides the engineering skills, tools, and other resources needed to create new application features and to integrate new systems and other software components into the existing service.
- Supplier management Assists in interactions with partners and suppliers and in selecting new suppliers to source service components.

Step 5: Deploy service components in preparation for launch



- When service components have been built, work to modify the live products and services can begin. Owing to the mixed nature of service components, the organization may need to use different approaches to modifying live products and services, for example:
- Software components leverage the CI/CD toolchain and are immediately deployed into production with a feature flag that prevents users from accidentally accessing new or changed features.
- Infrastructure components, such as server, storage, or network configurations, are developed and deployed prior to the launch.
- Internal documentation is developed over the course of the obtain/build step and are distributed just prior to launch.
- Marketing documentation can be developed using stable software features and in conjunction with release plans.

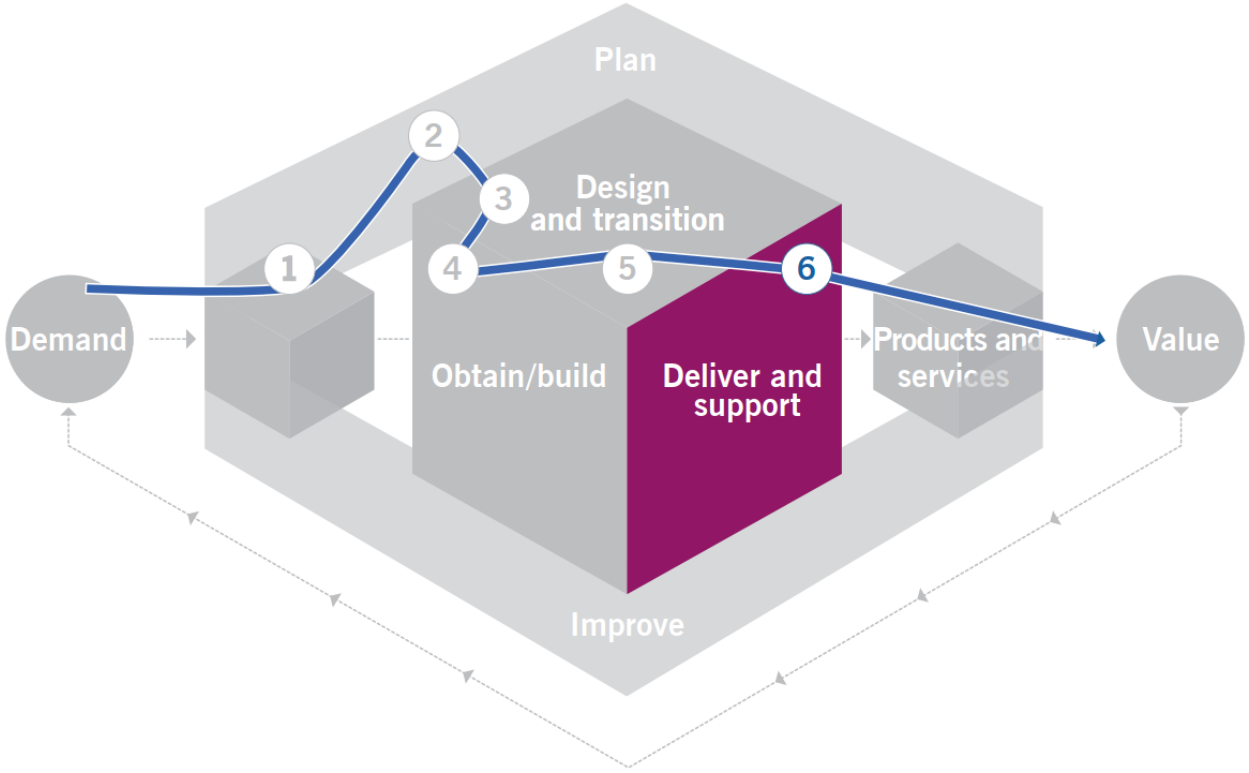
At this stage, two more important pieces of work can also be considered:

- Plan the release of the service When most of the development and configuration work is complete, it is possible to finalize the release plans. Depending on the context and need, it may be more effective to add another step to the value stream (e.g. returning to the plan value chain activity), where the outputs are the release plans.
- Create customer collateral This includes flyers, emails, posters, advertisements, etc. to build awareness of the new features and to promote their benefits.

Practices that commonly contribute to this step include:

- Change enablement Provides the skills, tools, and other resources needed to submit, assess, and approve requests for change, and schedule changes to various service components.
- Deployment management Provides the skills, tools, and other resources needed to deploy various service components (both technical and non-technical) into the live environment.
- Incident management Agrees the duration, channels, and methods to provide early life support (ELS).
- Knowledge management Provides the skills, tools, and other resources needed to update support scripts.
- Problem management Documents all known defects (technical debt) and workarounds present in the new features.
- Project management Provides cross-team coordination of activities, issue and risk tracking, and regular status updates to the project board.
- Release management Provides the skills, tools, and other resources needed to finalize the release (launch) plan, working with other groups in the organization (e.g. sales and marketing departments) to communicate these plans to users and customers.
- Service configuration management Provides information on currently operational services and configuration items, as well as the skills, tools, and other resources required to update service configuration records as service components are built.
- Service desk Ensures that all customer-facing support roles are adequately trained in the new features, known defects, and workarounds.
- Supplier management Assists in interactions with partners and suppliers and in selecting new suppliers to source service components.

Step 6: Release new service to customers and users



When all of the service components have been deployed, the organization is ready to make them available to end users. The previous step planned the release: this step will implement it.

Releases of service components can be more than technical procedures. It may be necessary to carefully coordinate technical and non-technical work, such as sales and marketing campaigns.

In this step, the service components are provided with ELS for a short period of time, before they move into a business-as-usual mode. ELS can take many forms and is dependent on the needs of the organization and its customers, with options such as:

- Dedicated ELS teams These are drawn from across the value stream. The team focuses on key metrics that are defined in the service design package and often have the autonomy to bypass the normal incident management and change management practices to rapidly deploy fixes. The team also works closely with the product owners across the organization to add priority tasks to the backlogs of various teams.
- Super-users Often drawn from the community of customers and users, super-users act as promoters and champions within their organizations on community forums, social media, and other channels. Promoters for the new or updated product have been trained and briefed to a high standard to enable them to support any teams or users; for example, business users or the first line/service desk.
- On-site, in-person support staff ELS can also be implemented by IT staff making themselves available at customer locations or on site. These staff are colloquially known as floor-walkers.

Practices that commonly contribute to this step include:

- Incident management Provides the skills, tools, and resources needed for ELS, to update support scripts and knowledge articles, and to enable transition from ELS to business-as-usual support.
- Infrastructure and platform management Provides IT operations resources to run the relevant infrastructure components.
- Problem management Documents all known defects (technical debt) and workarounds present in the new service.
- Project management Provides cross-team coordination of activities, issue and risk tracking, and regular status updates to the project board.
- Relationship management Provides the skills, information, and other resources needed to manage customer and user expectations when they contact the organization with issues, requests, and queries.
- Release management Provides the skills, tools, and other resources needed to execute the release (launch) plan, to ensure the release is successfully completed.
- Service configuration management Provides information on currently operational services and configuration items.
- Service desk Provides the skills, tools, and resources needed to capture customer and user demand (e.g. issues, requests, and queries) when the new service is released.
- Software development and management Provides IT application management resources to run the relevant software components.
- Supplier management Assists in interactions with partners and suppliers and in selecting new suppliers to source service components.

When the service components have been released, customers and users can interact with them through the service relationship, thus generating the required outcomes and co-creating value.

It is possible to extend this value stream to include additional activities after the components have been released, for example:

- engaging with the requester to identify any gaps in the new service, or any outcomes, costs, and risks that were not identified during the value stream activities.
- identifying opportunities to improve the service, value stream, and contributing practices.

4.2.2 Upgrading or restoration of a live service

This value stream model examines the typical activities that organizations undertake to support an existing service. This archetype is indifferent to the nature of the service and can be used to describe a value stream to support services provided to consumers within the organization or external to the organization.

4.2.2.1 Design considerations

Typical considerations when designing this value stream include:

- Identifying stakeholders and what the creation or restoration of value means to them, for example:
- for the user, it could mean the ability to resume using products and services
- for the organization’ s compliance officer, it could mean maintaining proper records of the issue and the steps taken to restore the value
- for the service owner, it could mean documenting activities in enough depth to enable trend reporting, problem investigation, and the identification of improvement opportunities.
- Taking an outside-in approach to understanding the impact of incidents and connecting these assessments to descriptions of value for various stakeholders.
- Defining first the scope of the value stream and then defining a single value stream that encompasses all activities within scope to create an end-to-end, holistic vision of how support creates or restores value.
- Highlighting activities performed by partners and suppliers that might introduce risks or dependencies to the successful creation or restoration of value.
- Understanding what (or how) systems should be integrated and data shared across multiple centres of activities.

4.2.2.2 Demand and value

This value stream is triggered by a user who is unable to use a live product or service. This loss of productivity leads to value leakage,11 wherein the service consumer is unable to derive maximum value from the sub-optimal product or service.

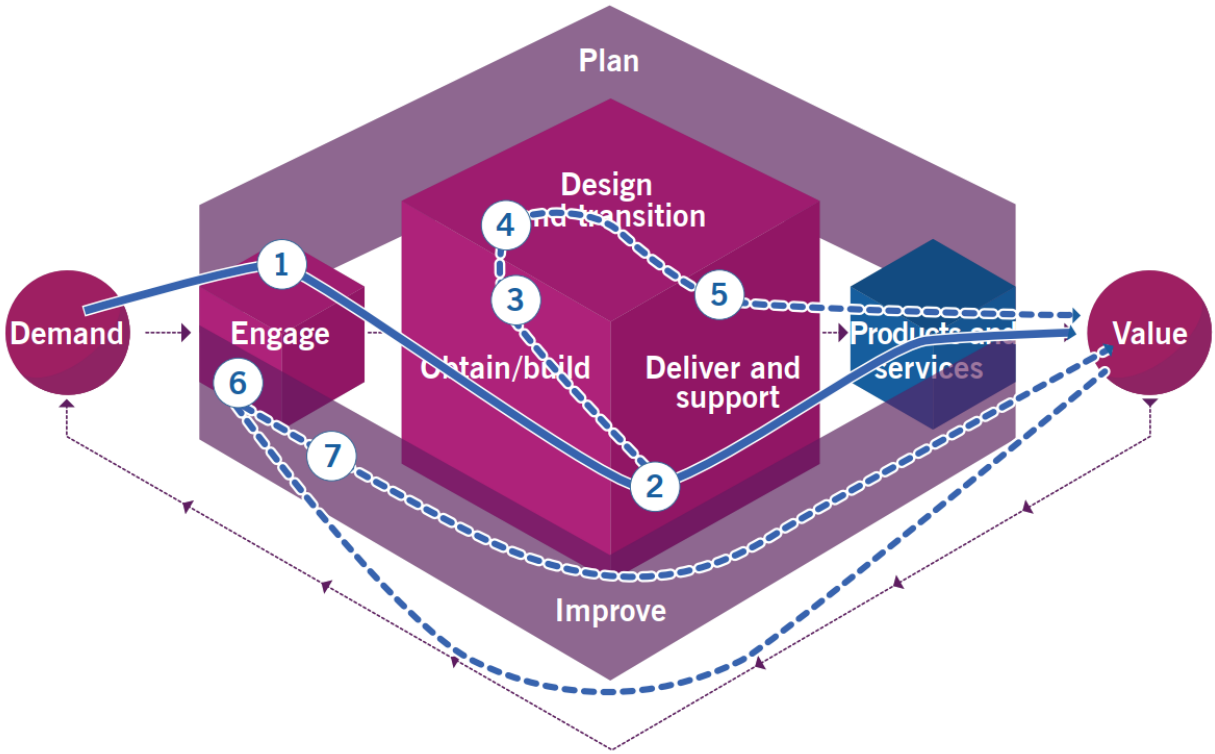
Demand could also originate within the service provider, when monitoring tools proactively alert the organization to failures that may or may not have impacted users. In this scenario, the value stream may bypass Step 1 or switch the order of Steps 1 and 2. In other words, the service provider may if required:

- start working to resolve the incident without being prompted to do so by a user.
- proactively contact users to notify them of an ongoing incident.
- approach users after the incident has been resolved.

The demand for value to be restored drives this value stream.

4.2.2.3 The journey from demand to value

This value stream describes seven key steps



1. Acknowledge and register the user query (engage)

2. Investigate the query, reclassify it as an incident, and attempt to fix it (deliver and support)

3. Obtain a fix from the specialist team (obtain/build)

4. Deploy the fix (design and transition)

5. Verify that the incident has been resolved (deliver and support)

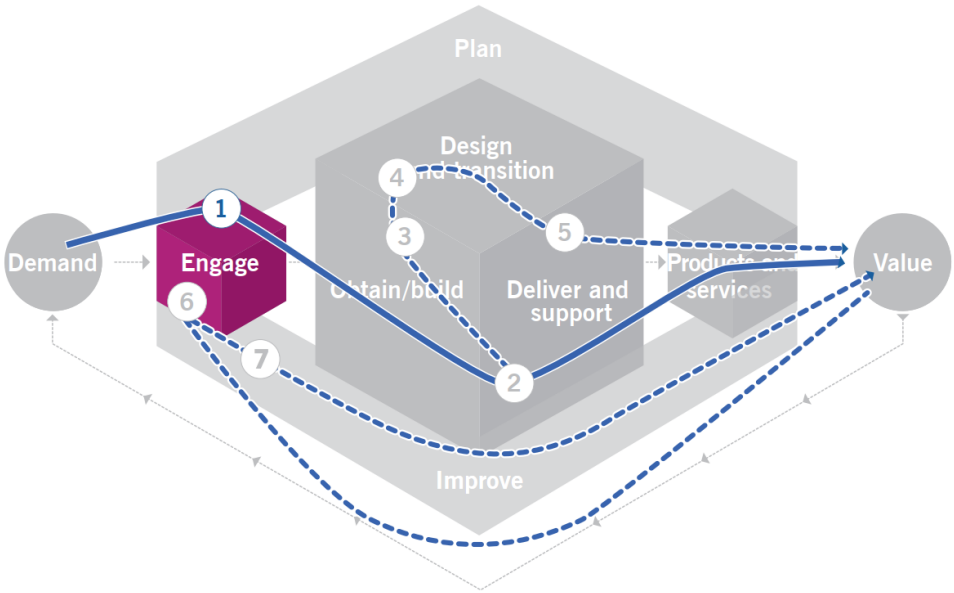
6. Request feedback from the user (engage)

7. Identify opportunities to improve the overall system (improve).

This value stream branches at Step 2. If the initial attempt to fix the incident is successful, then value is restored without any further activity. This is represented as the dashed line from Step 2 to value.

The restoration of value after Step 5 could be the end of the value stream, but there are further activities, described in Steps 6 and 7, which ask for and process feedback. For example, it is common for organizations to request feedback from a random sample of customers.

Step 1: Acknowledge and register the user query

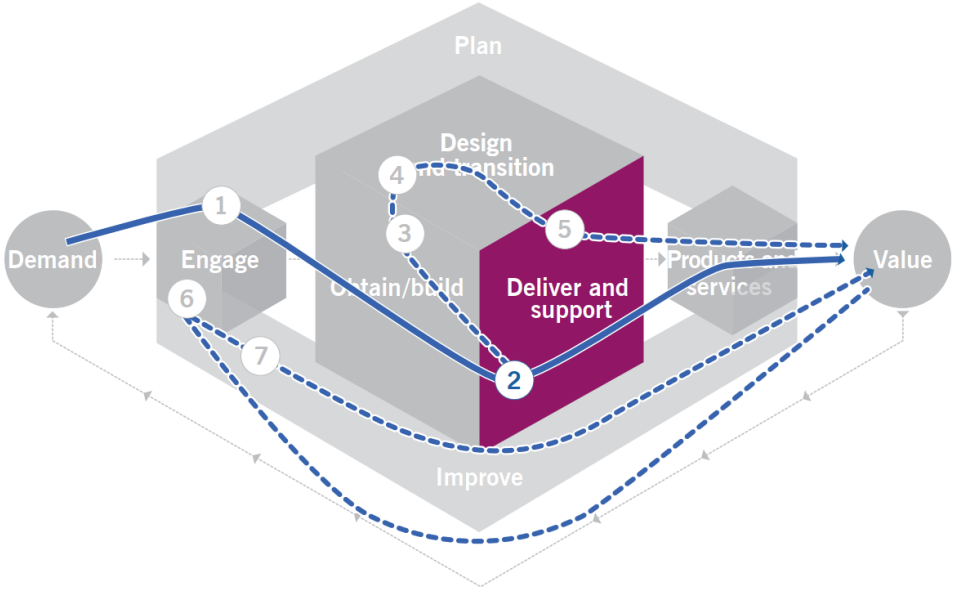


The first step in the value stream is to engage with the customer or user to recognize and acknowledge the demand and to record details about the query. At this stage, the user contact is still a query, as it has not yet been triaged and recognized as an incident.

Practices that commonly contribute to this step include:

- **Service catalogue management** Provides the information, skills, tools, and other resources needed to optimize the registration of the query.
- **Service desk** Provides the skills, tools, and other resources needed to allow the customer or user to contact service support, enable customer support agents to empathize and manage communications with the customer or user, and retrieve and communicate information about expected resolution time.

Step 2: Investigate the query, reclassify it as an incident, and attempt to fix it



As the query is recorded, a trained support agent or equivalent automation, such as chatbots, can recognize and recategorize the query as an incident, thus initiating a script or standard procedure for classifying the record accordingly. However, this could create a new incident record linked to the initial query, depending on the organization's procedures and tools.

When a user-initiated incident is registered, an attempt to quickly identify its nature and apply a known solution is usually made.

Support agents often follow a script, or workflow, of activities that allows them to attempt one or more fixes. If one of these fixes recovers the service to its normal state, value has been restored and the value stream can end. If none of these fixes work, then the issue can be escalated to a specialist role for further investigation.

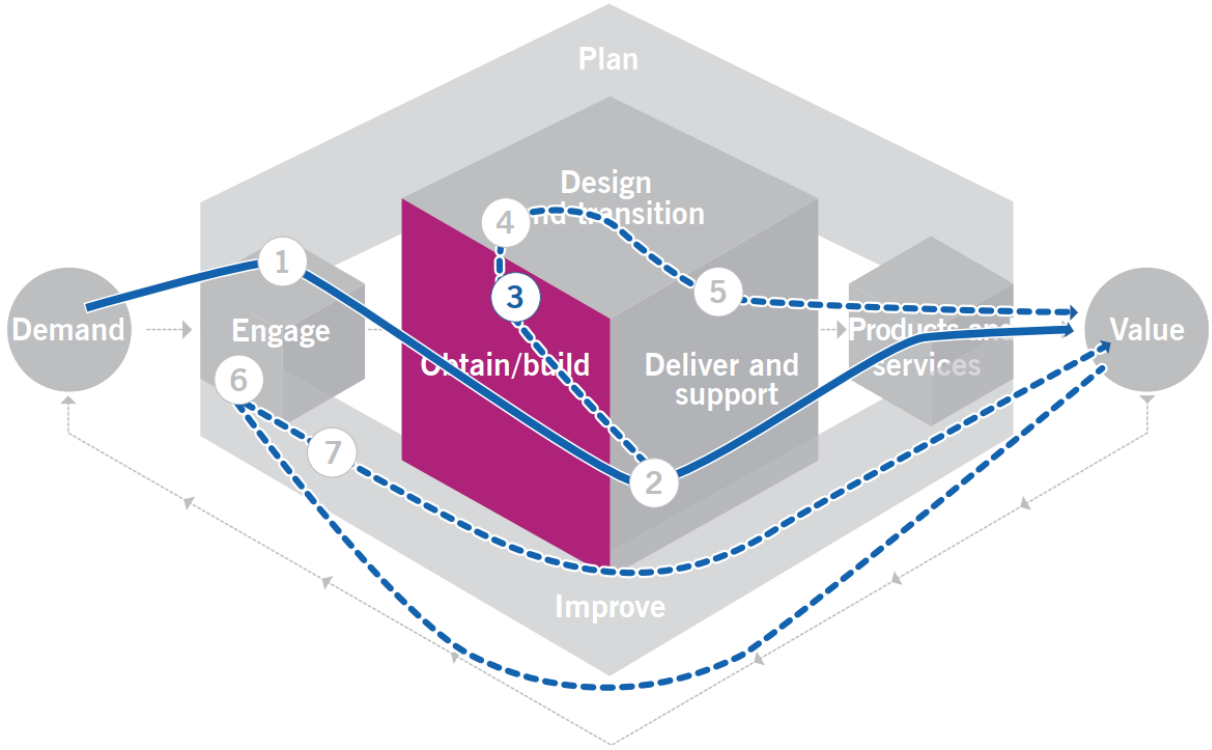
Practices that commonly contribute to this step include:

- **Incident management** Provides the skills, tools, and other resources needed to register the incident, together with information on how long it might take to resolve.
- **Knowledge management** Provides the skills, tools, and other resources needed to find technical information and workarounds that can help in the investigation, diagnosis, and fixing of the incident.
- **Monitoring and event management** Provides access to monitoring tools and logs to assist in the investigation and diagnosis of the incident.
- **Service configuration management** Assists the investigation and diagnosis of the incident, by providing information on relevant configuration items.
- **Service desk** Provides the skills, tools, and other resources needed to enable support agents to empathize with and manage communications with the customer or user.
- **Service level management** Provides information that can be used to assess the impact of the incident and plan restoration of service.

Investigation and diagnosis are often a highly technical activity. However, attention should also be paid to non-technical factors (such as environmental or financial factors) The following are possible examples:

- The reason for the network outage is because a storm is affecting local cables or satellite connectivity.
- The reason why a streaming service no longer works is because the customer's or user's credit card has been declined.

Step 3: Obtain a fix from the specialist team



In this step, the incident is escalated to, or referred to, a specialist team because initial attempts to restore theservice were unsuccessful. This can happen in several ways, depending on the context, some of which may involve passing control over to the specialist team. For example:

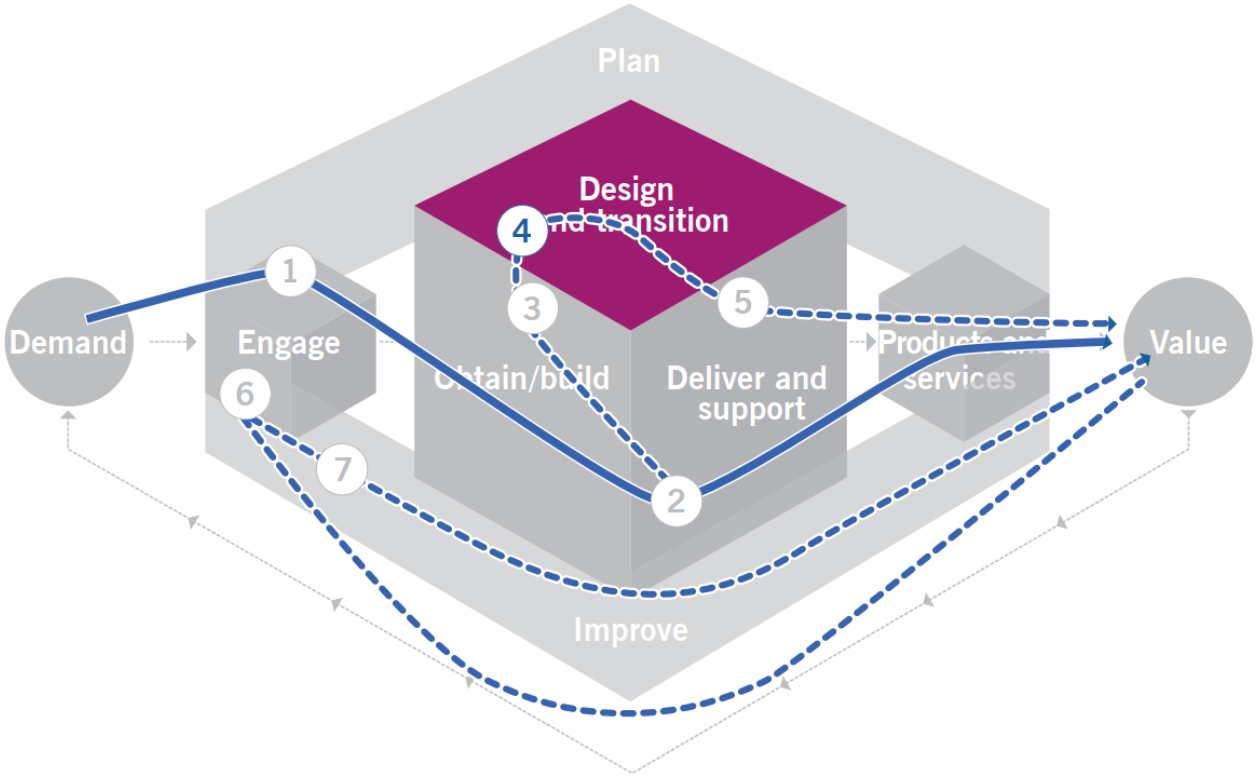
- The support agent can look for a patch on a vendor website. However, this does not pass control of the incident to the vendor.
- The support agent raises an incident with a vendor. This does not pass control of the user's incident, but instead creates a parallel incident ticket managed by the vendor.
- The support agent escalates the incident to an internal engineering team. This passes control of the incident to the engineering team.
- The support agent asks an outsourced engineering team to provide a fix. This may or may not involve passing control of the incident to the engineering team.

The fix can also be something readily available, such as a publicly available patch or upgrade. In some cases, the fix may be physical, such as replacing a faulty hard drive. Often, when dealing with custom applications or hardware, fixes have to be built before they can be deployed.

Practices that commonly contribute to this step include:

- Incident management Provides the skills, tools, and other resources needed to update the incident record with details of the activities necessary to build and test the fix.
- Infrastructure and platform management Depending on the nature of the incident, this practice might provide the skills, tools, and other resources needed to build or configure the fix to faulty infrastructure or platforms.
- Knowledge management Provides the skills, tools, and other resources needed to find technical information that can help in the investigation and diagnosis of the incident and to update existing knowledge records with information about the fix.
- Service configuration management Provides the skills, tools, and other resources needed to update service configuration records as the fix is created.
- Service desk Provides the skills, tools, and other resources needed to enable support agents to empathize with and manage communications with the customer or user.
- Service financial management Depending on the nature of the fix, this practice might need to pay partners or suppliers for resources or service components needed to resolve the incident.
- Service validation and testing Provides the skills, tools, and other resources to test the fix and confirm that it resolves the incident and meets all relevant policies and standards.
- Software development and management Depending on the nature of the incident, this practice might provide the skills, tools, and other resources needed to build or configure the fix to faulty software.
- Supplier management Depending on the nature of the incident, this practice might provide the skills, tools, and other resources needed to interact with key suppliers who can assist in building the fix.

Step 4: Deploy the fix



When the fix has been obtained, tested, and validated, it can be deployed to the user or to a production environment.

Deployment can take many forms; for example:

- using a CI/CD pipeline to distribute the fix across a production environment
- delivering a hardware component (e.g. a new hard disk) to a data centre, where it is subsequently provisioned
- delivering a hardware component (e.g. a new laptop) to the end-user office, where it is configured by the local IT support staff
- remotely logging on to the user' s PC to install a patch from a network drive.

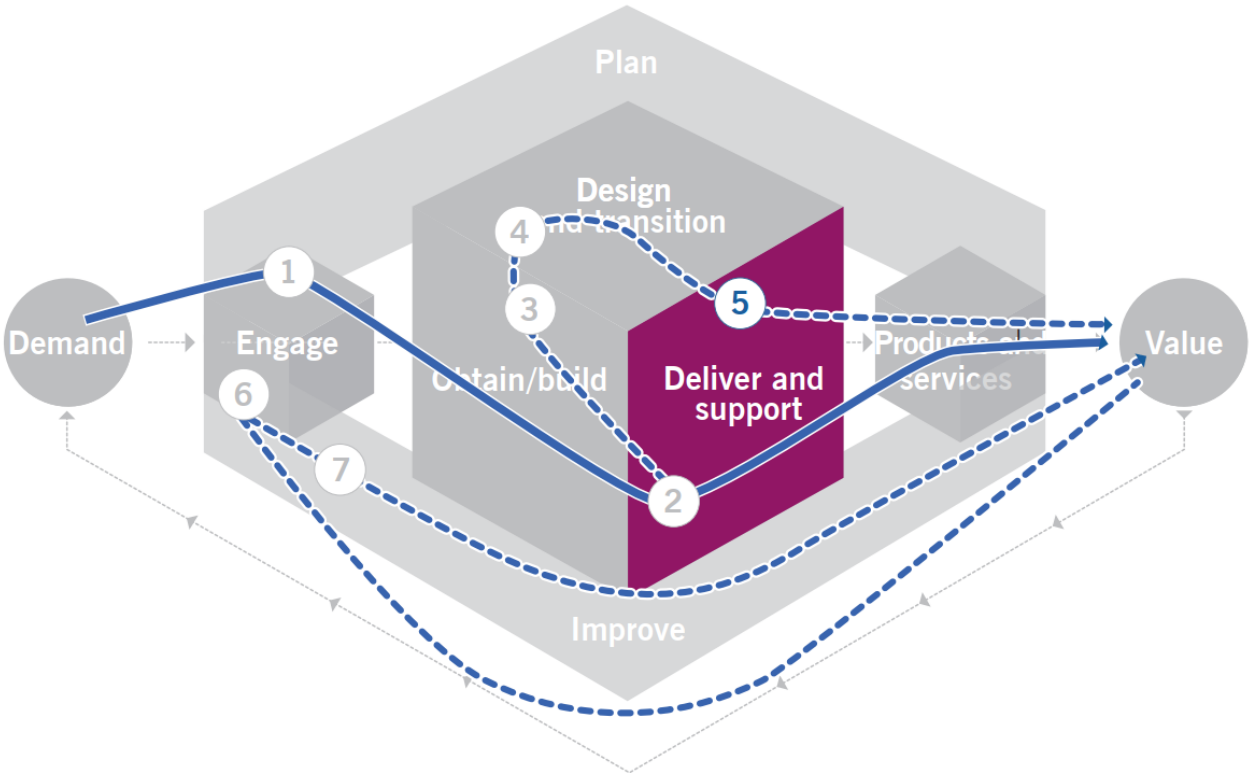
Practices that commonly contribute to this step include:

- **Deployment management** Provides the skills, tools, and other resources needed to deploy the fix to the user or to a production environment.
- **Incident management** Provides the skills, tools, and other resources needed to update the incident record with details of the activities needed to deploy the fix.
- **Infrastructure and platform management** Depending on the nature of the incident, this practice might provide the skills, tools, and other resources needed to configure and package the fix for deployment.
- **Knowledge management** Provides the skills, tools, and other resources needed to update existing knowledge records with information about the fix.
- **Service configuration management** Provides the skills, tools, and other resources needed to update service configuration records as the fix is deployed.
- **Service desk** Provides the skills, tools, and other resources needed to enable support

agents to empathize and manage communications with the customer or user.

- **Service financial management** Depending on the nature of the deployment, this practice might need to pay partners or suppliers.
- **Software development and management** Depending on the nature of the fix, this practice might provide the skills, tools, and other resources needed to configure and package the fix for deployment.
- Supplier management Depending on the nature of the incident, this practice might provide the skills, tools, and other resources needed to interact with key suppliers who can assist in configuring and packaging the fix for deployment.

Step 5: Verify that the incident has been resolved



When the fix has been deployed, the next step is to verify that the incident has been resolved. This step is quite similar to Steps 1 and 2 earlier in the value stream, as it involves the support agent communicating and empathizing with the user.

As described in ITIL Foundation, value is the perceived benefit, usefulness, or importance of something. In this model, value can be perceived differently by the user and the organization. For example:

- The user might perceive value leakage as a combination of the time it took to restore the service, associated loss of productivity, frustration from the loss of productivity, any additional issues or complications that may have arisen while waiting for service restoration, experience of working with IT support, and perceived reliability of the service. Efficient removal of the value leakage is, in turn, perceived as valuable.
- The IT support agent might calculate value based on the experience of working with the user, with specialist teams, the time taken to interact with various groups, and update

relevant records.

- The specialist team might perceive value based on the experience of working with either the IT support agent or the user, the complexity of creating and deploying the fix, and updating relevant records.

Moreover, while the incident might be resolved at a technical level, the user might need additional assistance.

For example, to:

- know that the service has been restored
- re-enable access and consumption of the service
- address any outstanding or additional concerns that arose due to the incident.

As a result, it is advisable to check back with the user to ensure that value has been restored satisfactorily. This helps in increasing empathy between IT support and the user, which can, in the long term, lead to increased trust between both parties.

The incident can be deemed to be resolved when the affected product or service is operating at optimal levels.

In other words, when value leakage has been rectified.

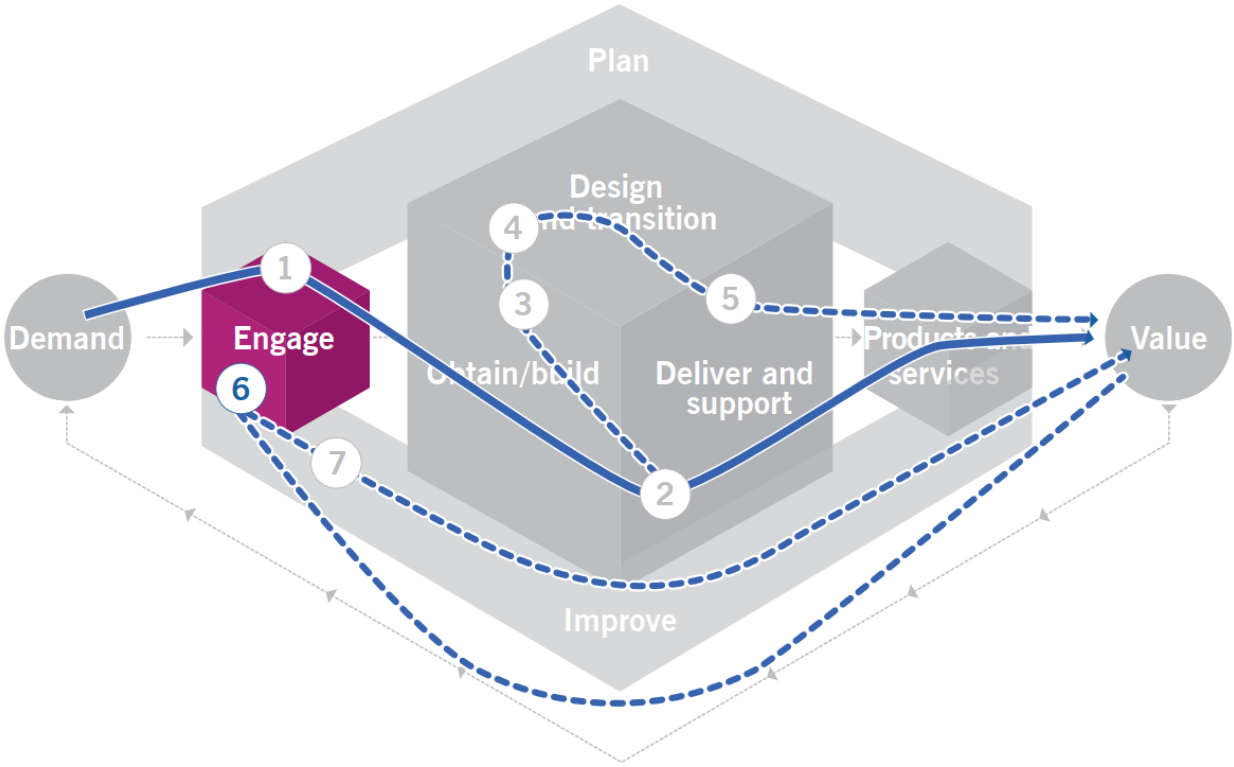
In order to distinguish between resolving and closing an incident, many IT support tools assign statuses to incident records in the following way:

- Resolving an incident means that the underlying technical concerns have been addressed.
- Closing an incident means that the fix, and associated restoration of value, has been confirmed by the user.
- Procedures to resolve or close an incident are part of the underlying design of the incident management practice and are subsequently used by the value stream. In this section, this generally refers to resolving an incident.

Practices that commonly contribute to this step include:

- Incident management Provides the skills, tools, and other resources needed to update (resolve or close) the incident record with details of the user interaction.
- Knowledge management Provides the skills, tools, and other resources needed to update existing knowledge records with information about the fix and the restoration of value.
- Service configuration management Provides skills, tools, and other resources needed to update service configuration records as the incident is resolved.
- Service desk Provides the skills, tools, and other resources needed to enable support agents to empathize and manage communications with the customer or user.
- Service level management Provides information to assess sufficiency of the restored/achieved service level and timeliness of the restoration.

Step 6: Request feedback from the user



Many organizations ask for feedback from users after incidents have been resolved in order to identify opportunities to improve the service, the way they communicate with the users, the procedures used to fix the incident, or the key practices. It is often useful to supplement this with feedback from other roles involved in the value stream, such as the IT support agent and technical specialists.

Whether giving or collecting feedback, it is important to maintain a positive attitude by exploring how to do better, rather than focusing on what went wrong. It is often hard to separate emotion and ego when discussing the history of an incident and its impact. It may also be necessary to identify and filter out environmental, personal, or professional factors that might bias the feedback, as in the following examples:

- A parent worried about a sick child might be overly negative when sharing feedback.
- An IT support agent worried about upcoming layoffs may not be focused on daily work.
- A business development manager who has landed a big sale might be more kind and forgiving of IT support issues.

Increasing empathy and trust between the user and IT support can help improve communication and reduce the impact of biases. Feedback can be collected in a variety of ways but should ultimately be stored in a central location, to aid analysis and management reporting.

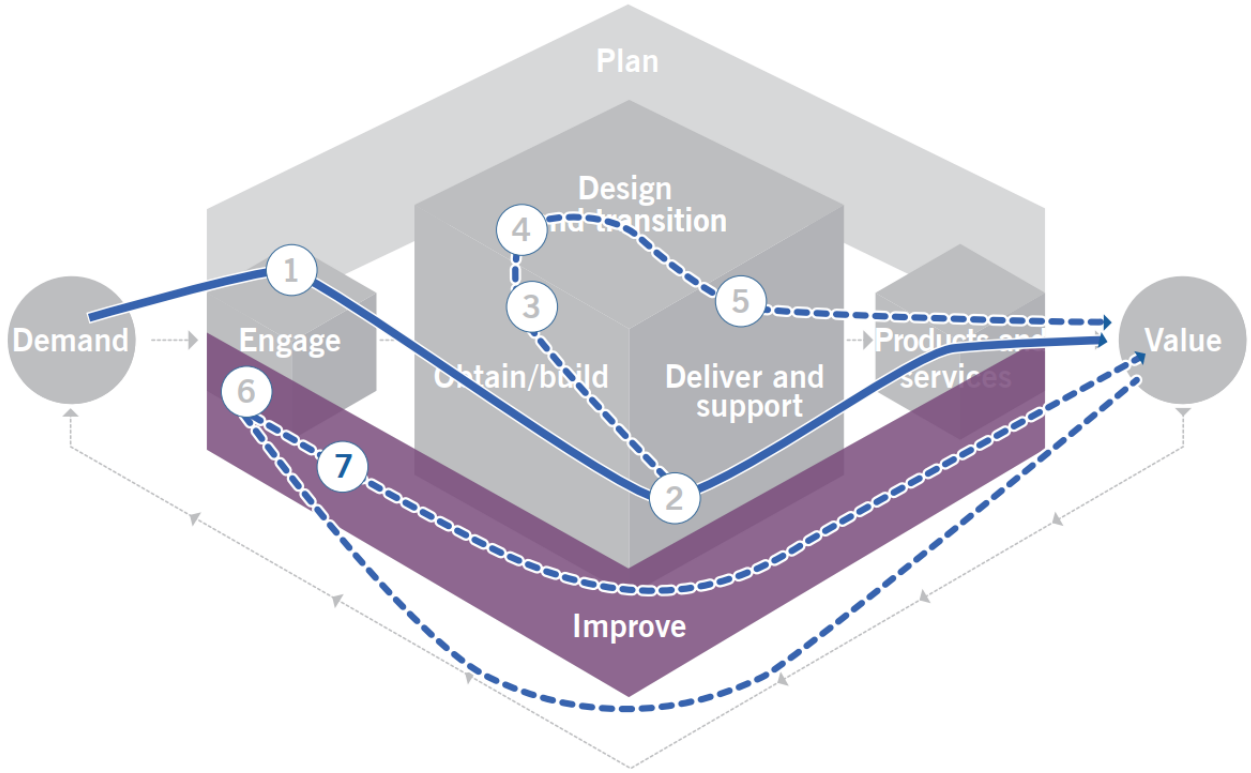
Practices that commonly contribute to this step include:

- Continual improvement Provides the skills, tools, and other resources needed to collect feedback from the user.
- Infrastructure and platform management Depending on the nature of the incident and the steps needed to resolve it, this practice might provide the skills, tools, and other

resources needed to provide relevant feedback that can be used to identify improvement opportunities.

- Service desk Provides the skills, tools, and other resources needed to enable support agents to empathize and manage communications with various stakeholders.
- Software development and management Depending on the nature of the incident and the steps needed to resolve it, this practice might provide the skills, tools, and other resources needed to provide relevant feedback that can be used to identify improvement opportunities.
- Supplier management Depending on the nature of the incident and the steps needed to resolve it, this practice might provide the skills, tools, and others.

Step 7: Identify opportunities to improve the overall system



When feedback has been collected from all relevant stakeholders, it can be analysed in isolation or in conjunction with other information, such as historical data about the service, the service provider, the service consumer organization, external constraints, etc. In this way, opportunities can be identified to improve the overall system. For example:

- the service provider organization or, more generally, the SVS and its components
- the value stream and associated steps, actions, and tasks
- the relationship with the user, partners, suppliers, and other stakeholders
- the ways of defining and perceiving value.

Any improvements identified should be logged in the service provider's continual improvement register, thus creating value for both the service provider organization and the provider's SVS. When logged in the register, improvement opportunities can be prioritized

against other work in the SVS.

Practices that commonly contribute to this step include:

- **Continual improvement** Provides the skills, tools, and other resources needed to identify opportunities to improve the SVS and its components; identify opportunities to improve the way in which feedback is collected and analysed; identify ways in which the service can be improved, and record these in the continual improvement register.
- **Deployment management** Provides the skills, tools, and other resources needed to identify opportunities to improve the practice and record them in the continual improvement register.
- **Incident management** Provides the skills, tools, and other resources needed to identify opportunities to improve the practice and record them in the continual improvement register.
- **Infrastructure and platform management** Provides the skills, tools, and other resources needed to identify opportunities to improve the practice and record them in the continual improvement register.
- **Knowledge management** Provides the skills, tools, and other resources needed to identify opportunities to improve the practice and record them in the continual improvement register.
- **Monitoring and event management** Provides the skills, tools, and other resources needed to identify opportunities to improve the practice and record them in the continual improvement register.
- **Problem management** Provides the skills, tools, and other resources to investigate and mitigate possible causes of the incident(s).
- **Risk management** Provides the skills, tools, and other resources to manage new risks that have arisen, or existing risks that have changed, due to the incident or the fix.
- **Service configuration management** Provides the skills, tools, and other resources needed to identify opportunities to improve the practice and record them in the continual improvement register.
- **Service desk** Provides the skills, tools, and other resources needed to identify opportunities to improve the practice and record them in the continual improvement register.
- **Service financial management** Provides the skills, tools, and other resources needed to identify opportunities to improve the practice and record them in the continual improvement register.
- **Service validation and testing** Provides the skills, tools, and other resources needed to identify opportunities to improve the practice and record them in the continual improvement register.
- **Service level management** Provides the information, tools, and skills to register and assess service improvement initiatives.
- **Software development and management** Provides the skills, tools, and other resources needed to identify opportunities to improve the practice and record them in the continual improvement register.
- **Supplier management** Provides the skills, tools, and other resources needed to identify opportunities to improve the practice and record them in the continual improvement register.

4.3 Using value streams to define a minimum viable practice

The value stream design and documentation techniques described in earlier sections help the service provider understand the nature and flow of work, from demand to value, and the contributions from organizational resources and practices that enable that flow.

The same techniques can also be used to define the minimum set of contributions needed from a practice that benefits the organization or a stakeholder and allows for learning and continual improvement.

Example of minimum viable practice contributions for service configuration management

Service configuration management practice	
Contribution	Purpose (step in value stream 1 or 2)
Provides information on currently operational services and configuration items as well as the skills, tools, and other resources to update service configuration records as service components are built	Build, configure, or buy service components (Step 4 in value stream 1)
Provides information on currently operational services and associated configuration items	Decide whether to invest in the new service (Step 2 in value stream 1)
Provides information on currently operational services and configuration items as well as the skills, tools, and other resources to update service configuration records as service components are built	Deploy service components in preparation for launch (Step 5 in value stream 1)
Provides skills, tools, and other resources to update service configuration records as the fix is deployed	Deploy the fix (Step 4 in in value stream 2)
Provides information on currently operational services and associated configuration items	Design and architect the new service to meet customer requirements (Step 3 in value stream 1)
Provides the skills, tools, and other resources needed to identify opportunities to improve the practice and record them in the continual improvement register	Identify opportunities to improve the overall system (Step 7 in value stream 2)
Assists the investigation and diagnosis of the incident by providing information on relevant configuration items	Investigate the query, reclassify it as an incident, and attempt to fix it (Step 2 in value stream 2)
Provides information on currently operational services and associated configuration items Provides information on current live services and service components to provide context when describing the demand	Understand and document service requirements Acknowledge and document the service requirements (Step 1 in value stream 1)
Provides skills, tools, and other resources to update service configuration records as the incident is resolved	Verify that the incident has been resolved (Step 5 in in value stream 2)

Thus, if challenged about the lack of a specific functionality or skill set, the logical response would be to investigate what value stream step requires that contribution, which may lead to one of two options:

- dropping the requirement to build the functionality or skill set
- documenting a new value stream, or an amendment of an existing value stream, that acknowledges the need for the new functionality.

In the example above, if a senior manager challenges the service configuration management practice owner on why the practice does not support the regular audit of the IT landscape to identify configuration items that have not been recorded, the discussion could lead to either of the following outcomes:

- Mutual agreement that the functionality is not needed.
- The identification of a new, or hitherto undocumented, value stream in which configuration items are regularly audited.

The adoption of a minimum viable practice approach will help organizations avoid investing in skills, tools, processes, and other resources that are not needed by the organization. This will:

- lower the total cost of ownership (TCO) of the practice
- increase the return on investment in service configuration management.

4.4 Summary

A value stream is a representation of a journey through the service value chain, showing how work flows across an organization as it creates, enhances, or supports products and services that co-create value with the service consumer. Value streams and processes are one of the dimensions of service management, depicting the steps, actions, and tasks required to co-create value from demand.

Value streams are also highly contextual and reflect the scope of control and influence of the organization, as well as the scenario or type of demand. Value streams reflect a level of granularity that is sufficient to communicate the flow of work. Value streams can be depicted as linear flows or as iterative loops. They can reflect an aspiration of how work should flow, or they might reflect how work flows across the organization.

In certain scenarios, value streams can also cascade across several organizations. For example, a step in a cross-organizational value stream could be the entire value stream of one participating organization.

Within a value stream, step, action, or task, an organization can identify the contributions (people, tools, information, processes, etc.) that need to be provided by the organization's practices. This information can be used to optimize the service value system and its components.

5 Prioritizing and managing work

5.1 Why do we need to prioritize work?

Queues occur wherever the demand for work exceeds the capacity to complete it within the expected timeframe. In an ideal situation, an organization would have no variation in demand and would have the appropriate quality and quantity of resources needed to satisfy it. However, organizations often need to contend with having a fixed capacity but a varying demand for services. This imbalance creates queues or backlogs in which work items need to be prioritized.

Prioritization is an activity commonly associated with support and software development work (e.g. prioritizing incident records or prioritizing a sprint backlog), but its use is universal.

5.1.1 Managing work as tickets

A ticket is a record of work. Before the widespread adoption of digital systems, paper forms were a common communication medium, sitting at the centre of the workflow process. These tickets were often constructed with a ruler, pen, and typewriter and would be photocopied, manually completed, and placed in the physical in-tray of the next employee in the documented process. Although the data might have been entered into an electronic system at some point, the physical ticket itself was the vehicle through which the data (and the response to that data) evolved.

The emergence of business IT systems and the normalization of computer-based work meant a fundamental shift in the media used for information capture and transmission, but it did not change the underlying ticket process. The data fields on paper forms became database tables controlled by software applications. Those tables were shown to users as on-screen forms, each typically composed of a collection of fields arranged in a familiar way. In other words, the software user interface echoed the paper form.

Digital forms were an extraordinary improvement over physical ticket systems for many reasons. Data transmission was instantaneous, replacing the time-consuming movement of internal office envelopes through physical company postal systems. Data could be made more consistent through the control of the nature of what could be entered into the given fields. Buttons and other controls improved automation and provided better guidance to the user. The main driver for the design, however, was arguably the data itself: user experience was not the primary consideration.

For some time, customer service industries, including IT service management, have designed support structures and workflow practices around data manipulation on ticket forms and the transfer of those tickets from one assignment list to another. Negative impacts are common and include, for example:

- hotel check-in procedures involving lengthy typing by a front-desk employee
- telephone support agents having to pause the conversation while they complete on-screen forms
- customers being asked to enter the same details on consecutive forms because their specific requirements necessitate several tickets

Just as paper tickets used to amass in physical in-trays, electronic tickets often accumulate in assignment lists. A core principle of Lean manufacturing, the industrial philosophy which underpins Agile and DevOps, is that work queues represent interruptions to the flow of work. Lean, Agile, and DevOps focus heavily on the reduction of accumulated work-in-progress. Consequently, many IT professionals have a negative opinion of queues.

It is important to recognize that the ticket represents a discrete unit of work and its current state within its expected lifespan. A busy service provider performs many tasks and activities simultaneously, so it is vital that they have the means to record and track their work. Without this, the risk of chaos, data and information loss, and a lack of accountability is high; all of these have significant consequences for the risk management and overall governance of the organization.

Hence, tickets are important. They enable prioritization, communicate the current state of any given task to anyone who should know it, and enable high-value behaviours. Even after the work has been completed, the archive of recorded tickets continue to provide value as a source of data for management reporting and analytics.

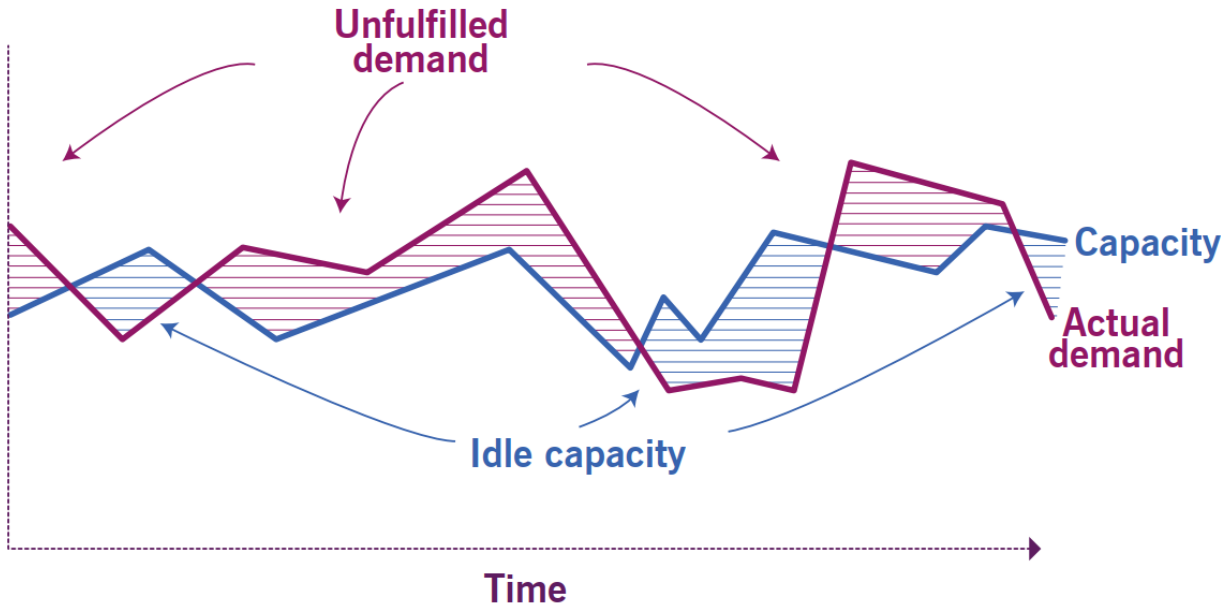
Nevertheless, the user experience and behaviours that have built up around tickets can cause problems. Tickets do not cause queues to happen: queues are not a fundamental property of a ticket. Rather, queues are the result of the way the organization allocates people and other resources to manage the tickets.

Recently, service providers have differentiated themselves by moving away from the digital equivalents of forms to polished interfaces that obscure the record-keeping experience. These new interfaces significantly enhance user experience because the interface is a more human representation of the work and context, although the system still performs data entry and record keeping.

Effective service design does not require the avoidance or elimination of tickets, but it does require that they are not the dominant influence on the user’s experience. Design-thinking principles are crucial, encouraging the service designer to focus on the stakeholders’ specific challenges and identify user-focused solutions.

5.1.2 Prioritization and demand management

The prioritization of work to create, deliver, and support services is necessary for co-creating value while minimizing the costs and risks that arise from unfulfilled demand and idle capacity. Prioritization is thus a technique within an organization's risk management practice.



Demand variations and their effect on capacity

At a high level, if demand is created when idle capacity exists, then there is no need to prioritize the work; the work can start immediately. However, when demand exceeds capacity, organizations have the option of managing the demand in order to minimize the queue and thus avoid the need to prioritize the work. Examples of this include:

- reducing variations in demand for value by:
  - using pricing mechanisms based on volume of work (e.g. the first ten requests for a service are charged at a lower rate than the next ten)
  - using pricing mechanisms based on when demand occurs (e.g. a restaurant offering a discount on week-night service)
  - using pricing mechanisms based on quality (e.g. a business class plane ticket costing three times more than an economy class plane ticket)
  - altering customer expectations about the length of time needed to complete work (e.g. requests made after 11am will be completed the following working day)
- reducing variation in how much demand is taken into a value stream or step (e.g. employees only being allowed to submit one request per quarter to change their benefits)
- increasing how much demand can be satisfied within a given period of time; for example, by:
  - using automation to accelerate the processing of toil (common and repetitive tasks that scale in a linear fashion)

  - increasing the size of teams or the number of teams so that more work can be done in parallel
- reducing the cost of increasing or decreasing capacity; for example, by:
  - using elastic cloud platforms to swiftly increase or decrease available computing power
  - outsourcing staffing requirements to professional services organizations
- using shift-left techxs to deflect demand or prevent demand from being created; for example, by:
  - using a self-service knowledge base that enables users to troubleshoot common issues without the need for specialist skills
  - using automated testing, integrated with development tools, to reduce the demand for separate testing and validation resources prior to deployment.

The above list highlights common methods for managing demand but, depending on context and complexity, other methods might be more appropriate.

5.1.3 How to prioritize work

The prioritization of work can occur at various levels of granularity, with a variety of implications for the wider system, and with various levels of impact on user or customer experience. For example:

- Prioritization conducted at a value-stream level increases the need to manage user or customer expectations in order to keep them engaged and to provide regular status updates. This is because, from their perspective, the realization of value is being delayed.
- Prioritization conducted at a value-stream step, action, or task level can result in a constraint in the flow of work. Resources that are waiting to be utilized later in the value stream may remain idle, or a build-up of work (a queue or a backlog) may form earlier in the value stream. This phenomenon is commonly referred to as ‘creating a bottleneck’ or ‘creating a constraint’.

As much as is possible, prioritization should be data driven, rather than emotionally driven, and it should consider all available information that affects the demand and workflow.

There are many different techniques for prioritizing work to minimize queues and wait times. These techniques can be broadly categorized as follows:

- **Resource availability or quality** Prioritization is determined by the availability of resources to complete the work. For example, if an infrastructure support team has one networking specialist to whom every network support case is assigned, then the team should prioritize non-network-related cases whenever the network specialist is occupied.
- **Current workload** Prioritization is determined by the current workload of the resource, provided there are no differences in quality between resources or variations in the sizes of work items, For example, support-centre automation might assign incoming calls or chats to support agents who are not currently engaged with a user, or to agents with smaller workloads.
- **Age** Prioritization is determined by the age of work items; for example:
  - **First-in, first-out** The oldest waiting item is actioned.

- **Last-in, first-out** The newest waiting item is actioned.

- **Time factors** Prioritization is determined by the time required to complete work items; for example, by:
- **Shortest item first** The item that can be completed the quickest is actioned next
- **Longest item first** The item that requires the most time to complete is actioned next.
- Economic or financial factors Prioritization is determined by the monetary benefits and costs of work items.

For example, an organization that has the capacity to process just one work item is likely to prioritize the item that has the highest economic benefit, such as that which earns most revenue, has the highest financial impact, or has the highest return on investment.

- **Economic penalties** Prioritization is of work items subject to economic penalty, such as a compliance feature that will reduce a regulatory fine.
- **Source or type of demand** Prioritization is of work items that are entitled to more immediate attention, such as a request from the CIO of an organization. Commonly, organizations create levels of entitlement (and set prices accordingly); for example, technology vendors and support service providers may implement a tier-based system in which silver-tier customers are prioritized over bronze-tier customers.
- **Triage** Prioritization is determined by urgency, based upon an assessment of the impact a delay may cause. For example, a doctor would prioritize treating a broken bone over a cold. Less urgent needs are only considered when more urgent needs have been addressed. Organizations should supplement this technique with procedures to ensure that low priority work is not left unattended. For example, support organizations often increase the priority of open support issues when certain deadlines or thresholds approach.

It is important to note that prioritization techniques are context-specific. A technique that works for one environment or type of work might not work for another. At the same time, it is useful to align the prioritization of all types of work against a simple set of common objectives. For example, the prioritization of:

- **Continual improvement opportunities** These can be determined in the same way as other projects, such as using ROI estimates.
- **Incidents** These can be determined in the same way as items in a development backlog (e.g. using economic benefit/ penalty estimates).

It is also common to find several prioritization techniques working together. For example:

- In the Cost of Delay14 method, prioritization considers the economic impact or penalty over urgency.
- In the Weighted Shortest Job First (WSJF)15 method, prioritization considers the Cost of Delay and the duration of the work.

A common technique for prioritizing incidents is to consider both impact (an economic factor) and urgency (a time factor). Work prioritization should be revised periodically or as more work enters the system; this allows for the dynamic reallocation of resources to manage queues.

5.1.4 Swarming

Swarming16 is a method of managing work in which a variety of specialist resources or

stakeholders work on an item until it becomes apparent who is best placed to continue with the work, at which point the others are freed up to move on to other work items.

Swarming is an alternative to hierarchical organizations of specialist resources, where work escalates until it reaches the right level of competency and authority. The disadvantages of a hierarchical structure, which swarming addresses, include:

- Each tier has its own queue of work items, which affects:
  - the total work in progress
  - the time taken to find the right specialist to complete the work.
- Work can be reassigned between tiers, either from a lower tier to a higher tier, or vice-versa. A team that escalates work, by definition, does not have the right skills to complete the work. This might also mean that the escalating team might not have collected or might have misunderstood the information necessary to complete the work, which might result in work items being sent back or escalated to the wrong group. For example, a service desk agent might presume that a user complaint about the failure to print a document was a printer issue, when the issue might actually be a network outage.
- Easily solved cases may be escalated to higher tiers, leading to overloaded specialists who should be focusing on more difficult cases.

Swarming seeks to address these disadvantages by:

- creating a single cross-functional and self-organizing team with a dynamic and flexible structure, and which reacts to the work that comes in
- relying heavily on good communication and collaboration, both within the team and with external stakeholders
- focusing on avoiding queues
- sharing and encouraging the development of skills and experience across all team members.

Organizations typically utilize a mixture of swarming techniques alongside ones that are appropriate for tiered structures. For example:

- assigning a person to own a work item until it is completed, even though the work could be completed by someone else in the swarm
- using swarming within specialist hierarchical groups to reduce negative behaviours within each tier.

Because of the self-organizing nature of swarming, there are no definitive categories or types of swarms. However, some examples from real organizations include:

- Dispatch swarms These meet frequently throughout the day to review incoming work, select quick-tocomplete items, and validate that the correct information has been recorded for work which requires onward assignment.
- Backlog swarms These convene on a regular or ad-hoc basis at the request of product or service specialists who need input from members of other specialist groups, thereby avoiding delays as work items get reassigned between teams and queues.
- Drop-in swarms Experts are either made continuously available or they continuously monitor the activity of other teams in order to decide if and when to get involved.

The adoption of swarming can be challenging and may require a review and realignment of

many of the organization's practices to support new ways of working. The organizational change management practice can help to smooth the transition and ensure that lasting benefits are achieved by managing the human aspects of the change. Commonly encountered challenges include:

- justifying a perceived increase in the cost of work, which may occur if higher-skilled staff are involved earlier in the work stream
- switching from a performance review model based on individual contribution (which is often difficult to describe or quantify in a dynamic and self-organizing team) to team contribution, which can be monitored at the output or outcome level
- accepting the fluidity and high degree of collaboration required to form successful swarms
- ensuring that individual contributors do not disrupt discussion or dominate decision-making processes
- securing executive support to loosen or suspend adherence to rigid or prescriptive processes, funding, and policies.

These concerns may be reduced if the measurement and reporting of work (and workflows) shows that the benefits are greater than the perceived or actual costs (e.g. reduced completion times for development work).

5.1.5 Shift-left approach

Shift-left is a term that arose out of software testing circles but is relevant in other areas of IT and service management. Shift-left involves moving work closer to its source. The value-stream design principle states that highly interdependent tasks should be combined rather than performed as a sequence of specialized tasks. Shift-left is an integrated approach to improving the flow, efficiency, and effectiveness of work. It is used to move the delivery of work toward the optimum team or person with the aim of improving lead times, resolution times, customer satisfaction, and efficiency. In development environments, this means moving bug-fixing activities to the frontline of build and test teams earlier in the lifecycle. In support environments, repair or problem-solving activities can be moved from the higher-level technical teams to generalist frontline teams.

In the software development lifecycle, where the shift-left approach is more familiar, the first step is to gather requirements, which is followed by design, development, testing, and support. Applying shift-left to software development involves testing earlier in the lifecycle. Placing the testing software closer to the step for gathering requirements results in a reduction of the number of defects that are found in the production step. Consequently, this lowers the cost of resolving those defects by a significant factor. Research has shown that defects identified in production are far more expensive to fix than those identified in the design phase.

Shift-left is applicable in numerous management practices, including release management, deployment management, service validation and testing, service request management, and the service desk. It improves the quality of the work and the speed with which it is performed, and reduces the need for and cost of rework. It requires more knowledge and skills, because practitioners (or, in some cases, users) need to perform a broader scope of tasks. It can also lead to higher employee satisfaction (unless the extra tasks are too challenging, in which case there may be implications for recruitment). Comparing these benefits with the cost of having the right competencies determines whether an investment in shift-left is justified.

Shift-left is not limited to the service provider's tasks. It can also be used to shift tasks to the service consumer, if they are willing and able to acquire the necessary competencies and to take responsibility for performing the tasks.

In software testing, where the term 'shift-left' originated, testing is not organized as a separate task that is performed after the software code has been developed. Rather, testing is performed as an integral part of each step of software development, beginning with testing the requirements and design. There is a shift from tester to testing. Testing is no longer performed by testing specialists but by multiple practitioners. The role of the testing specialist shifts to ensuring that others are able to perform the tests.

Similarly, information security can also be shifted left by embedding information security tasks into the daily work of development and operations. This contrasts with the traditional approach of giving these responsibilities to a specialized information security officer, who controls whether products and services conform to requirements. This is often referred to as DevSecOps.

Building a shift-left approach

Step	Activities
Identify shift-left opportunities and goals	Review data from a variety of sources, including: ● customer and other stakeholder feedback, on time, cost, or quality metrics ● delays in the flow of work due to handovers between teams ● project interruptions for repetitive incident support ● rework to fix bugs or defects, or other service quality concerns ● staff frustration/feedback
Clarify the costs and benefits of improvement	Data is needed to support a business case and communicate expectations by, for example: ● cost, time, quality, or experience metrics ● results from a high-level cost – benefit analysis ● identifying affected areas, including practices, processes, people, teams, structures, ● policies, training, recruitment, roles, and remuneration
Set targets	Define new targets, based on the type of work and the goals. For example: ● resolution/fulfilment times ● number of escalations/interruptions ● number of deployments per day ● customer or other stakeholder satisfaction ratings ● number of audit failures
Set up the improvement initiative	Activities include: ● deciding on actions and building them into a coherent strategy ● planning the work required ● working with key people to sell benefits and impact ● communicating with employees and stakeholders ● establishing rapid feedback channels
Progress incrementally with feedback	This step can include any of the four dimensions of service management. For example: ● pilot specific tasks to leverage quick wins ● periodically analyse quantitative or qualitative feedback, and adjust the shift-left

	approach ● move a percentage or a number of tasks per month ● benchmark current performance ● retrain or redeploy staff ● review changing roles and responsibilities ● adopt new processes or work instructions ● implement or change automation ● review and modify contracts with partners and suppliers ● update the service catalogue ● define new measurements to track benefits
Review outcomes	On a periodic basis, or when the initiative ends, it is important to: ● identify the achieved benefits, as well as the lessons learned ● communicate the achieved benefits to employees, customers, and other stakeholders

The same principles can be applied within other domains. For example:

- The division of tasks across first-line, second-line, and third-line support can be reorganized so that first-line service agents are capable of managing more challenging calls.
- Change approval judgements can be taken by knowledgeable developers rather than by a separate change advisory board.

The approach involves reviewing feedback and measurement to assess the current flow of work, followed by an adjustment to the ways in which the work is organized and delivered: moving testing closer to coding, automating where possible, and moving support activities closer to the customer.

In an organization that is suffering from poor customer feedback and frequent project interruptions, and which has demand for reduced service delivery resolution times, shift-left can address those areas of need.

.When done well, a shift-left approach can lead to the following improvements:

- faster resolution times, leading to increased productivity for the consumer and, therefore, increased customer satisfaction
- a reduced number of interruptions and, therefore, an increase in completed projects.
- a reduction in cost per incident, owing to the availability of a self-service interface that facilitates highvolume requests and offers relevant and accurate resolutions to common issues
- an increase in the variety of tasks that team members can perform, leading to improved employee satisfaction and retention.

5.2 Commercial and sourcing considerations

The service provider has the option of creating the service components themselves, or obtaining them from partners or suppliers.

It is important to remember:

- A partner is an organization that provides products and services to consumers and works closely with its consumers to achieve common goals and objectives.
- A supplier is an organization that provides products and services to consumers but does not have goals or objectives in common with its consumers.
- 'Vendor' is a generic term used to describe any organization that sells a product or service to a customer. From the service consumer's perspective, a vendor can either be a partner or a supplier, or it can have no direct service relationship with the service consumer. A vendor can also be a partner in some areas and a supplier in others. For example:
  - A cloud services provider might supply infrastructure services to a consumer, but also partner with that consumer to implement tools that allow the consumer to maximize their consumption of those services.
  - A customer service provider might supply skilled staff, tools, and other resources to a consumer, but also partner with that consumer to run a marketing campaign that highlights the quality of their customer care.

This section refers to 'service components' as a generic term that can cover people, tools, information, or any other type of resource that is used to create, deliver, or support products and services. It uses 'organization' to refer to the buyer or consumer of services, and 'vendor' to refer to the provider of services.

It is increasingly rare for organizations to create products and services using only their existing resources. As a result, organizations frequently have to decide whether to build or buy service components. These decisions should be made using data and evidence rather than emotion, rumour, or unconfirmed reports. In response to the growing complexity of such decision-making, many organizations, especially large enterprises, adopt formal sourcing strategies in which they consider factors such as:

- the organization' s current and future sourcing needs
- the current and estimated future costs of sourcing service components (often, the TCO is considered)
- the scarcity of resources in the ecosystem
- the influence of competition, suppliers, and customers within the ecosystem
- the barriers preventing new suppliers from emerging, and those preventing existing suppliers from winding down
- the costs and risks of sourcing components from an array of suppliers.

These considerations are used to form a sourcing strategy, along with associated plans and models on how to source each type of service component.

5.2.1 'Build vs buy' considerations

It is important to recognize biases or pressures that arise from:

- familiarity with a prior version of a tool, or with the tool vendor's products and services
- prior experience in using the product and service without recognizing the difference in context
- a strong desire to work with new tools or skills simply because they are new
- aggressive sales tactics by the vendor
- pressures to reduce cost, often at the expense of quality.

Building service components using existing resources works better in contexts where:

- the service component heavily relies on knowledge of the organization and its business
- customer demand for personalized products, services, or experience is high
- the ecosystem is volatile or subject to rapid change (e.g. when customers face little or no cost when switching between competitors, the provider's business model is rapidly changing, or the use of products or services is evolving)
- service components lack mass-market adoption
- compliance to standards and policies is a high priority
- the service provider is undergoing rapid growth, either organically or through acquisitions or transformations, which can lead to inconsistent or frequently changing requirements.

Buying (or otherwise acquiring) service components from partners and suppliers works well when:

- in-house resources are scarce or highly utilized in other areas
- the skills or competencies needed to create, operate, and maintain the component are highly specialized and would take time to build (e.g. most organizations do not manufacture their own computing equipment)
- the processes to build products and services are immature and need to be developed and implemented
- components or services are highly commoditized
- the demand for service components is low or subject to significant fluctuation (e.g. seasonal demand or demand triggered by rare events)
- the service component is not core to the strategy, brand, or competitive differentiation of the service provider
- creating the service component is predictable and repetitive work
- the ecosystem is stable and generally not subject to volatility.

5.2.1.1 Commodification

As technology adoption increases, there is often a need for higher-order tools to manage technology more efficiently and effectively.20 For example:

- As the use of data centres became more prevalent and as computing power increased, virtualization tools emerged to manage virtual infrastructure.
- As the cost of computing and storage fell, and as virtualization tools matured, cloud computing models (infrastructure-as-a-service) emerged.
- As cloud computing models matured, other cloud-enabled platforms emerged, such as platforms-as-aservice, software-as-a-service, and more recently, functions-as-a-service.

This means that when considering whether to build or buy a service component, it is important to consider the current level of 'commodification' and ongoing industry trends to commodify that component.

5.2.1.2 Defining requirements for service components

When defining requirements, an organization should reflect the needs of all relevant stakeholders. As a result, requirements for service components should cover a broad range of topics and should not be limited to the functional needs that are articulated by users. Requirements that other stakeholders might address include:

- maintainability and supportability of the component
- geographic location of vendor resources
- cultural alignment between the organization and the vendor
- cost of service consumption (e.g. skills needed in-house, and financial outflow over time)
- alignment with the organization' s business, technical, and information architecture
- vendor brand and public image
- interchangeability of vendors.

A common approach to defining requirements is to focus on the technical (functional and non-functional) features of a product or the technical quality of a service. However, it is frequently better to define requirements using outcomes. For example, a technical requirement to:

- 'use email' could be phrased as 'communicate with users' when described as an outcome requirement
- 'check-out and check-in code' could be phrased as 'version control code' when described as an outcome requirement.

A key challenge when defining requirements for service components is determining which features are essential and which are merely beneficial. For example, when defining requirements for:

- an incident management tool, an organization might consider integration with the corporate email system to be essential, and integration with SMS or text messaging systems to be beneficial
- a code repository tool, the requirement to 'check out' and 'check in' code might be deemed essential, and the ability to send notifications when a code has been changed might be deemed beneficial.

Defining and prioritizing requirements is often a complex and emotionally charged exercise. The MoSCoW method is a simple prioritization technique for managing requirements. It relies on cooperation, and often negotiation, between all relevant stakeholders. As a result, it allows stakeholders to explicitly agree on priorities.

The MoSCoW acronym stands for:

- Must have The mandatory requirement covering the most important needs.
- Should have The requirements that should be included if possible.
- Could have The requirements that could be included if they do not affect the 'should' or 'must' requirements.
- Won't have Requirements that will not be included this time but may be included in a future release.

The method covers the requirements that will not be delivered. This is useful, as lists are commonly overpopulated with unnecessary requirements, such as reports that nobody needs. These requirements increase cost without adding value.

5.2.1.3 Selecting a suitable vendor

When looking for a vendor, organizations typically publish requirements for services or service components and invite potential partners and suppliers to respond. Depending on the needs or context, this exercise can be termed either:

- **A request for quote (RFQ)** This technique is used when requirements have been defined and prioritized, and the organization needs information on:
  - how vendors might meet requirements
  - how much it might cost to meet the published requirements.
- **A request for proposal (RFP)** This technique is used when the problem or challenge statement has been clearly articulated, but the exact requirements or specifications of the service components are unclear or likely to change. Vendors need to provide recommendations or potential solutions, articulating benefits and outcomes as well as costs.
- **A request for information (RFI)** This technique is used when requirements are unclear or incomplete and external assistance is needed to refine or add requirements. RFIs are often followed by an RFQ or RFP.

In some cases, organizations can include their internal IT teams to participate as a vendor when conducting their search for a suitable vendor. This approach allows organizations to compare their internal IT with external organizations. However, where this occurs, it is important to:

- recognize the difference in relationships and ensure that colleagues are not treated as vendors
- understand that the internal IT operating model shares the same characteristics, strengths, weaknesses, opportunities, and threats as the wider organization
- balance the often-higher cost of in-house resources with the shared knowledge and goals that these resources have with the wider organization.

Ideally, a vendor will reflect the organization's vision, mission, ethics, and principles, thus minimizing friction and tension between the two groups. In many cases, a vendor can be

seen as an extension of the organization's brand. It is critical that this idea is considered and remembered throughout the selection process.

5.2.2 Sourcing models and options

A sourcing model is a component of an overall sourcing strategy. It describes topics such as:

- the conditions under which the organization will source service components or a specific type of component
- the roles and responsibilities of the vendor
- the degree of oversight that the organization requires over the vendor resources
- vendor assessment criteria, such as
  - service levels, warranties, and guarantees
  - geographic coverage
  - time to deliver
- general management policies, such as:
  - payment terms
  - use of preferred suppliers and an exception management process
  - use of RFI, RFQ, or RFP techniques
  - standard terms and conditions when engaging with vendors.
- financial management policies, such as:
  - capitalization payments made for service components
  - acceptable price ranges or pricing models
  - tax reporting.

An organization may have many sourcing models, which reflect factors such as:

- line of business
- budget accountability
- type of service component (for instance, there may be a model to source contractors, another to source computing equipment, another to source infrastructure, etc.)
- reporting, auditing, and compliance requirements.

The selection of a particular sourcing model will reflect the organization's framework for managing, reporting, auditing, and ensuring compliance with the organization's vision, mission, ethics, and values across its service supply chain. Within each line of business, the differences in the models will have a significant impact on who is accountable and who is responsible for the work.

Common sourcing models include:

- Insourcing Where the organization' s existing resources are leveraged to create, deliver, and support service components
- Outsourcing Where the organization transfers the responsibility for the delivery of specific outputs, outcomes, functions, or entire products or services to a vendor; for

instance:

- a local data centre vendor is used to provide computing and storage resources
- a recruitment agency is used either to source candidates for open roles or to find contractors.

Outsourcing models can be further subdivided based on the location of the vendors or their resources. This categorization might not apply when describing many technology vendors or providers of cloud computing services (infrastructure-as-a-service, software-as-a-service etc.) because the physical location of vendor resources is not always publicized. There are three categories of vendor location:

- Onshoring Vendors are in the same country.
- Nearshoring Vendors are located a different country or continent, but there is a minimal difference in time zone (e.g. a UK-based organization using a vendor in continental Europe).
- Offshoring Vendors are located in a different country or continent, often several time zones away from the organization (e.g. a US-based organization using a vendor in India).

When outsourcing work, the organizational resources that remain after the work has been shifted to a vendor are referred to as the 'retained organization'.

5.2.3 Outsourcing considerations

Many organizations decide to outsource work to reduce short-term operational costs, only to find that they have become constrained, they are unable to pivot business models, or they are spending more in the long term.

Outsourcing might also lead to higher costs over time, because the organization may have to bear higher costs to increase the scope of services and manage the quality of deliverables. It might also incur travel costs if work is sent offshore.

A holistic approach to outsourcing can help to reduce the likelihood of these negative impacts. It is important to consider:

- whether it is important to retain knowledge and skills that might potentially be sent offshore
- what the impacts are to enterprise risk management when sending work offshore: which risks are mitigated, worsened, or created as a result?
- whether the industry or scope of work supports outsourcing
- the cultural or language differences between the organization and the vendor
- whether and how much management overhead will be added when outsourcing work.

5.2.4 Service integration and management

Service integration and management refers to an approach whereby organizations manage and integrate multiple suppliers in a value stream. This is a new challenge for outsourced services and suppliers, where previously the end-to-end ownership and coordination of various third-party suppliers were managed by a single entity.

Service integration and management can be delivered using different models, although the basic concept, that the delivery of outsourced products and services is managed by a single entity, regardless of the number of vendors, remains the same.

5.2.4.1 Service integration and management models

There are four main models in this area (Figure 5.2). Organizations must consider the best model for their circumstances in order to transition to a more coordinated service–supplier landscape:

- Retained service integration Where the retained organization manages all vendors and coordinates the service integration and management function itself.
- Single provider Where the vendor provides all services as well as the service integration and management function.
- Service guardian Where a vendor provides the service integration and management function, and one or more delivery functions, in addition to managing other vendors.
- Service integration as a service Where a vendor provides the service integration and management function and manages all the other suppliers, even though the vendor does not deliver any services to the organization.

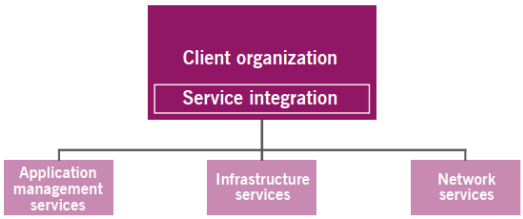
Service integration and management is increasing in importance, owing to a variety of factors:

- Vendors increasingly specialize in niche areas, which has led to an increased number of vendors working with a single typical organization.
- The commodification of some types of service component means that vendors can be regularly replaced by other vendors to leverage a better pricing or service experience.
- The increasing complexity of technology products and services means using multiple vendors to support the organization.

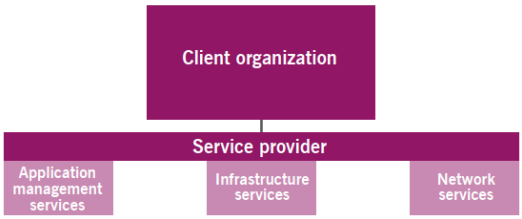
When an organization chooses a service integration and management approach, it should regard the approach as a strategic imperative and tender service integration and management contracts separately from individual vendor contracts. A clear organizational structure, with an appropriate governance and management model, is also required.

Service integration models

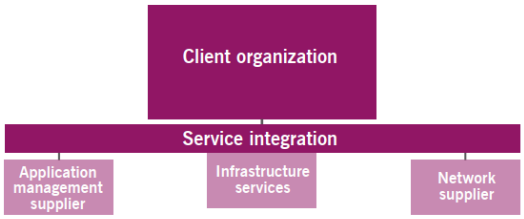
Model 1: Retained service integration



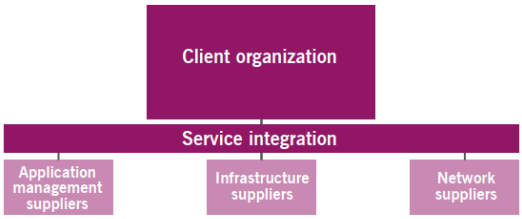
Model 2: Single provider



Model 3: Service guardian



Model 4: Service integration as a service



5.2.4.2 Service integration and management considerations

When deciding whether to take a service integration and management approach, it is important to consider:

- whether the organization is mature and capable enough to run or work within such a model
- the metrics that are appropriate to measure and incentivize:
  - quality of service delivery
  - quality of outcomes that require coordination and collaboration across multiple vendors
  - transparency, coordination, and collaboration between vendors and the service integration and management function
- how the use of multiple vendors changes the design and measurement of service level agreements
- how service level agreements will influence behaviours among different vendors
- how vendors will be incentivized to align with organizational outcomes (or penalized if they choose not to)
- which vendor selection criteria are appropriate to this approach
- whether services will be delivered by a single supplier or require collaboration between vendors
- how service management practices will change as a result of service integration and management, including:
  - knowledge management
  - incident management

- service desk
- problem management
- change management
- service request management.

5.3 Summary

Organizations are rarely able to balance capacity and demand, leading to queues or backlogs of work, which increases the risk of unhappy customers, users, and other stakeholders. In order to mitigate this risk, organizations have a wide variety of techniques to either manage demand or prioritize the various types of demand.

Organizations should be careful when using these techniques and apply the guiding principle of think and work holistically to assess the impact of these techniques on other parts of the organization, on customers, on stakeholders, and even on the flow of work from demand to value.

Organizations may also turn to external partners and suppliers to source additional capacity or capabilities, or even to transfer responsibilities for the delivery of outputs, outcomes, functions, or entire services. As the number of partners and suppliers increases, so the management overhead to direct and coordinate external activities can increase dramatically, often requiring dedicated resources to integrate, manage, and align external providers with the organization’s products and services.

6 Conclusion

The evolution of business and technology stimulates the evolution of service management. This affects all of the four dimensions of service management: organizations and people, value streams and processes, information and technology, and partners and suppliers. To support the needs of today's organizations, professionals in IT and service management should adopt a collaborative culture that is focused on value for the organization, its customers, and other stakeholders. They should consider and apply new ways of working that are more agile, more holistic, and more effective in a constantly changing, complex environment.

Organizations, their leaders, and practitioners should continually develop their understanding of emerging technologies and their potential impacts. Cooperating and collaborating in the context of wider ecosystems is crucial because it enables the development and growth of cross-organizational value streams. Teams and organizations should manage internal communications and workflows in a holistic, flexible, and efficient way.

This publication provides an overview of these challenges and practical recommendations for dealing with them, including exploiting the related opportunities while minimizing associated risks. It covers organizational, cultural, technological and other aspects of todays' IT service management.

To get the most out of ITIL 4 Create, Deliver and Support, it should be studied alongside the ITIL management practice guides, which are available online and provide detailed, practical recommendations for all 34 general management, service management, and technical management practices. They include hands-on guidance that can be applied in the context of all four ITIL Managing Professional publications.

All ITIL publications are holistic and focused on value. They address the four dimensions of service management and help to manage resources in a way that enables value creation for the organization, its customers, and other stakeholders.

ITIL 4 Direct, Plan and Improve provides guidance on aligning product and service management with today's business requirements, driving successful organizational transformation, and embedding continual improvement into an organization's culture at every level.

ITIL 4 Drive Stakeholder Value contains guidance on establishing, maintaining, and developing effective service relationships. It leads organizations on a service journey in their roles as service provider and service consumer, helping them to interact and communicate effectively at every step.

ITIL 4 High Velocity provides detailed guidance on comprehensive digital transformation and helps organizations to evolve towards a convergence of business and technology, or to establish a new digital organization.