Integrating Six Sigma and ITIL® for continual service improvement

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1 Executive summary

The introduction of formal ITIL processes into organizations has been a focus for improvement over the past two decades. When adopting ITIL there is an impact on the four Ps – people, processes, product (technology) and partners (suppliers) – and this requires a significant organizational commitment to meet improvement objectives, including funding and resources. Many organizations, on completing their process implementation projects, believe that the processes, as implemented, will serve the organization well for some time. Sadly, this is not the case. Unless organizations continually pay attention to the processes, they will almost certainly not protect their initial investment and, more importantly, the processes will not stay abreast of the changing needs of the organization. Neither will any shortfalls in process performance be addressed.

To address this practical and operational issue, the ITIL framework defines a service lifecycle stage – continual service improvement (CSI) – that is intended to measure and improve processes and services. Although *ITIL Continual Service Improvement* (Cabinet Office, 2011) offers a generic improvement approach, the quality practitioner may need more guidance than the seven-step improvement process can offer. Fortunately, multiple frameworks are available in the public domain to integrate well-defined quality practices into an improvement schema.

In this White Paper we discuss an approach using one such well-established process improvement methodology – Six Sigma. The Six Sigma methodology is particularly compatible with ITIL. A basic premise of Six Sigma is a focus on improvement efforts surrounding process, product or service performance that impact on the customer. This relationship is very similar to the one between services and the business and how those services are managed via the ITIL processes. We review some basic ITIL principles; we also discuss how those principles apply to Six Sigma, and how Six Sigma can be applied practically to CSI efforts. Finally, we offer some practical tips for applying Six Sigma to improve ITIL processes and services in general.

This White Paper will be useful to all ITIL practitioners, process owners and managers, but it will be of particular interest to CSI managers, reporting analysts, process improvement programme managers, problem managers, service level managers, service owners and directors. As we will discover, Six Sigma can have broad applicability to support the ITIL processes. For example, we (the authors) have worked with an organization that employed the Design for Six Sigma (DMADV) method to help in designing and implementing their ITIL processes. For this organization, a critical component of the process design was an assurance that the processes would function at a high level of quality when implemented. We have also observed organizations using the DMAIC approach when designing metrics to support problem management or their CSI initiatives (see section 3 for an explanation of these two approaches).

2 Service management and the need for improvement

CSI is an integral component of the ITIL service lifecycle. IT organizations have been making service improvements for many years, but they have often been in a reactive mode. In many cases, the improvement effort has used cost reduction (rather than improving service value) as the driver for the initiative. For instance, when there is a failure, typically a project is formed to address the failure – after the fact. CSI is a formal proactive practice that addresses improvement opportunities for IT services, service management processes and the service lifecycle. The proactive nature of CSI is one of anticipating service-related issues and addressing them before they become an issue for the customer. Additionally, CSI can identify areas for increased service or process efficiency and effectiveness, which increase the value to the customer and/or reduce the cost of delivering the service.

There are many quality frameworks available to support improvement activities. In this White Paper we discuss the relationship of IT service management (ITSM) – in particular, CSI as a practice within ITIL – with a well-understood quality improvement approach known as Six Sigma. The basis for this discussion is the relationship of the continuity of the service lifecycle with the interaction of improvement activities as the lifecycle is completed and started again.

To set the stage, let us review some key ITSM principles that will apply directly to the relationship between ITSM, ITIL and Six Sigma. As Figure 1 illustrates, CSI focuses on improving the ability of the service organization to create and maintain value for customers through improvements in the design, introduction and operation of IT services. CSI ensures that IT is continually capable of enabling business outcomes even as the dynamics of the business environment change.

One of the key drivers for process initiatives is the need to improve the service capability of the organization but, as most service and process practitioners have come to realize, achieving the benefits from a service comes not just from the introduction of the service, but in continually revisiting the service, its performance and, most importantly, the ability of the practitioners to manage service delivery.

It is highly unlikely that an implemented process would achieve optimal performance straight away. For that reason, in conjunction with the initial implementation of a process, we must also introduce the organizational ability to:

- Monitor a process or service against established expectations
- Evaluate performance variances
- Take corrective action as needed to meet performance goals or to improve performance over time.

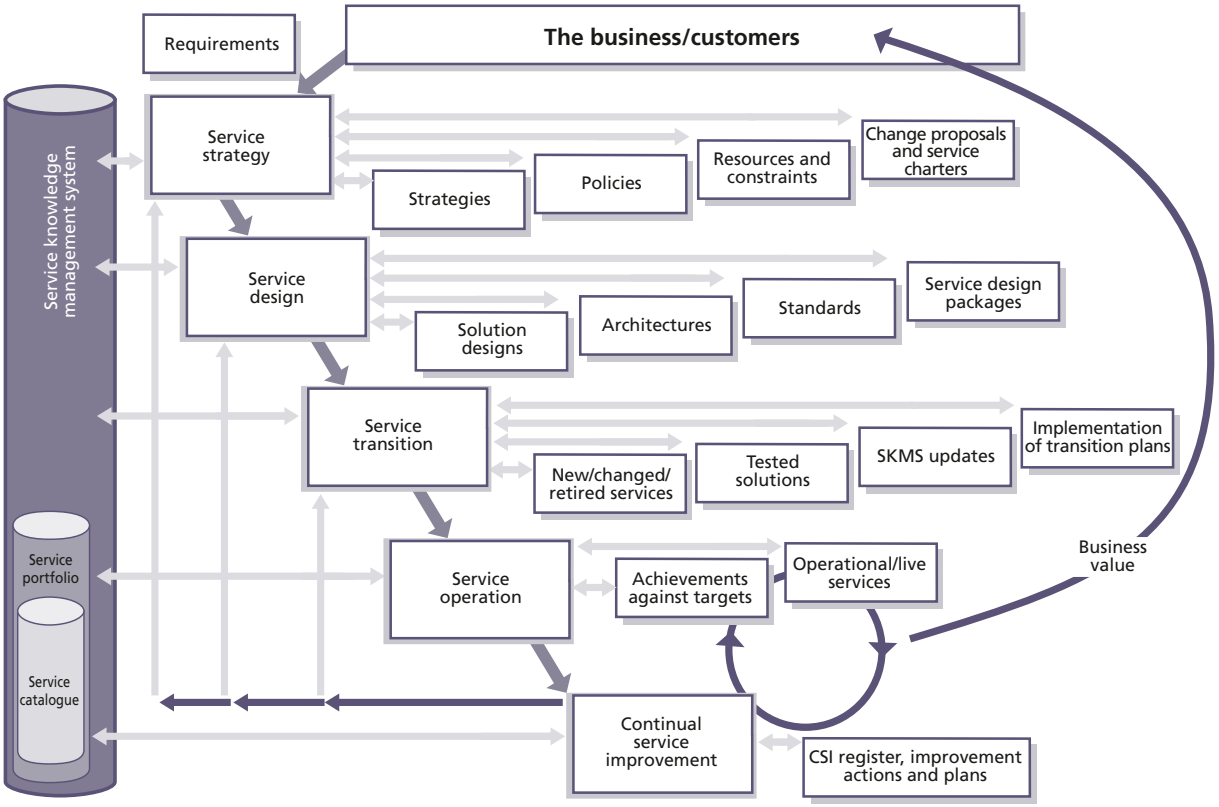

Figure 1 Integration across the service lifecycle

In addition, services (and the processes that assist them) must be reviewed continually to ensure the greatest balance of efficiency and effectiveness in order to support the business strategies, goals and objectives.

A valuable approach to a continual review is detailed in the continual service improvement approach shown in Figure 2.

The steps of the continual service improvement approach are as follows:

- **What is the vision?** Improvement opportunities are validated in comparison to the business and IT vision, mission, goals and objectives.
- **Where are we now?** In order to be able to track and measure improvement, it is important to create an initial baseline of how services are currently being delivered and how effective and efficient service management processes are, as well as the effectiveness of the service lifecycle itself.
- **Where do we want to be?** Defining targets for services such as availability and reliability, and key performance indicators (KPIs) for service management processes, provides a means for a service organization to track progress from the baseline to the defined targets. Setting targets should follow the SMART concept: Specific, Measureable, Realistic and Time-bound.
- **How do we get there?** The difference between where we want to be and where we are today is a performance gap that should be addressed through a dedicated effort such as a project. The gap is closed by means of an improvement project team that is managing work on a core set of deliverables to produce the expected results.
- **Did we get there?** To measure whether the gap is closed requires ongoing validation measurements and assessment. Were the desired outcomes achieved?
- **How do we keep the momentum going?** Ensuring that changes are embedded in the organization.

A concept that lies at the heart of the ITIL process framework and the lifecycle is the definition of a 'service'. A service is the logical representation of what a service provider – in this case, IT – assembles or produces to deliver value to a customer (the business) through support or achievement of customer outcomes. The value that the customer receives from a service can be discussed and measured through the utility (what the customer wants) and warranty (how the customer wants it delivered) of the service itself.

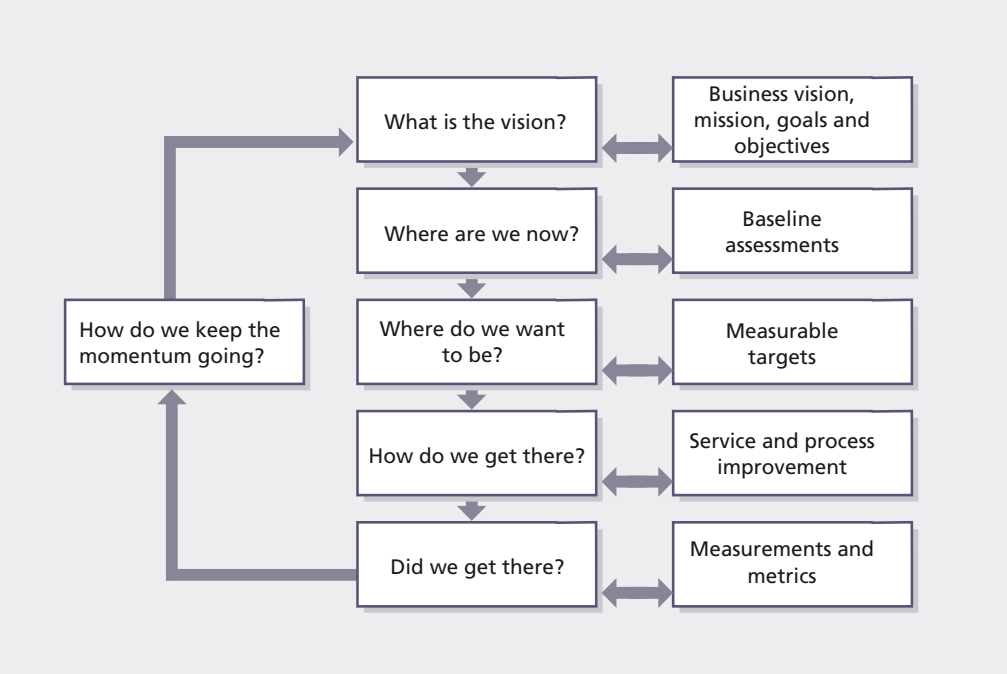

Figure 2 Continual service improvement approach

Another important point is the concept of the service portfolio and the vital investment decisions, design and development activities that must be made as part of the service pipeline (see Figure 3).

The service portfolio identifies what is in the service pipeline: for example, new services to be provided to the business, the published service catalogue that lists all the current services available to the business, and retired services. The value of a service portfolio strategy is demonstrated through the ability to anticipate change while maintaining traceability back to strategy and planning.

Details of applying the service portfolio in Six Sigma will be discussed in section 4.

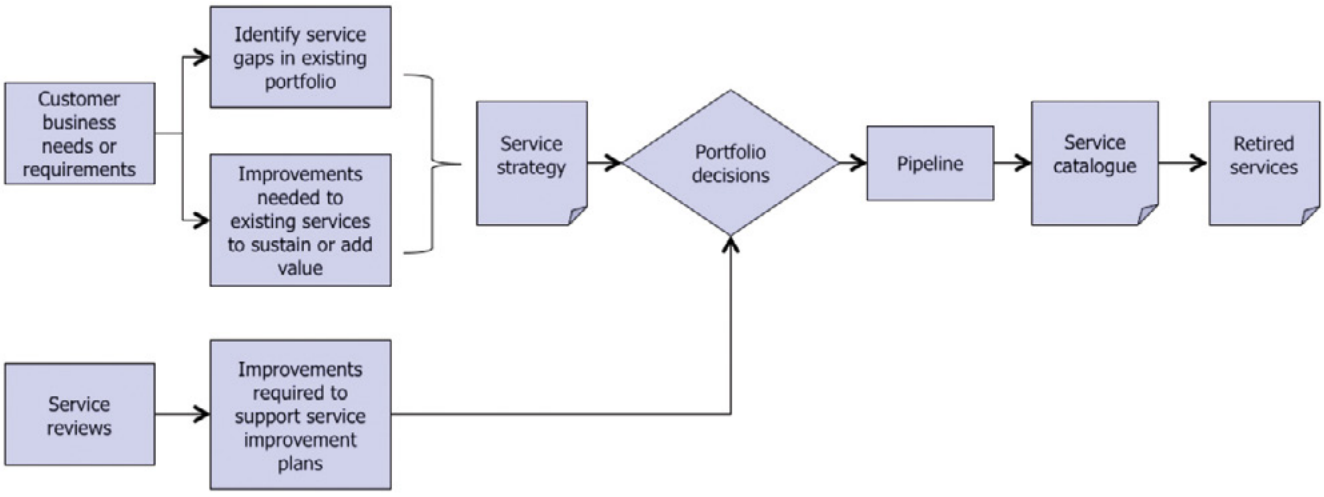

Figure 3 The service portfolio decision-making process

3 Overview of Six Sigma

Quality is one of the four measurable and reportable process attributes of *ITIL Continual Service Improvement* (Cabinet Office, 2011). As defined in the ITIL glossary, quality is 'the ability of a product, service or process to provide the intended value'. By extension, the concept of process or service quality requires you to meet value expectations by instituting an ability to monitor the efficiency and effectiveness of the process or service and, if necessary, to improve it.

Over the past 50 years, there have been numerous quality approaches that have focused on the improvement of processes (which can be extended to include services as well). The litany of process improvement concepts includes total quality management, quality control and zero defects, to name but a few. Many of these concepts have been espoused by leaders in the quality movement such as Shewhart, Deming, Ishikawa and Juran; however, it could be argued that the basis for these efforts has been quality for quality's sake. In other words, the quality improvement goal was to root out all sources of error and eliminate them irrespective of their impact on customer needs or expectations. Six Sigma is a quality method that has a different focus.

Six Sigma is a quality technique developed and introduced by Bill Smith at Motorola in 1986 to identify and eliminate defects in manufacturing processes. Over time, the technique has been extended to focus on business processes.

Since the introduction of Six Sigma at Motorola, and the company's winning the Malcolm Baldrige award two years later, Six Sigma has gained a global following. The list of organizations that have embraced the practice includes General Electric, Honeywell, 3M, Air Canada, Caterpillar, Dell, EMC, Lockheed Martin, DHL, Samsung Group, Siemens AG, Starwood Hotels, TRW, McGraw-Hill Companies, and the arms of the US military. Six Sigma is attractive to global organizations that require parts or assemblies manufactured in one part of the world to align seamlessly with others crafted elsewhere. Variance of performance, especially in the manufacturing world, is not an option.

Six Sigma and its application to business processes rely on the fact that processes can be measured, analysed, controlled and improved. This concept of metrics and measurement is vital to Six Sigma. The Six Sigma analytic techniques are statistically based and some mathematical acumen is needed to understand and apply them. Other quality approaches have also applied statistical analysis, but the key distinguishing characteristic of Six Sigma is the focus on the analysis.

The primary differentiator between Six Sigma and other quality initiatives is that Six Sigma improvement efforts are based on the 'Voice of the Customer' (VOC). This concept provides a lens through which a quality initiative can be directed. Quality improvement efforts address those quality issues, and only those issues, that impact the customer. It is the VOC that creates a linkage between Six Sigma and ITIL.

To expand this further, VOC is the process of gathering customer comments regarding a process, product etc., usually in the form of surveys. VOC statements are translated into quantitative specifications for the process. Those specifications determine what will be 'Critical to Quality' (CTQ), such that the customer believes that the process, product, service etc. is meeting his or her quality expectations.

For example, VOC customers might complain that an online banking website is taking too long to load and that they therefore can't conduct virtual banking. The CTQ specification might be that the web pages must load within two seconds of a customer request. The bank's IT department would then monitor the number of times the web pages exceeded a two-second load time – these are quality defects that could form the basis for a Six Sigma project.

So, what is Six Sigma? A sigma, or one standard deviation, is a statistical measure of the dispersion of the values, in a set of data, from the average of the data – if the variation is small, the standard deviation is also small and vice versa. It is the statistical underpinning that gives Six Sigma its name. Six Sigma is a methodology to identify, reduce and potentially eliminate process variances or poor performance that create errors which impact on the customer. Six Sigma uses a variety of statistical techniques to identify the problems and sources of error, and ultimately to design a solution that will eliminate the errors.

Although we would hope that a service would perform as designed each and every time it is executed, that will not be the case, as human or other factors come into play. In many cases, those factors are the result of errors or challenges in the service or a process supporting the service that must be addressed.

The goal of Six Sigma is to reduce the number of process defects or errors (whether manufacturing or business). A defect is a customer experience with the process, service or product that is outside of the customer expectations or requirements. Six Sigma endeavours to reduce the number of defects to below a target level by measuring the performance of the process etc.

The variability of a process, service or product can produce defects. A valuable quality calculation is to determine the yield of the process or the number of times the process performance is free of defects. If we perform the process 20 times and there are five errors, the yield would be 75% (20 performances – 5 errors/20 performances × 100%).

We now have a way to calculate the sigma level of a process or service. The accepted way to report the number of 'sigmas' of performance is based on the number of defects per million opportunities (DPMO) – the number of chances to have a defect. To state it differently, the DPMO represents all of the service, process or product non-conforming (outside of the expected performance limits) occurrences. If we want to set a performance at a Six Sigma level that would mean that the process or service will incur no more than 3.4 DPMO.

Table 1 converts yield to sigma level and the corresponding DPMO. As you can see, improving the yield (or the percentage of times the process is defect-free) increases the sigma level. For instance, a 99.4% yield equates to 6,210 defects, which is a 4.0 sigma level. While a 99.4% yield on the process might look great, the 4.0 sigma level still leaves room for substantial improvement.

Table 1 Converting sigma level to expected defects per million

Sigma level	Yield	DPMO
1.0	30.9%	690,000
2.0	69.2%	308,000
3.0	93.3%	66,800
4.0	99.4%	6,210
5.0	99.98%	320
6.0	99.9997%	3.4

Let us translate this statistical concept into some practical results. A process or product performing at 1.0 sigma would generate 690,000 DPMO or a yield of 30.9%. In IT terms, this would mean that for every 1,000 calls to the service desk there would be 690 incorrectly completed incident tickets or errors – not a stellar result. If we improve to 3.0 sigma, the number of service desk errors would fall to 66.8. Finally, a 6.0 sigma level of performance would result in 0.0034 errors for every 1,000 calls – a laudable target.

To recap this important concept, Six Sigma strives to reduce the number of process or service defects. As the process or service is improved to eliminate defects, the yield and the sigma level both increase. A process improvement team can establish improvement goals based on sigma level or yield and meet those targets using Six Sigma methodologies.

Six Sigma uses two forms of sub-methodologies to improve process quality. They are known by the abbreviations DMAIC and DMADV. DMAIC is used to improve existing processes. In other words, after a process has been implemented, the DMAIC practice can be applied to focus on a specific problem, identify the sources of error, and eliminate them. DMAIC stands for:

- **Define** Apply Six Sigma to a specific customer-impacting problem that will be solved via a Six Sigma project through a set of improvement or performance requirements to achieve an established goal
- **Measure** Collect the relevant CTQ data about the process or process performance resulting in defects
- **Analyse** Apply analytical techniques to identify (prioritize) the root cause of the defects
- **Improve** Determine and implement solutions to remove the defects and improve the customer's experience
- **Control** Continuously monitor the improved process.

DMADV is also known as the practice of Design for Six Sigma. This practice operates under the principle that a process, product or service can be designed with quality in mind. The DMADV practice is engaged in the following phases:

- **Define** Identify customer-focused design goals and requirements
- **Measure** Identify and create measurements of CTQ factors that will impact the ultimate process or service delivery, possibly through the use of critical success factors (CSFs) – customer needs and process capabilities
- **Analyse** Develop the design options and design capabilities such that the implemented process, service or product will achieve the design requirements
- **Design** Develop and optimize the service process to meet the customer requirements
- **Verify** Test/pilot the process and transition to the customer and test that the implemented process meets the target performance or customer specifications.

At the risk of oversimplifying these sophisticated practices, it is important to understand the differences between the two as well as how they might fit within an organizational practice.

DMAIC can be thought of as a reactive practice; it uses or 'reacts to' the performance data of existing processes or services to target areas of concern and correct them. DMADV, on the other hand, is more proactive; it supports the development of a new and well-designed process that should perform far better from the outset as a result of the analytically based design process.

One additional point: both practices must augment or be augmented by existing organizational processes and practices in order for Six Sigma to be effective. For example, DMAIC would be an excellent fit with problem management or CSI to focus on any process, service or lifecycle phase activity. On the other hand, DMADV would rely heavily on the processes detailed in the service design and service transition lifecycle stages.

Several elemental roles are necessary for a successful Six Sigma implementation. The first role comprises the various Six Sigma practitioners. The practitioners are designated by titles that reflect their experience in the practice of Six Sigma and the successful completion of Six Sigma initiatives. Every organization has its own methodology and criteria for designating and appointing the various levels. The four types of Six Sigma practitioner are as follows:

- **Master Black Belts** These are individuals in an organization who are the advocates of the Six Sigma practice and who serve as coaches and mentors to other Six Sigma practitioners. Typically, the Master Black Belts will have a number of Six Sigma initiatives under their supervision and will serve to certify aspiring Black Belts. They also work to ensure that the Six Sigma practice within the organization is uniformly followed and that the required disciplines are maintained.

- **Black Belts** These are assigned to individual Six Sigma projects and spend 100% of their time on the project to achieve the expected quality improvements. To achieve Black Belt certification, candidates must demonstrate proficiency in using the methodology by completing one or more projects. Black Belts typically work under the supervision of Master Black Belts.
- **Green Belts** Individuals in an organization who will work under the direction of a Black Belt on a Six Sigma project or may lead a Six Sigma project. Typically, Green Belts are not dedicated full-time to improvement activities and have not yet reached the level of expertise and proficiency required to be certified as a Black Belt.
- **Yellow Belts** Some organizations also designate Yellow Belts. These individuals do not have the same breadth of knowledge of the Six Sigma practices as do Black and Green Belts. Instead, they may be assigned to perform very targeted tasks in support of a Six Sigma project, or may lead improvement initiatives using the Deming Plan-Do-Check-Act (PDCA) methodology.

Two other organizational roles are vital to success of Six Sigma. They are:

- **Executive leadership or sponsorship** One of the CSFs for a Six Sigma initiative is the support of senior management. Six Sigma, as an organizational discipline, will require a substantial investment of time and resources to be successful. For instance, Six Sigma practitioners will need time to complete extensive training, and Six Sigma projects are typically substantial in terms of cost. This level of organizational investment requires senior leadership to allocate scarce resources. Black Belts may shift permanently to this quality role from other important functions to clear organizational obstacles and road blocks and provide critical oversight of Six Sigma initiatives to ensure that expected returns are achieved.
- **Champions** Six Sigma requires a champion, especially as the discipline will potentially change the *modus operandi* of the organization. The champion will be called upon to be the spokesperson, advocate or outward face of the Six Sigma practice. The champion must be willing to go anywhere to talk to anyone, at any time, about Six Sigma, the benefits and the reality of quality initiatives under the wing of Six Sigma. The role of champion may be unique within an organization, or it may be undertaken by the Master Black Belt.

How does a typical Six Sigma project work? Figure 4 outlines some of its major activities.

The initial step in Six Sigma is identifying the problem to be solved. One might say that the problem is a source of customer dissatisfaction, such as having recurring incidents caused by a service being up and down. Another way to think about the starting point is as an initiative that must be undertaken to move the organization forward. Whether solving a problem or moving along with a new project, there must be a clear reason for engaging Six Sigma and the valuable resources required for such a project.

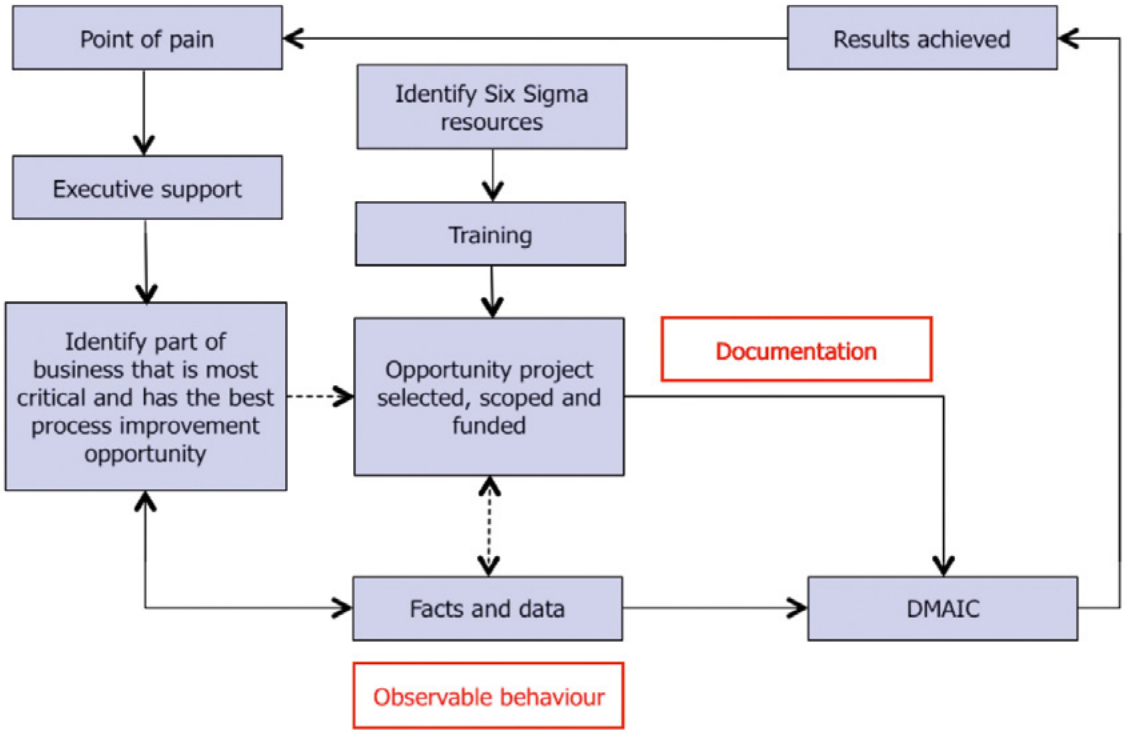

Figure 4 Activities of a typical Six Sigma initiative

Next is the need for executive support. This support may take the form of a sponsoring authority or the funding source. Senior-level engagement is necessary as Six Sigma initiatives are not small undertakings.

What follows next is a focus on the scope of the Six Sigma effort. What part of the business or customer arena will be the target of investigation? Will the initiative be limited to one customer segment or is the intention to look broadly across all markets the organization serves? The key is that the scope of the initiative is aligned with a challenge that the customer – whether the ultimate customer of the business or an internal customer of IT, such as the financial group – believes would serve their interests directly. In other words, the improvements can be clearly articulated in customer terms – both the initiative to secure the improvement as well as the end results.

At this point the project is initiated, a project charter has been completed, and appropriate funding has been allocated. Make no mistake: Six Sigma initiatives are projects and should be governed that way. Project management brings the necessary discipline to the forefront to ensure that resources are engaged appropriately at the right time, and that there is formal oversight of the improvement effort, possibly via a project steering committee. The project scope is, of course, stated in customer-facing terms and will be targeted to improve aspects of an existing product, process or service, or possibly to introduce a new product, process or service for the benefit of the customer. What is crucial is that a Six Sigma effort is formal and focused.

The Six Sigma discipline now moves into high gear, collecting and analysing data and applying the Six Sigma practice disciplines. For simplicity's sake, the project illustrated in Figure 4 suggests that this is a DMAIC effort, but this project could easily engage DMADV. However, whether we are speaking of DMAIC or DMADV, the project goal and its objectives are to improve the area within a customer-oriented scope; the results are tangible, measurable and will be reported.

Just as ITIL itself is a lifecycle, so are improvement efforts. Thus, as one Six Sigma project is implemented and the benefits are realized, the operating business dynamic changes as well. These changes foster new opportunities for the next Six Sigma effort as the business climate changes, customer expectations evolve, or any of the other myriad of business dynamics drives the need to look inward one more time to bring improvement to products, processes or services.

4 Application of Six Sigma to ITIL concepts

Now that we have explained Six Sigma and how it works, both mechanically and organizationally, a pressing question remains: how does it apply to service management? To answer this question we need to evaluate the ITIL principles and consider how Six Sigma, as an improvement methodology, would provide value as a tool of the CSI practice. In addition, as Six Sigma relies extensively on process measurements, there must be agreed and documented service management metrics and measurements that are accurate and consistently reported. Let us take a look at some basic ITIL concepts and find some common ground to answer this question.

A basic premise of what sets Six Sigma apart from other quality efforts is the concept that all improvements are focused on VOC. In other words, Six Sigma does not undertake improvements for their own sake, but with the expressed intention of improving the customer experience – more specifically, improving the customer's interaction with the organizational products, services or processes consumed for the benefit of the customer.

So, the question is: is there a VOC concept within ITIL and if so, how would it apply?

The VOC can be considered at two levels. At an operational level, we should consider how the process or service, and the defects addressed by Six Sigma, directly impact on an organization's customers. Those defects could affect its reputation or customer goodwill – thus the need to be very focused on customer-facing issues. At a more strategic level, we might also consider those issues that could impact the business strategy, objectives and goals. Clearly one could make the argument that the accumulation of customer-based issues will eventually impact business goals or objectives. In the end, the business is the customer of IT or the service provider. Therefore any issues caused by the service provider and impacting the business would be within the scope of a Six Sigma investigation.

An important note regarding definitions is needed here. As explained in the context of the VOC in section 3, the concept of the 'customer' is integral to the Six Sigma methodology and practice. In Six Sigma language, a customer is 'a person who receives the product or service of a process'. However, ITIL defines a customer as 'someone who buys goods or services' or the individual who has the chequebook; this individual may or may not be a user. ITIL defines 'user' as 'a person who uses the IT service on a day-to-day basis' or essentially the individual who relies daily on the product or service to support his or her activities.

For the purpose of our discussions, we will use the term 'customer' to mean an individual or entity who consumes a service or a product that the ITIL processes support, and who has expectations or expected standards of performance relative to the service or product. It is when those expectations are not met that the VOC comes to the fore.

At the heart of understanding how Six Sigma applies to service management is the concept of a 'service'. According to ITIL a service is 'a means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs and risks'. This is a powerful

concept, especially in the light of the tenets of Six Sigma. Let us investigate several key words or phrases of the service definition and explore how they apply directly to Six Sigma.

The first idea is that a service is 'a means to deliver value to the customer'. Value implies that whatever we deliver to the customer, the customer finds it of sufficient worth that they are willing to exchange something of value (i.e. pay) for the delivered service. Of course, value is in the eye of the beholder and the degree of value can vary depending on who the customer is, their business circumstances, the availability of substitutes (e.g. outsourcing the service desk) for the service and so forth. The bottom line is that the customer needs the service and that they find it economically valuable.

The second and most important concept in relation to Six Sigma is that the service 'facilitates the outcomes customers want to achieve'. With this simple construct, the delivered service is inextricably linked to the internal processes, products or services of the customer. Thus, service improvements are clearly aligned with the customer or, in the words of Six Sigma, can be measured in terms of the VOC.

Therefore, the overall framework we employ to deliver these services (service management) forms the scope for Six Sigma projects.

Services do not magically appear from the ether. They are delivered by the effort of service assets combining resources and capabilities in a productive way so as to deliver value for customer consumption. The lifecycle of the service and the interaction of the service asset with the customer are depicted in Figure 5.

Although the value-creating nature of a service is called out in this figure, what is most important, from a Six Sigma perspective, is that multiple sources for measurement are possible during the service lifecycle. Measurement is vital to any quality effort, but performance data-gathering through measurement is particularly necessary for Six Sigma. Let us look at several measurement 'stations' and discuss how they are helpful.

- **Station 1** The measurement of the value potential created and delivered by a service provider (or perceived to be delivered by the customer) and the visible demand for the service is the goal of VOC. The customer demands a service only if they believe the value of the service is worth demanding. Thus up or down trends in customer demand (and in turn perceived value) are important metrics. Customer perspectives relative to the intrinsic value of the product or service can be the focus for a Six Sigma problem statement.
- **Station 2** The measurements contained within Station 2 in and of itself do not speak directly to VOC, but instead can be considered contributing factors (or potential sources of defects) that can directly influence the VOC. If the service organization or department is not effective or efficient in terms of how it brings together both resources and capabilities, value may be delivered, but at what cost to the organization or department? Or as is more likely the case, perceived value deteriorates over time due to the inefficiency or ineffectiveness of the service unit – a potential source for the Six Sigma problem statement.

  The scope of the problem statement can also lie in the nature of the resources and capabilities. During the fact-gathering and analytic stages, a Six Sigma Black Belt might look to the service construct or the combination of resources and capabilities, their basic nature and the challenges associated with their eventual use by the service unit to deliver a service.
- **Station 3** Ultimately, the service unit must meet the demands of the customer, as outputs from the service asset. As the customer consumes the supply, there is economic

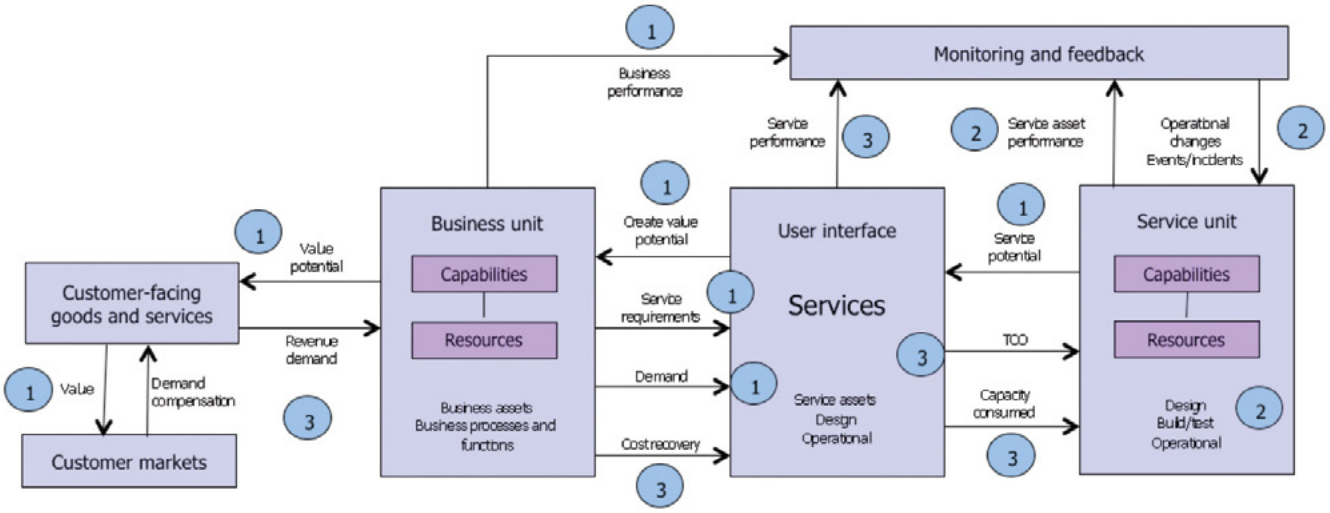

Figure 5 Possible sources for measurement

exchange with the service unit for the value delivered. For most IT organizations or departments, the 'value exchange' may not result in a profit, but at least the exchange should provide an ability for the service unit to recover production and delivery costs.

Measuring the ability of the service unit to meet demand and the adequacy of 'value exchange' are the final key measurement points for Six Sigma. Additionally, the service organization must have sufficient capacity to meet customer needs over the long haul. Again, both of these measurements can be considered more effect than cause, but they do serve as indicators of problems to be resolved, and they provide data for problem analysis and solution. Although Station 3 measurements could be considered secondary factors to the overall problem, shortcomings in either of the two can have significant impact on the ability of the organization or department to sustain services over the long term – which of course would be a true issue for the customer. One other ITIL concept must be understood, as it has a direct and immediate linkage to Six Sigma initiatives. This concept is how value is created.

ITIL Service Strategy (Cabinet Office, 2011) states that the value of a service can only be achieved if both the utility and warranty of services are assured. To put it simply, service utility (or fitness for purpose) are the feature or function attributes of a service that have a positive impact on the customer. Customer outcomes can be improved through the consumption of the service, as the service provides the features or functions required by the customer to support their value-adding process outcomes. It goes without saying that there is value in leveraging a service that will make the customer's life more efficient or effective. But there is a caveat to the value equation – utility is necessary but not sufficient on its own.

In addition to utility, the service must be delivered consistently over time – or with warranty (i.e. it must be fit for use). To expand this concept, the customer must be able to depend on the service to deliver the utility when needed and as needed. In terms of IT service management, this consistency or warranty is defined or measured in terms of availability, capacity, security and continuity.

In section 5 we integrate the concepts of utility and warranty as potential opportunities for improvement initiatives.

5 Integrating Six Sigma and ITIL to achieve continual service improvement

The key to improvement, and a requirement of Six Sigma, is the ability to measure and report against the performance of processes, services or projects. Within *ITIL Continual Service Improvement* three different types of metrics – technology, service and process – are discussed. Organizations may also identify and report other metrics that support the operational, tactical or strategic goals or objectives.

All three forms of metrics are important, but the organizational emphasis on them is typically out of balance. Historically, in most IT organizations there has been more emphasis on capturing technology metrics, especially at the component level, and less emphasis on service metrics. But we have seen how technology metrics can be aggregated to present end-to-end service metrics; i.e. how the customer is experiencing the service. Of course, process metrics are typically lacking, especially at the outset of an ITSM process project. Organizations must consider capturing process metrics as part of the process initiative at least to form a process performance baseline or benchmark.

Over time, as these metrics are captured they can be used to report on the wellbeing of the target itself (for instance, a service could be assessed in terms of its ability to meet the needs of the business) and to identify potential improvement opportunities if the quality is lacking. The improvement opportunity could be the subject of a typical Six Sigma project.

In order to apply Six Sigma there is one basic requirement: the existence of a process, or at least the intention to design one. Without the discipline and focus of the repeatability of a process, the Six Sigma methodology has little applicability. Processes can be measured across four dimensions: value, quality, performance and compliance. Any of these dimensions could serve as the basis for a Six Sigma project, especially if one considers the impact of poor performance on the customer of the process.

Figure 6 shows a generic process model. From this, we can identify certain areas that support the need for measuring the health of a process and how they can be tied to the four dimensions mentioned above. These areas are as follows:

- **Process inputs** Processes are typically integrated, meaning that one process provides the input to a downstream process through a process output. Process inputs provide the raw materials that are required by the process activities and are transformed into outputs. The inputs can be provided by internal or external organizations. It is especially important that process owners clearly define the expectations and requirements for the inputs. A high degree of variance in the inputs can create significant challenges for process practitioners and other key resources during process execution. The suitability of the requirements is and should be easily measured.
- **Process control** Process objectives are defined and measured to ensure that the process goals and objectives are continually met. Also, the objective measurements provide information on whether the value has been delivered or the process is followed.

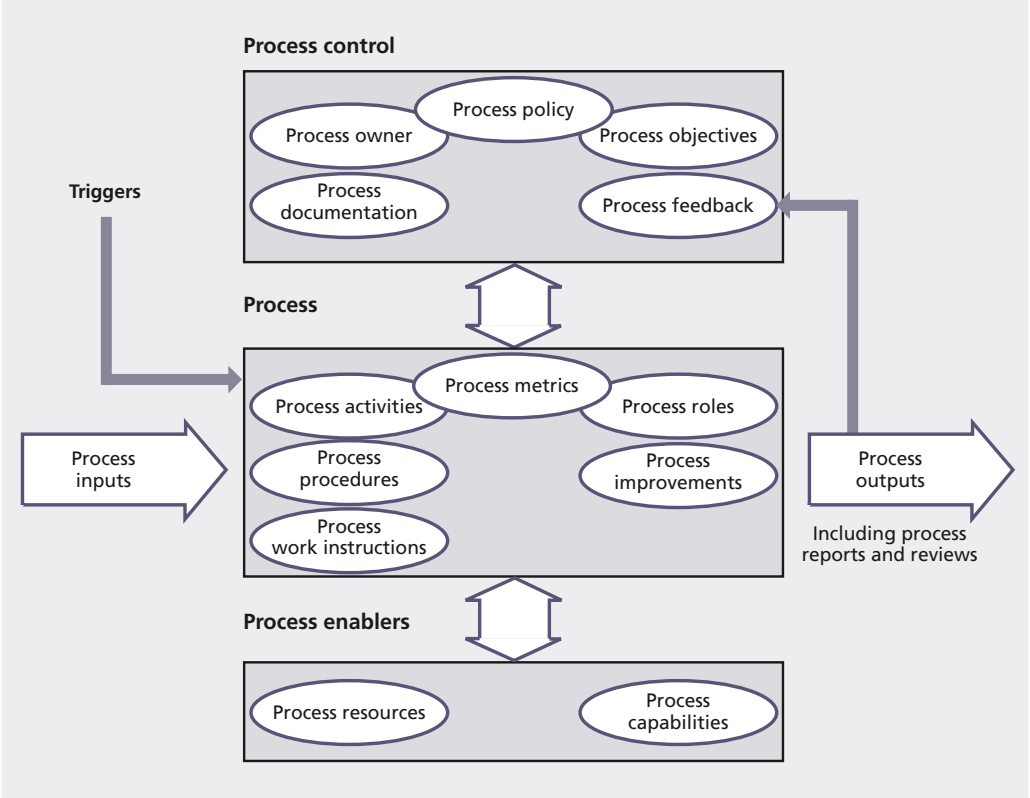

Figure 6 Process model

- **Process feedback** This is another measuring point to obtain process users' feedback, such as through the VOC, on the efficiency and effectiveness of the process. This feedback can be an important source of information about the value, quality and performance of the process.
- **Process** Within the process activity space there are defined CSFs, KPIs and process activity metrics that can be measured on an ongoing basis. How the KPIs support the CSFs should be balanced, and depending on what the KPI is, both the KPI and CSF can and should support one or more of the four dimensions of value, quality, performance or compliance.
- **Process enablers** It is important that an organization has adequate human and technology resources to capture, process and report on the different measures and metrics required to understand the health of a process and identify improvement opportunities.
- **Process outputs** The output of a process will include reports with agreed measures and metrics, which are often reflected in a process scorecard. The output of a process will also help define whether the process is meeting its performance targets, such as measuring the efficiency of the process, or whether it is meeting a defined objective tied to its value and quality.

All of these process measurement sources are prime candidates for Six Sigma analysis. But a word of caution is important here. The data gathered as part of the output must be relevant to the analytical objectives. The age-old saying 'Garbage in yields garbage out' should be considered as wise guidance in preparation for measurement and analysis.

The principal connection between ITIL and Six Sigma lies in CSI. As the 'purpose of the CSI stage of the lifecycle is to align IT services with changing business needs by identifying and implementing improvements to IT services that support business processes', a technique such as Six Sigma would be at the heart of the purpose. There should clearly be alignment between CSI and the Six Sigma methodology, analysing the metrics discussed in section 4 with a view to meeting or exceeding the needs of the customer.

ITIL Continual Service Improvement defines and describes the CSI approach (Figure 2) and the seven-step improvement process (Figure 7). There is a tight linkage between this process and approach and the two approaches to Six Sigma.

The CSI approach can be used to design and build new processes or services as well as improve existing ones. Thus, it can be aligned with both the DMADV and DMAIC approaches, as Table 2 shows.

Table 2 Aligning the CSI approach with stages of DMADV and DMAIC

CSI approach	DMADV	DMAIC
What is the vision? Validating against the business and IT vision, strategies, goals and objectives. Understanding business requirements	Define	Define
Where are we now? (Creating a baseline) and **Where do we want to be?** Setting targets for measurements such as CSFs and KPIs	Measure	Measure
Where do we want to be? and **How do we get there?** Identifying design options for process improvements	Analyse	Analyse
How do we get there? Identifying design options for process improvements	Design	Improve
Did we get there? Verifying new results and whether we met the improvement objectives	Verify	Control
How do we keep the momentum going? Assessing whether the organization (and individuals within it) is embracing the new or improved processes	Verify	Control

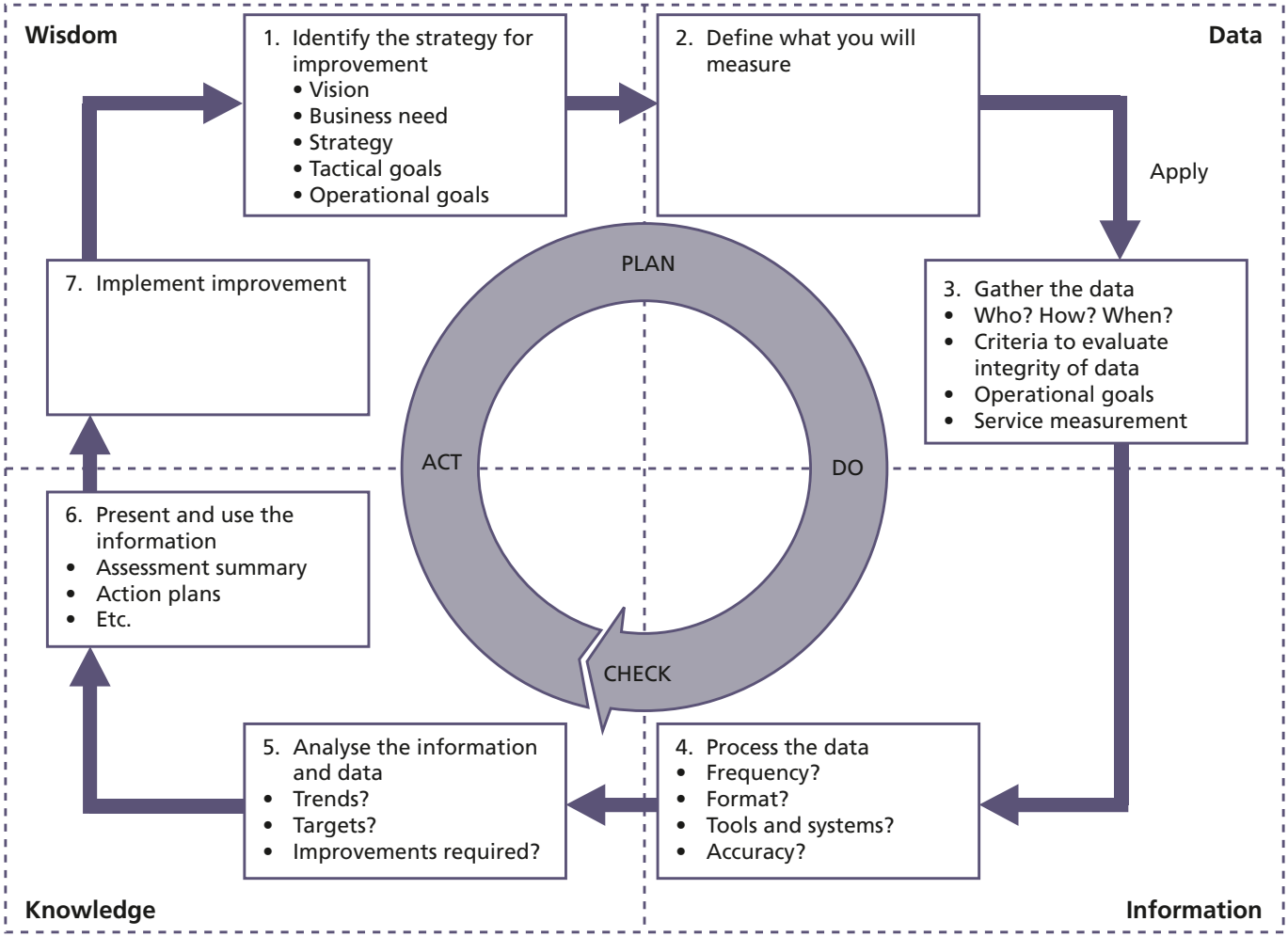

Figure 7 The seven-step improvement process

Table 3 Aligning the seven-step improvement process with stages of DMADV and DMAIC

Seven-step improvement process		DMADV	DMAIC
Step 1	Identify the strategy for improvement. Vision, business need, strategy, tactical goals and/or operational goals are all inputs into understanding the purpose of an improvement.	Define	Define
Step 2	Define what you will measure. This should be driven by what is important to the customer.	Define	Define
Step 3	Gather the data. This would include existing technology, process and service metrics.	Measure	Measure
Step 4	Process the data and turn it into information in logical groupings that will make it easier for analysis.	Analyse	Analyse
Step 5	Analyse the information and data, looking for trends, improvement opportunities and recommending areas for improvement. It is also important to identify whether the trends are positive or negative.	Analyse	Analyse
Step 6	Present and use the information. Information could be presented in reports that allow an organization to make strategic, tactical and operational decisions. This also includes prioritizing improvement initiatives.	Analyse	Improve
Step 7	Implement improvement.	Design	Improve
Step 1	The cycle starts again, ensuring that improvement opportunities support new or changing business requirements.	Verify	Control

There are numerous opportunities to exercise the improvement process within service management. Some examples would include:

- **Example opportunity 1** It is important to create an initial baseline measurement on the maturity, effectiveness and efficiency of a process and/or service. This provides the ability to measure improvement successes after improvement initiatives have been implemented. Many organizations will not want to create an initial baseline until after the improvement initiative has been implemented; however, this makes it much harder to determine the amount of improvement that was made. Organizations may also say they do not have any good data, so why bother creating an initial baseline? In fact, bad data is better than no data, and this in itself is an improvement opportunity.

  This maps to both DMADV and DMAIC as a part of the measurement activity.

- **Example opportunity 2** Create targets for improvement. These could be improvement targets for process and/or service effectiveness and efficiency that will often be defined in the form of KPIs and are driven by the VOC.

  This maps to both DMADV and DMAIC as a part of the 'Analyse' activity.

- **Example opportunity 3** Did we get there? This is a measurement of the process and/or service, utilizing the defined KPIs to determine whether the improvement results met the defined objectives. This maps to the DMADV 'Verify' activity and to DMAIC as a part of the 'Control' activity.

The seven-step improvement process can be easily aligned with the DMADV and DMAIC methods as well. It is useful itself in identifying the improvement opportunities of existing processes or services. Table 3 compares the stages of the process to the stages in sub-methodologies DMADV and DMAIC.

To sum up the concept of improvement opportunities and how DMAIC and DMADV could support improvement, you only need to look at the concept of utility and warranty. If (and only if) IT can deliver the service with both utility and warranty prescribed in terms of what the customer needs, then (and only then) will value be delivered. Value, as expressed in terms of utility and warranty, is clearly at the heart of VOC. This definition of value is important to applying Six Sigma to ITSM as a VOC construct. But another set of concepts bears noting as they play directly into the basic analytic practices of Six Sigma.

As noted in section 3, Six Sigma applies underpinning statistical practices and techniques. Six Sigma, as an approach, draws its name from a statistical component (the sigma or standard deviation) of data distribution curves. Interestingly, both utility and warranty can be expressed as data distributions and in turn can be subject to Six Sigma mathematics. Let us look at this.

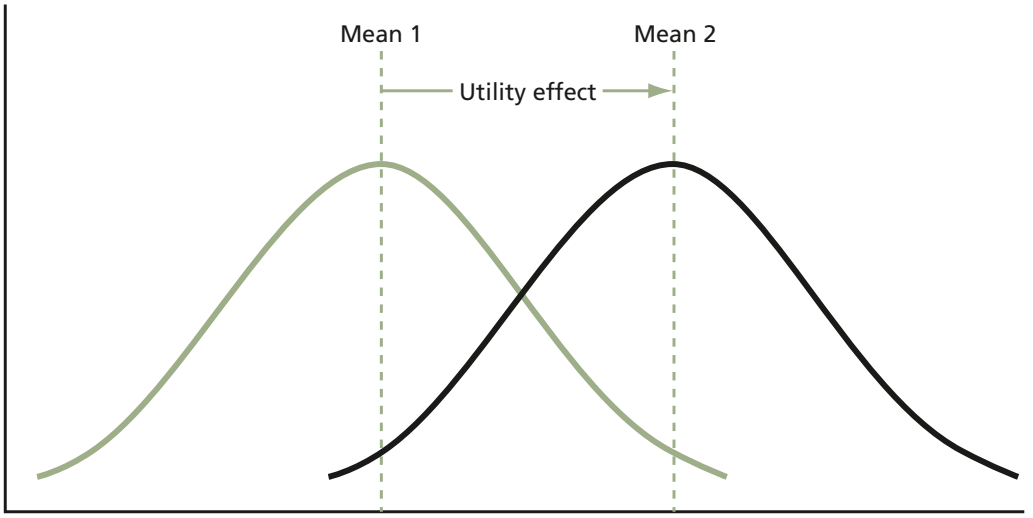

Figure 8 Utility increases the performance average

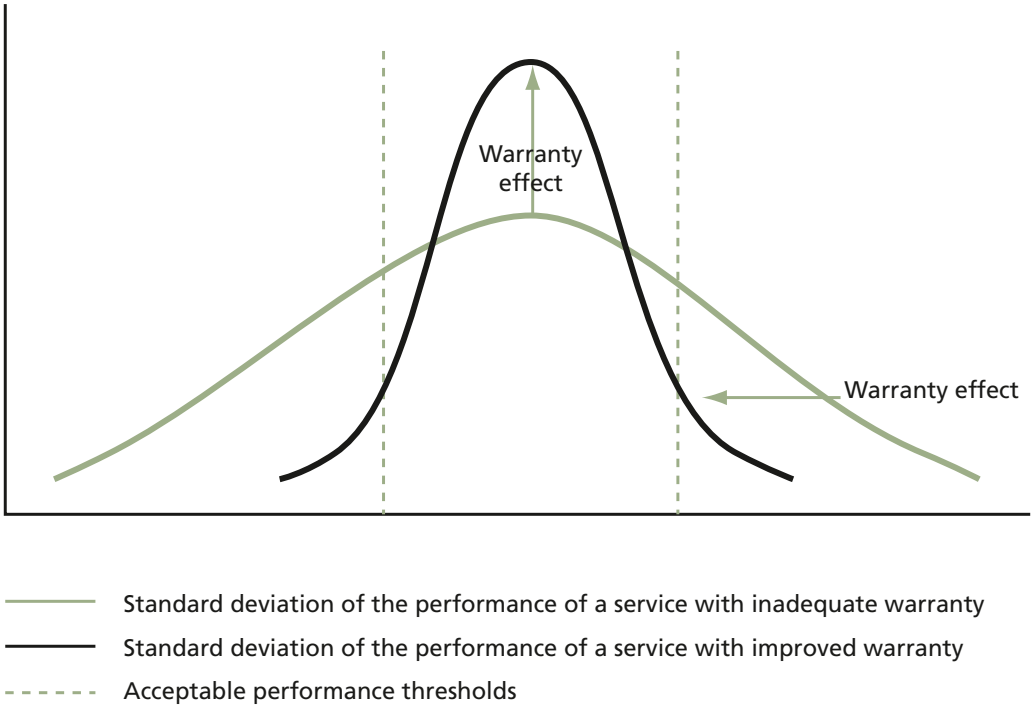

Figure 9 Warranty reduces the performance variation

Figures 8 and 9 depict both the utility and warranty performance of a service as distribution curves. Why would that be the case? Think about how services are delivered: are results consistent again and again? Typically not. Instead, if we measure a service and the delivery of service utility and warranty precisely, we will find that the outcomes might be a little better or worse from time to time; however, the overall performance is somewhat consistent and clusters around an average (or mean). If we plotted the outcomes over time, we would arrive at curves very similar to those represented in Figures 8 and 9.

If we plot the service performance graphically over time, we find that the performance data can be depicted as a distribution curve. The curve will have some degree of symmetry around the average or mean. As service managers, we would prefer the service to perform as expected and as such, we would like to reduce variations in performance that might make the service or process more difficult to manage or impact on customer processes.

What do these graphics suggest?

With respect to utility, IT can improve the performance of the organization to deliver provisioned features and functions that would be viewed positively by the customer. The shift in performance of utility is known as the 'utility effect'. The utility effect can be understood to be the impact on the customer of improving service or process performance through some improvement effort. If we improve the feature/function of a service or process then we would expect the average performance to also improve. If that is the case, then the distribution of performance would also shift in a positive direction.

The improvement project, whether using the CSI approach or the seven-step improvement process, would seek to improve the performance without potentially impacting the current defect level or yield. After the utility effect is implemented you could address improving warranty.

There is a slightly different perspective when looking at warranty. As we have seen, delivering a service with warranty means improving the consistency of delivery over time. If that is the case, then you would expect the distribution of results to 'tighten' up around the average – meaning that any inconsistency with respect to service delivery would 'shrink' and thus the distribution of service performance would become tighter or closer to the expected average performance. This tightening of the performance is known as the 'warranty' effect. Another way to think of the warranty effect would be removing the number of defects or improving the yield.

What does this mean to ITSM and service or process improvement? A major tenet of Six Sigma is that a service, process or product performance is measurable. Six Sigma uses statistical techniques (remember what a sigma stands for) and these curves show that services etc. can be measured statistically and can be subject to Six Sigma methods. Thus, as an organization is working towards improving a service or process, accurate measurements are not only important but also can be analysed critically to identify improvements and progress towards those improvements.

6 Aligning Six Sigma with IT service management

Let us bring all of these principles together and discuss where we would apply them.

First and foremost, there are some points within the service lifecycle where Six Sigma principles can apply. The service portfolio is useful to this discussion (see Figure 10).

The service portfolio consists of the service pipeline and the service catalogue. Within the pipeline, decisions must be made either to introduce new services into the service catalogue or to improve existing services. These decisions will lead to specific design and implementation practices, as the new or improved service moves from concept to reality. Six Sigma provides a statistically based approach to supplement the typical approaches to the decision, design and implementation activities that result in more consistent processes and process improvements.

As we discussed earlier, DMADV is useful to implement the design decisions emanating from service strategy and brought to fruition in service design and transition. DMAIC, on the other hand, will underpin the improvement decision process, focused through continual service improvement, as either a primary or supplemental improvement identification and decision technique.

In either case, ITSM practitioners can apply Six Sigma directly in managing the service or process design, build and implementation activities as well as the improvement efforts of the organization.

The ITIL processes themselves can also support Six Sigma activities. Tables 4 and 5 suggest which ITIL processes might be useful to provide either performance data for completing Six Sigma analysis or useful techniques and practices that can supplement or be supportive of Six Sigma methods. For instance, when applying DMAIC, we seek to define a Six Sigma problem. Service level management (SLM) would be useful in the Six Sigma 'Define' step. One aspect of SLM is to monitor and, if necessary, address the performance, or lack thereof, of services to meet the needs and expectations of the customer (business). In the event that service performance does not consistently achieve the expected service levels, a service improvement plan may be developed. Six Sigma could supplement the work of SLM in understanding and analysing the underpinning issues associated with the service deficit. SLM would be useful in defining a customer-specific Six Sigma problem. In other words, the Six Sigma problem could be defined in terms of the service issue raised by SLM, or Six Sigma could be helpful in sorting out true service-related issues.

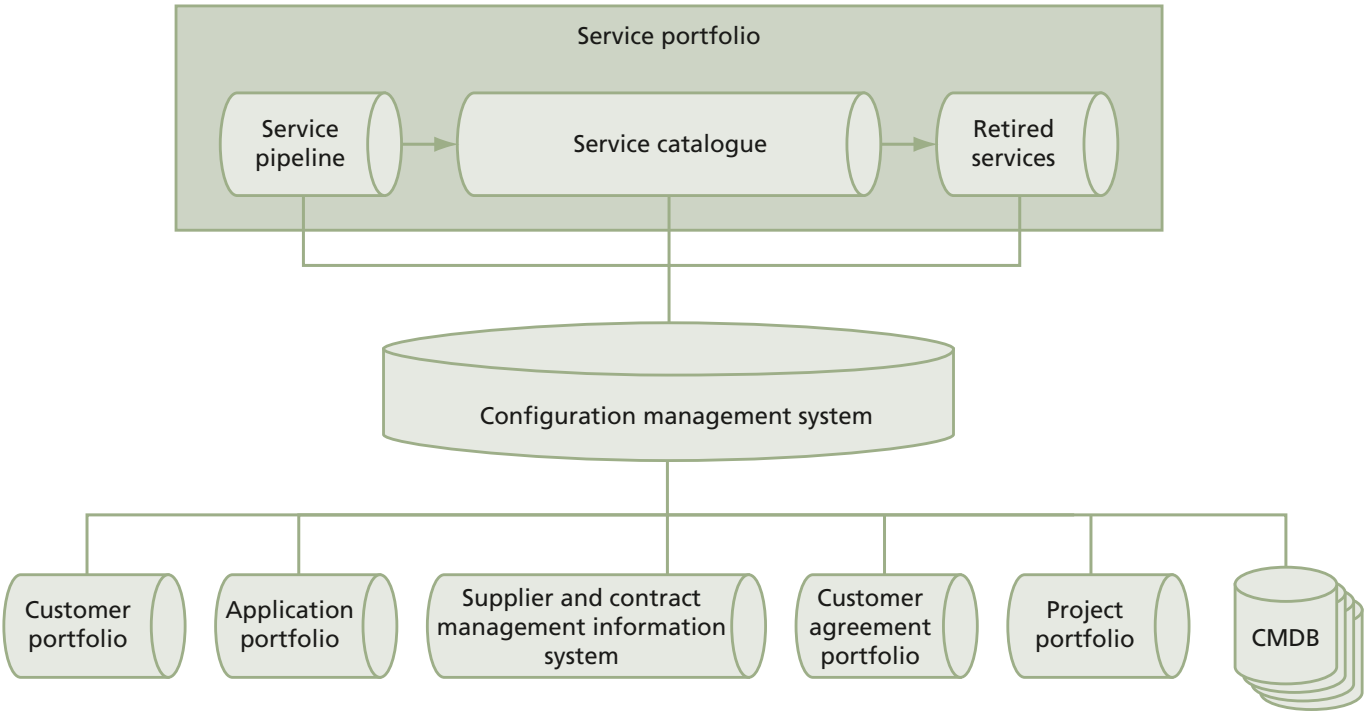

Figure 10 The service portfolio

Table 4 ITIL processes and their application to Six Sigma's DMAIC

DMAIC	ITIL processes
Define	Business relationship management, demand management, information security management, service level management, service portfolio management, seven-step improvement process, strategy management for IT services, transition planning and support
Measure	Access management, availability management, capacity management, change evaluation, event management, financial management for IT services, incident management, information security management, IT service continuity management, problem management, request fulfilment, service asset and configuration management, service catalogue management, service level management, service portfolio management, seven-step improvement process, supplier management
Improve	Change evaluation, change management, release and deployment management, service validation and testing, seven-step improvement process, transition planning and support
Control	Availability management, business relationship management, capacity management, event management, information security management, knowledge management, service level management, seven-step improvement process, supplier management

Tables 4 and 5 depict the author's perspective of ITIL processes and their application to and support of Six Sigma practices. Another, broader approach would be to align Six Sigma's DMAIC and DMADV with the overall service lifecycle. DMAIC, owing to its intrinsic focus on improvement, broadly spans the lifecycle, whereas DMADV can be aligned quite well with the development of new services. Table 6 depicts the nature of the Six Sigma and service management lifecycle.

Table 5 ITIL processes and their application to Six Sigma's DMADV

DMADV	ITIL processes
Define	Availability management, business relationship management, capacity management, financial management for IT services, information security management, IT service continuity management, knowledge management, problem management, service asset and configuration management, service catalogue management, service level management, service portfolio management, seven-step improvement process, strategy management for IT services, transition planning and support
Measure	Availability management, capacity management, event management, financial management for IT services, incident management, request fulfilment, seven-step improvement process, supplier management
Analyse	Availability management, capacity management, financial management for IT services, information security management, IT service continuity management, service asset and configuration management, seven-step improvement process
Develop	Change management, design coordination, release and deployment management, service asset and configuration management, service catalogue management, service validation and testing, seven-step improvement process, transition planning and support
Verify	Availability management, business relationship management, capacity management, change evaluation, demand management, financial management for IT services, incident management, IT security management, IT service continuity management, problem management, service level management, service validation and testing, seven-step improvement process

Table 6 Six Sigma and the service management lifecycle

Lifecycle stage	DMADV	DMAIC
Strategy	Define	Define
Design	Define/Measure/ Analyse	Measure/Analyse/ Design
Transition	Design/Verify	Improve
Operation	Verify	Control
Continual service improvement	Verify	Define/Measure/ Analyse

7 Tips, tricks and traps

As with any framework, standard or model, you must keep in mind that every organization is different. Adopting ITIL or Six Sigma for the sake of it could be a pointless exercise. There must be a valid sense of urgency as to why an organization undertakes the effort to implement the Six Sigma discipline. Also, when adopting ITIL or Six Sigma it is important to always consider fitness for purpose, or what makes sense for the organization. Organization-specific Six Sigma implementations will have different resources to support the initiatives, different budget levels etc. Remember that one size does not fit all.

One of the major challenges of implementing Six Sigma to support ITIL is the demand made on a common pool of resources. This competition for resources is very typical when multiple projects are ongoing. Each project wants to have the 'best of the best' on the project team.

To address these issues, the following tips should be taken into consideration when implementing ITIL and Six Sigma:

- All improvement opportunities should be recorded in the CSI register where the opportunities are prioritized using the VOC. Both ITIL and Six Sigma initiatives will require senior management support and participation. This involves not only providing a budget, but also ensuring the right skilled resources are available and allocated to the projects.
- ITIL and Six Sigma should focus on the customer and not necessarily IT. So, it is important to understand the customer needs and listen to the VOC.
- ITSM is about defining and managing services, so it is important to define and publish a service catalogue and also understand how the service catalogue fits into the larger service portfolio. Define how investment decisions are made to help the organization transform itself, grow the business, maintain the status quo or retire services.
- Create a process governance structure with clearly defined roles and responsibilities to ensure that projects are continually validated according to the business mission, vision, strategy, goals and objectives. Process governance should also ensure the proper CSFs and KPIs are being measured and reported to identify improvement opportunities.

- Adopting ITIL and Six Sigma will require the organization to move towards an organization-wide process orientation and away from managing individual groups or functional silos.
- Continue to develop the necessary skills and competencies to support ITIL and Six Sigma. ITIL Experts and Black Belts should be considered as professions within the organization.
- Be sure that proper procedures, tools and resources have been put in place to capture, process and analyse the data; however, avoid getting caught in the typical trap of 'analysis paralysis'.
- Define the tools required to support the ability to capture, process and analyse data. Six Sigma will require statistically oriented analytic tools to do the data 'crunching'. There are many fine tools on the market, but secure the one that best meets the needs of the Six Sigma practitioners – this is a special skill set. Then, of course, implement the appropriate tools as required.
- Implementing ITIL and Six Sigma will require a strong project management discipline. In fact, implementing ITIL usually requires overall programme management to manage the multiple projects that will be required. For further programme management information, see *Managing Successful Programmes* (Cabinet Office, 2011).
- Managing organizational change is the number one issue that must be addressed. Failure to do so is a significant reason why projects of this nature fail.
- Neither ITIL nor Six Sigma is a 'silver bullet' that will solve all the problems the organization has today or in the foreseeable future. Six Sigma helps you define and understand your problem.

8 Conclusion

Organizations often ask if they should implement Six Sigma or adopt ITIL, and the answer is 'Yes!' They both provide value so it is not about choosing one or the other, but understanding how they complement and collaborate with one another. The only competition is for resources, as mentioned in section 7.

As the ITIL service lifecycle runs its course, the processes and activities of the lifecycle provide a wealth of data necessary to support the design, management, build, implementation, operation and eventual retirement of the service. It is this data that can form the building blocks for the Six Sigma practices.

ITIL processes, at their most detailed level, are a rich source of information. In casting about for Six Sigma projects, you could look to the ITIL processes in the following areas:

- Process activities that need to be executed
- Process inputs and outputs
- Roles and responsibilities associated with each process
- Management information such as KPIs.

Using Six Sigma to supplement the management of ITIL processes and support the ITSM practices makes great sense. Six Sigma is process-oriented and as such can provide a focus on process or service aspects that may not be obvious to the casual observer; however, as we suggested earlier, it is not the cure for all process or service ills. It must be wisely and judiciously implemented. ITIL and Six Sigma will help the service organization meet the needs of customers today and into the future.

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