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Tips and Tricks Guide™ *To*

Creating Business Continuity through Enterprise Storage Solutions

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Note to Reader: This book presents tips and tricks for seven topics related to business continuity created through enterprise storage solutions. For ease of use, the questions and their solutions are divided into topics, and each question is numbered based on the topic, including

- Topic 1: Securing Availability and Business Continuity

- Topic 2: Maximizing Storage Resources and Solutions

- Topic 3: Information Management

- Topic 4: Cost Management

- Topic 5: Compliance

- Topic 6: Security

- Topic 7: Aligning Storage to Serve Business

Copyright Statement

Topic 4: Cost Management

Q4.1: How can I control the cost of storage growth?

A: Controlling the cost of storage growth is on the top of nearly every CIO's to-do list because, quite frankly, many organizations do a rather poor job of forecasting and planning for storage growth. Resolving that concern is, in and of itself, a major task but other factors also contribute to the cost of storage growth both directly and indirectly such as the absence of any concrete storage strategy and the inability of many organizations to consolidate and standardize their storage infrastructure.

Planning for Storage Growth—It's All About the Business

The first step in getting a handle on controlling storage costs is to establish an understanding of what is driving the need for storage. Oftentimes those that provide storage resources within an organization are not the primary consumers of it. There are customers, clients, and internal partners (consumers) that depend upon the storage infrastructure to get their work done. How well you understand what their work entails and how it impacts storage is the first key to getting a handle on storage growth. Work to ensure that a clear understanding is developed that covers:

- Who are the customers, clients, and internal partners (consumers) that use storage?

- How do these consumers use storage?

- For each particular type of storage used, why is that type being used? For example, why did a particular department choose to archive files to tape storage while another chose to archive to DVD?

Understanding how and why storage is used for a particular consumer will help you to better plan and prepare for future needs. Assuming a customer-centric approach is vital in protecting the overall storage investment and managing growth because through it you can:

- Identify storage needs based upon actual business drivers to eliminate guess work by linking storage procurement to business forecasts

- Plan storage growth along with business growth

- Prevent, to a large extent, emergent (and often costly) last minute storage purchases

- Build customer loyalty by demonstrating interest in their storage needs and your desire to meet those needs

In addition to the benefits of developing a relationship with a storage consumer, planning for storage also allows for a measure of relief in being able to link storage growth to business growth. If business grows faster than expected and storage demands increase proportionately, you can clearly demonstrate why storage must be expanded—it is clearly driven by the business need. This also allows storage engineers, architects, and managers to make more informed decisions about how much more storage to put into play and escape from the routine of "it's at capacity" guesswork.

Develop a Concrete Storage Strategy—Planning vs. Having a Plan

In the 19th century, Helmut Karl Bernhard von Moltke, who later became the Prussian General Staff Chief, was credited with saying "Plans are nothing, but planning is everything!" He was also known for having said that "No battle plan survives contact with the enemy." So then why do we endeavor and endure to create a storage (or any other IT) strategy? In a word: Awareness.

Developing a storage strategy creates situational awareness and provides a common point of focus and orientation for a team. Question 3.4 covered some of the components of a successful information management strategy. These components apply here as well. The Kalpič, Pandza, Bernus model provides a solid foundation to develop a storage strategy (and really any IT strategy) because it takes into consideration the following four key areas.

Strategic Identity Creation

Strategic identity creation includes the development of a mission, vision, and strategic intent as well as identification of core capabilities resources and competencies. Who are you (as a storage provider)? What is your mission? What are your own strategic intentions, or, in other words, from a direct storage and technology point of view, what strategy do you desire to follow? This could include a desire to standardize SAN solutions to a single provider or to outsource desktop backups within the next 3 to 5 years. During this step, you will also identify all of those items that are "core" to your group and, perhaps, evaluate if they really need to be.

Strategic Analysis

As touched on in the previous topic, strategic analysis focuses on industry foresight development, product and market competencies identification, and new competencies identification. This would be on a broad scale. In the realm of storage strategy, this may specifically include analysis of:

- Current and anticipated future technology trends in storage

- Current and anticipated future business trends needing storage

- Current competencies, capabilities, tools, and resources to meet the need

Strategic Implementation

Once the analysis is complete, the next step is to articulate the strategy, evaluate the strategy, elaborate on the strategy, and execute it. This equates to documenting the overall strategic plan, measuring and evaluating it against the need, and elaborating on any ambiguous area prior to executing the plan. For example, if your strategic development has led your organization to standardize on a particular SAN architecture, this is the point in time where all the communication takes place to ensure that all parties involved in storage procurement, application development, infrastructure, and business understand that direction, why it's taking place, and what process exists for an exception (if any are permitted). The strategic analysis portion of developing the overall strategic plan should have clearly demonstrated that this direction is for the common good of the organization. Understanding that the common good of the entire organization is rarely the common good for every interest in the organization is the kind of tact and concern that must go into articulating and elaborating on the strategy in order to persuade individual interests to the best interest of the organization.

Strategic Reformulation

Herein lies the difference between developing a plan and planning. Strategic reformulation is the process whereby the overall strategy is re-evaluated and re-designed on a regular basis. Developing a strategic plan is a continuous process that will need to be revisited and recycled as often as the needs of the business demand. Technology, on average, can be forecast out to 3 to 5 years. This number, however, may be more driven by the length of an average equipment lease than it is on the technology itself. However, assuming 3 to 5 years as a planning cycle, it would be advisable to revisit the overall strategy at least every 6 months and to begin the strategic planning process anew at least every year.

Consolidation and Standardization

In the whole of IT, it is important to understand that standardization is your friend and variation is your enemy—but complexity should not be feared. Once that statement is accepted your organization has taken its first step towards realizing the benefits of consolidation and standardization.

Consolidation

Question 2.6 discussed the steps that can be undertaken to consolidate storage management and identified the four stages of consolidation. The top three stages can directly apply to storage consolidation. To recap they are:

- Logical consolidation—Focuses on the centralization, or unifying, of management of IT resources and is commonly referred to as unified management

- Centralized consolidation (co-location)—Is sometimes referred to as co-location and is the physical consolidation of servers, storage devices, or other infrastructure components to a central location—usually a data center

- Physical consolidation (compiled workload)—Involves the compiling of workload from multiple servers or storage devices onto a single server platform; in terms of storage, this may be the equivalent of replacing multiple independent RAID-5 storage arrays on many separate servers within a SAN.

The most cost-effective step to implement is usually logical consolidation. For some organizations, this might simply mean the purchase and implementation of software capable of simplifying the management of all storage assets under one system. Centralized consolidation involves the co-location of physical storage devices and is usually more costly to implement than unified management, depending of course on the size and complexity of the storage infrastructure. If your organization, for example, currently has data stored sporadically across the infrastructure, consolidating the data to few, or one, data center will simplify the management of the data to that physical infrastructure. Physical consolidation, which oftentimes is realized hand-in-hand with centralized consolidation, is an easy entry point for standardization efforts as this involves the simplification and standardization of an infrastructure often to a single platform.

Standardization

Standardization, to a large degree, is required for civilization. If we couldn't all agree on a common language when speaking to one another, or a common monetary system when buying or selling, we would live in chaos. These two examples, however, were chosen with purpose because although we may standardize on a local scale, there are other options on the boarder to be considered as well. That which works best for us may not always work best for others, so there is, to a large degree, a balance that must exist between standardization and diversity, whether we are considering languages and money or storage solutions.

There are many options in the storage arena on which to standardize, and you may find that there is no one-size-fits all solution. We need a compromise that fulfills the needs of the business in the most efficient and direct way possible. We next need to ensure that everyone uses the standard system. Some of the benefits to standardization include:

- Decreased hardware and licensing costs and/or the ability to leverage larger volumes of licenses for cost savings

- Decreased support costs (again leveraging the vendor relationship)

- Decreased training costs

- Simplified career development focus for associates (no longer need to be proficient in multiple, disparate technologies in order to fulfill job responsibilities)

📖 For more information about standardization, please refer to Question 2.5.

Q4.2: What best practices exist to aide in storage procurement?

A: Best practices in storage procurement should equate to more than just getting the best price for your storage solution at the point of sale. Best practices should also equate to a manageable solution that aligns with business, technology, and storage strategies and results in a lower total cost of ownership (TCO) throughout the life of the solution.

Best Practice #1: Know What You're Buying and Why

To accomplish this goal, the first stage in procurement must be to define the required benefit to be derived from the procurement. What is it that you are trying to accomplish? The answer can be quite complex but it must be clearly defined in order to move forward and should be considered a critical defining point in the procurement process. For example, a new application system may require 80GB of online storage. Once you understand the required benefit, you can begin to compare products, services, and solutions offerings to the presented need and your own storage strategy. The next step is to match the benefit to actual use so as to be certain not to overspend for unneeded resources. Using the storage example, it may be foolish to purchase an extra TB of SAN storage to meet an 80GB application need that can be met by a local Direct Access Storage Device (DASD).

Best Practice # 2: Play Fair and Be Rewarded

Good procurement is conducted in a fair and relatively transparent manner. This will allow potential vendors to bid in an open and unassuming environment. Treating vendors as fair and equal partners in the procurement process will result in lasting healthy relationships with your key vendors and respect for your organization within the market. Organizations that refuse to play fair within the market can lead vendors to take anti-competitive steps in their solutions offerings, which often yield little or no benefit to both the organization and the vendor.

Best Practice # 3: Remain Brand Neutral

The use of brand or product names inhibits competition and cost savings by locking procurement choices into a limited scope. Unless there is a specific reason why you must choose a single brand, and only that brand, try to keep your specifications as vendor neutral as possible. This will encourage vendors to offer innovative products at competitive prices.

Best Practice #4: Develop a Procurement Strategy

A procurement strategy is essential in ensuring the success of your procurement program, and it should be developed in such a way as to be complementary to the business and IT strategies of your organization. The goal of a procurement strategy is quite simply to develop a plan that will drive out maximum procurement benefits. This strategy should be developed through close partnerships with internal stakeholders (those making the purchase requests) to understand their needs and to predefine categories of products and services required by each stakeholder. Each category should be assigned both a market champion, who will act as a subject matter expert (SME) on procurement within that category, and a risk profile that clearly outlines the risk associated with the category. For example, if a category has been created for "Storage Devices," a member of the storage engineering team may be assigned as the SME for that category and its associated risk profile may state that storage devices must comply with internal standards (by listing internal reference documents) and perhaps outside regulations.

Best Practice #5: Maintain Transparency and Separation of Duties

The concepts of transparency and separation of duties are both central concerns to procurement operations that are all-too-often subjugated by projects that have become out of control. Indeed, one of the most difficult jobs in procurement is to prevent the chaos generated by a project from becoming the chaos of procurement; these two concepts—transparency and separation of duties—can help prevent that.

Transparency

Ensuring transparency essentially means that any information related to any procurement should be readily available for consultation, and the individuals responsible for the procurement should be able to provide any additional information as required. Transparency is a key concept that should govern any procurement action. To ensure transparency, many organizations have implemented procurement committees to address procurement actions and award contracts to the most responsive bidder. Members of a procurement committee need not be permanently placed. They can be initiated as a single-point solution depending on the nature of the goods or services to be procured, frequency of the procurement, and the technical competence of the staff involved.

Separation of Duties

The principle of separation of duties also reinforces transparency of the procurement process. Separation of duties in the procurement process is important to maintaining financial control. It simply states that no one individual in a the procurement process should be granted the ability to request goods and services, write the specification for the goods and services, solicit bids or proposals for the goods and services, and further award contracts and payment for the good and services. Separation of duties is a challenge for both small and large organizations, especially when the procurement process is being forced to meet project deadlines. To prevent separation of duties from becoming a concern, you might choose to implement some sort of physical or logical control in the procurement process.

Q4.3: What are the differences between an RFI and an RFP and how can each be used to maximize vendor relationships to benefit cost management?

A: The major difference between a Request for Information (RFI) and a Request for Proposal (RFP) is in the scope. RFIs are broad documents meant to get a feel for the capability of a business or its products and services to meet the needs of your organization. An RFP, however, is a request for a bid on a specific product or service offering to be provided by the vendor. Both have their specific use, play an important part in the procurement process, can positively impact cost management by increasing the awareness of the capabilities of various vendors—how far they can stretch to meet your needs, and drive competition.

RFI

An RFI is a business process whose purpose is to collect information about the capabilities of various suppliers for comparative purposes. To be fair to the vendor, a good introduction of your organization should be included with the RFI; the introduction should cover the basics of who you are and what you're looking for. An RFI can be used to gather information such as business background and capabilities.

Business Background Information

It is important to capture the background of your vendors. Who runs the business and who the key decision makers are can be equally important as what kind of products and services are being delivered. Although it doesn't happen very often, a vendor executive wouldn't be without precedent by closing one failing business and reopening it under a different name.

Key items to request in the business background information section include:

- 1 to 3- and 3 to 5-year financial history—This request first answers the basic question of how long they have been in business and second demonstrates how well the business has performed. A single drop in financials over 5 years is not typically a delimiting matter, but a history of bad finances may be indicative of a deeper organizational, managerial, or product/service problem.

- Organizational structure—The organizational structure of a vendor can tell quite a bit about how the organization is managed. Deeply nested tiers of organizational hierarchy may raise a concern in the number of approvals that need to be obtained within a vendor's organization to get products and services delivered; whereas, a relatively flat hierarchical structure may demonstrate that their associates are more empowered to make their own decisions, which makes working with a vendor much, much easier.

- List of top executives—It has been said that an organization's effectiveness hinges on the leadership of its CEO. When dealing with a storage hardware provider, it also hinges on its Chief Storage Architect, Chief Engineer, and Head of Software Development. Knowing who are the key people in the organization and how they contribute to the success of their organization is an important step in understanding how their organization will contribute to the success of yours.

- Business operations areas—Knowing where an organization operates is important for gauging how agile they may be in meeting your growing needs.

- Business goals, objectives, and history—It's important to understand the overall goal of the organization as well as their objectives and their history. How has this organization changed over the past 5 years? What were their goals then and what are their goals now? If their goals haven't changed, is it because of a resounding success of those goals or a failure to adapt to change?

Capabilities Information

Ask the vendor specific questions regarding their capabilities. Feel free to ask them how many customers they have and how many fall into your specific demographic. If they are a SAN storage provider, for example, you might want to ask how much storage they have brought online in the past 6, 12, or 24 months. The important thing is to pose questions that will either qualify or disqualify the vendor. Key items to request in the capabilities information section include:

- How many of a particular employee type (consultants, technicians, sales, support) do they staff in your region?

- What is their average time to market for the products/services you're likely to request?

- What strategic alliances do they rely upon to maintain their capabilities? For example, if onsite support will be provided by a sub-contractor, ensure that the relationship is identified and understood.

> 📖 An RFI affords you the opportunity to ask probing questions, so be creative. Asking a potential vendor about their competition, for example, can reveal a great deal of information about how they envision their role in the market place. Even though a particular vendor may have a product or service you need, it may not be their niche.

An RFI is, in many ways, like an interview. Use this as a tool to interrogate prospective vendors for their potential to serve the needs of your organization. Unlike an RFP, an RFI is not an invitation to bid and is not binding for either the buyer or sellers.

RFP

An RFP is an invitation for suppliers, through a defined bidding process, to bid to provide a specific product or service. It is important to remember that there is often a direct correlation between the amount of detail provided to outside vendors during the RFP process and the resulting cost accuracy. The lesson here is that by being as detailed and specific as possible when requesting proposals, you can help to ensure accurate cost forecasting.

RFP's often include very specific and highly detailed information such as the following:

- Overall project details/scope—Provide as many details as you are permitted:
  - Project charter or mission
  - Geographic footprint
  - Number of sites impacted
  - Number of systems impacted
  - Specific work area constraints
  - High-level project plan (timeline)
- Product/services requested—If you know exactly what you want, state it here. If what you're requesting is a custom service, define in as much detail as possible exactly what custom service you are requesting and what comparable product or service might be used as a basis.
- A few other items to consider might be:
  - Quantity
  - Scope
  - Delivery schedule
- Systems architecture background/expectations—Educate the vendor about your current environment. If you're requesting a proposal for a 150TB SAN solution, for example, it might be helpful to explain what platforms within your organization will need to access the SAN and to define your current network and data center architecture.
- Security background/expectations—Installation day isn't the best time to mention for the very first time a need for the entire solution to be encrypted end-to-end. Although it is not always easy to articulate security requirements publicly, you can speak in general terms. Indicating that you will be relying on the vendor, for example, to provide consultation in the area of security, encryption, cryptography, and other like security areas is usually enough information to get started. Granularly detailed information about your security architecture should only be delivered after an authorized party for the vendor has signed and agreed to a non-disclosure agreement (NDA).

Through the use of RFI and RFP documents, you can first evaluate outside vendors as potential suitors for your IT investments, then encourage competition through specific proposal requests. The first serves to protect your investment by helping to ensure the party with which you're doing business is not only reputable but also capable and the second takes the most capable vendors and gives them an opportunity to compete for your business.

Q4.4: What is the Six Sigma methodology and how can it be used to reduce storage costs?

A: The Greek letter sigma (σ) is used in mathematics to represent standard deviation. Six Sigma (often represented as 6σ) is a business improvement methodology that was originally developed by Motorola in the 1980s to improve processes by eliminating defects. The concept of a "defect" is central to this methodology and is defined as any unit that is not a member of the intended population. If, for example, a file needs to be restored from a backup copy and the restoration process works flawlessly 99 out of 100 times, that 1 time would be the defect. Defects in relation to the population are usually represented as Defects per Million Opportunities (DPMO); Six Sigma, in the mathematical sense, represents, essentially, a rate of 3.4 DPMO or 99.9997 percent. The Six Sigma methodology, however, is about much more than just measuring defects and is used in today's business world to refer to various strategies, processes, and tools employed to deliver results to an organization's bottom line by defining what needs to be measured, measuring what needs to be analyzed, and analyzing that which needs to be improved.

Six Sigma Methodologies

Six Sigma has two methodologies that are most often used to improve existing business processes, DMAIC, which is used to improve upon existing business processes, and DMADV, which is used to create new product or process designs. DMAIC as a process consists of five phases:

- Define—During this phase, the improvement goal is defined.

- Measure—This phase involves the collection of data for analysis.

- Analyze—During this phase, measurements are analyzed to ensure relevance and relationship to all other factors.

- Improve—In this phase (which is sometimes referred to as the Optimize phase), steps are taken to define and implement solutions that "improve" upon the results.

- Control—This phase often includes testing the implementation of the improvement in a production environment and instituting a way to continually measure the improvement to ensure that variances are corrected before they result in defects.

DMADV as a process consists of five phases:

- Define—During this phase, the design goal is defined—what is the need?

- Measure—This phase involves the identification of design elements that are critical to quality, identification of capabilities, and risk assessments.

- Analyze—During this phase, measurements are analyzed to ensure relevance and relationship to all other factors.

- Design—During this phase, the design is optimized and a plan for design verification is developed.

- Verify—This phase involves verifying the design in accordance with the design verification plan, implementing (or producing) the design, and turning over the design to those who will support it moving forward. If this were a physical product, for example, this is the point at which the design would be delivered to manufacturing. In terms of business process, this would be the point where the process is implemented for use.

Both processes can assist in reducing storage costs by establishing a process for design and improvement that is based upon a clear understanding, measurement, and analysis of the need. Defining that need is often gathered through an exercise known as Voice of the Customer (VOC).

VOC

Every organization has a customer either internal or external to their own organization. For example, if your department provides computer and networking services to the other major divisions within your organization, such as Sales, Marketing and Human Resources, those divisions are, in many ways, your "customers." To provide the best possible service, your organization will need to gather some form of feedback or "voice" from these customers as a starting point for improvement. This customer-centric approach is not only aimed at gathering the need but also at creating the best possible customer experience and will in turn drive customer loyalty. If, for example, your customer informs you that response times on an important business application are lower than desired, this "voice" can then be used as a starting point for an improvement effort. As this effort progresses and your division begins to interact and fully understand the need of the customer, this, often times, will be recognized as a legitimate concern for the well being of the customer. It's this kind of communication that drives customer loyalty and will pay dividends in the long run.

A good Six Sigma project will never have a predetermined outcome; after all, if you already know the solution, you really should just go and fix the problem. As an example, consider an improvement effort around reducing server downtime using the DMAIC approach.


During the define phase, the project team will be formed and clear direction will be given on the scope of the effort. In this example scenario, the project team may consist of the line of business partner (or customer) that uses the server, the infrastructure partner that provides for network connectivity to the server, the team that supports the server, and any application support team that may need to be involved.

At a minimum, the following deliverables and checkpoints should be met before proceeding to the measure phase:

- Customer is clearly defined.
    - All customers who use the system are clearly identified.
    - Customer usage is defined (How? When? Why? How critical?).
- Impact is clearly defined.
    - Any data gathered to reflect customer impact is organized and presented.
- Team of qualified personnel is formed.
    - Project sponsor or champion is identified.
    - Leaders are identified.
    - Team members are assigned.
    - Time commitment to work on the project is pre-approved.
    - Team members are qualified in both their area of expertise and Six Sigma (as needed).
    - Team members have access to all materials, tools, and resources.
- Team charter is established.
    - Problem statement is clearly articulated.
    - Goal statement is clearly articulated.
    - Roles and responsibilities are established.
    - Communication plan is established and understood by all.
    - Business case has been developed.

Once all of these points have been met, you should have a team of qualified individuals who have a clearly defined customer impact to address and are prepared to move forward together.
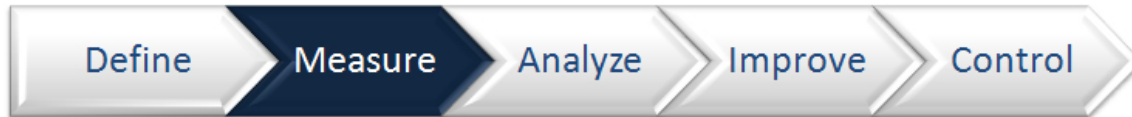
During the measure phase, the key measurements are identified and some form of data collection method is established. It is also in this phase that you capture the first sigma level for the process you want to improve. In the case of server downtime, there are a number of ways in which to measure overall downtime. If your organization is a 24/7 operation, the methodology used to gather downtime will differ from an organization that only operates for 8 hours a day or only during certain days of the week. For example, if your organization operates 24/7 every 30 days, the server has 43,200 minutes (or opportunities) to be down; assuming the measurement you choose for downtime is minutes. If your organization only operates 8 hours per day, 5 days a week, the server would only have 9600 opportunities in 30 days to be down. The saving grace of the Six Sigma process is that defects are always measured per million opportunities (not per *x* amount of days or any other measure of time). Thus, although your measurements may be gathered per hour, day, or month, you'll need to reflect that measurement off of the mirror of DPMO to get an accurate representation:

DPMO = (Total Defects / Total Opportunities) * 1,000,000

If the server operating 24/7 had 10 minutes of unexpected downtime (10 defects out of 43,200 opportunities), this would equate to 231 DPMO or a yield of 99.98 percent uptime. Sounds pretty good right? Well, not quite. As good as that sounds, a DPMO of 231 is equal to about a Sigma Level of 5.00, which isn't quite Six Sigma quality. To reach Six Sigma, you would want to reach a DPMO of 3.4, which, for this example, would mean less than 9 seconds per 30 days of downtime. If your servers aren't quite at Six Sigma level just yet, don't panic, it can be done with the right team and when the proper focus is given to decreasing downtime. If, however, you're of the opinion that Six Sigma cannot be reached for server downtime, by all means do panic because your competitors are very likely working towards this goal or something close to it depending upon the anticipated return on investment (ROI).

📖 Calculating sigma value and DPMO is made easy via an online tool provided by iSixSigma.com at http://www.isixsigma.com/sixsigma/six_sigma_calculator.asp.

At a minimum, the following deliverables and checkpoints should be met before proceeding to the analyze phase:

- Establish an understanding and agreement on key measurements
    - Identification
    - Agreement within the team on measurements
- Gather data for measurement
    - Plan established for data collection and duties assigned
    - Collect data
- Establish current sigma level
    - Based upon data collection and measurements establish current sigma level

It is important to note that some projects end at this point. There may, for example, be a perception offered by a VOC that leads an organization to believe a problem exists that is larger than it actually is. Once the problem is measured, however, a clearly documented analysis may show that the problem is not as bad as it first appeared. For example, in the example case of server downtime, if your organization has a tolerance for a sigma level of 5.00 or 5.5, it may not be worth the time spent to improve upon the problem. Even if this is the case, however, it may be prudent to at least complete the analysis phase simply to ensure that the problem is clearly understood.

Define Measure **Analyze** Improve Control
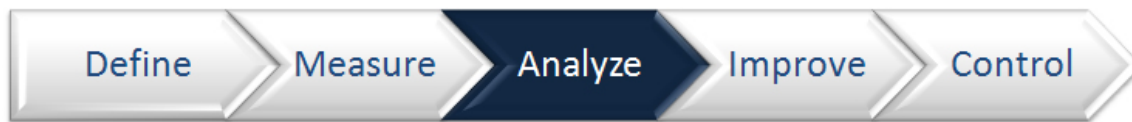
During the analyze phase, data collected is, of course, analyzed and an active search is underway for the root cause of the issue. Using the downtime example, during the analyze phase, an in-depth look into server and network activity during the time of the outages may be undertaken to identify the underlying impact factor.

At a minimum, the following deliverables and checkpoints should be met before proceeding to the improve phase:

- Detailed analysis

    o Analysis of the present sigma against the target (how much are you looking to improve?)

    o Analysis of the root cause

- Identification of the opportunity

    o Using the analysis of the present state vs. the target state, quantify the opportunity in terms that can be understood. For example, increasing server uptime 15 minutes per month for a server that is used by 1000 employees who consistently access a database on that server would result in 250 people-hours of productivity reclaimed! (15 * 1000 / 60)

Once you understand what is causing the problem and what you have to gain by fixing the problem, you can move forward together to improve the situation.
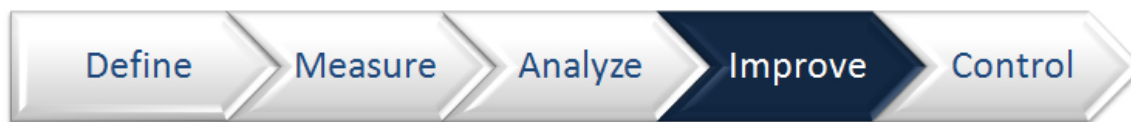
Those who really enjoy problem solving live for the chance to be a part of a team during an improve effort because it is here, during improve, that problem solutions are developed, tested, selected, and put into place.

At a minimum, the following deliverables and checkpoints should be met before proceeding to the control phase:

- Develop possible solutions

- Select the best solution

    o Does the solution work?

    o Does the solution meet the needs of all customers?

    o Does the solution add any new risk?

    o Is the solution cost-effective?

- Implement the solution

    o Create a plan for implementation

    o Create a back out plan for implementation

    o Ensure all impacted parties (or potentially impacted parties) are informed of the change and that proper change control procedures are followed

    o Implement the solution

Reaching the end of the improve phase is a monumental step in the Six Sigma process. So far, your team has defined a problem, measured the problem, analyzed its nature, and implemented a solution that will hopefully maintain a higher state of quality within your environment—but that is never guaranteed. To ensure that all this work isn't forgotten in 6 months or a year, the final phase of the DMAIC process, control, will build in some safeguards to protect the investment of time, effort, and money to maintain the improved state.
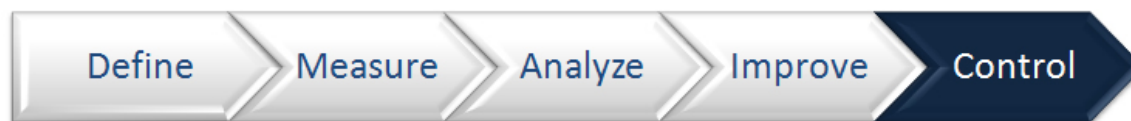
The purpose of the control phase is to ensure that control is exhibited over the improvement. At a minimum, the following deliverables and checkpoints should be met during the control phase:

- Establish ongoing monitoring
  - How will the monitoring be performed?
  - At what intervals will monitoring be performed?
  - Clearly assign ownership
- Documentation
  - Document the project including measurements, analysis, improved actions, business case, and anything else that you feel may aide future projects of a similar nature
  - Publish the documentation
- Relinquish control
  - Identify the party responsible for control
  - Establish a plan and a date to relinquish control to the proper party
  - Relinquish control

It's important to remember that Six Sigma is a tool and any tool is only as good as the hand that wields it into action. With the proper team and direction, Six Sigma can yield great dividends and has for companies such as Motorola, 3M, AMD, Caterpillar, and Bank of America.

Q4.5: What steps can be taken to increase the ROI of storage costs and maximize technology investments?

A: Increasing the return on investment (ROI) of storage costs and maximizing technology investments is a bit of a numbers game the crux of which will, like many things, focus specifically on the organization's understanding of the numbers, how they're calculated, and more importantly on where the perceived value is derived.

Calculating ROI

ROI is the ratio of money gained or lost on an investment relative to the amount of money invested. There are arguably as many different ways to calculate ROI as there are people using the term, so it is important to grasp the basics. There are three basic calculations that have been used:

- ROI = Benefit – Costs—In this calculation, the results are straightforward and can be represented in a positive or negative benefit rapidly.

- ROI = Benefits / Costs—Dividing the benefits by the costs provides a ratio that might be preferred by management that is used to seeing benefits displayed in ratio format.

- ROI = (Benefits - Cost) / Costs—This calculation is one of the most widely used because it deflates the ROI to a more 'realistic' number.

ROI can also be represented over multiple years by expanding the formula. The equation for a 3-year ROI, for example, might be:

(Benefits in year 1 / (1+discount rate) + Benefits in year 2 / (1+discount rate) + Benefits in year 3 / (1+discount rate)) / Costs

Thus, if the initial cost for your new storage infrastructure was $10,000, your annual benefits minus annual costs are constant at $5000 for the next 3 years, and the discount rate is 10%, your 3-year ROI would be:

($5,000 / (1 + .1) + $5,000 / (1 + .1)^2 + $5,000 / (1 + .1)^3)/$10,000 = 124%

Deriving Value from the Investment

Increasing the return on storage and technology investments begins with a solid understanding of what is being invested and what value is being returned on that investment. The value of a storage infrastructure is not, simply, in its capacity to store data or information but rather should be represented as a value in relation to an underlying business process. Although a storage engineer, architect, administrator, or manager might look at any given storage media and calculate it's ROI based upon cost per Megabyte, Gigabyte, or Terabyte, the real value lies in what the storage technology returns to the storage consumer.

For example, if a consumer of storage resources within your infrastructure has an application that is responsible for placing orders on a stock market, and that application requires very fast (low latency) response times from the storage infrastructure in order to complete transactions and log them appropriately, then the impact of storage latency on storage value is a direct contributing factor to ROI. After all, what good is $0.15/GB of storage if it's so slow that your stock traders are losing money waiting on storage? Storage response time saved nearly always equates to personnel time saved and personnel time saved nearly always outweighs the actual cost of the storage infrastructure.

Once you have established the basis for ROI and a focus on where the value should be determined (within the business), the next step is to maximize the ROI of storage investments. This is, of course, easier said than done, but there are a few things you can do to aim in the proper direction:

- Ensure the investment is aligned with current standards—Purchasing any storage or investing in any technology that is not in alignment with current standards is very likely going to increase storage costs and drive up the overall cost the storage infrastructure.

- Invest in the right technology for the organization—Maximizing ROI often means stepping outside of the originally intended audience to ensure that, from an organizational perspective, the right purchase is made. In the most basic example, if the accounting department is presenting a need for an additional 2TB of SAN storage, rather than just purchasing storage for that one isolated need, it might make sense to ask other departments about their storage needs first. A good storage strategy that includes input from line of business partners will help here.

- Evaluate all options by the same criteria—A common mistake when evaluating storage or technology proposals is to get caught up in the details. It is important to understand exactly what it is that you're looking for in a storage or technology solution and evaluate all options based upon the same criteria. Doing so will help to ensure that the right candidates get through based upon their ability to meet the criteria set forth by your organization, rather than some whiz-bang sales pitch.

- Differentiate and quantify "hard" and "soft" benefits—A hard benefit is any real, tangible, solid benefit such as *Reduction in infrastructure costs by $1M in the next 3 years*. A soft benefit is, sadly, one that usually benefits people the most but to an extent is very difficult to quantify. The challenge lies in quantifying that which benefits the people in a way that makes sense on paper in dollar form. If the new solution, for example, is estimated to save 20 minutes per day in administrative frustration, quantify that by determining the value of the employee time and calculating the benefit. Very rarely will a CIO purchase a storage solution or other piece of technology based simply on the "it will make thing easier" argument, but if you can show that it will make things $10k per month easier, you're on to something.

Q4.6: How can I reduce the TCO of storage?

A: No matter what return on investment (ROI) formula you choose, by reducing your total cost of ownership (TCO) you are reducing your costs and thereby increasing your ROI. Reducing the overall TCO will require focus and a solid understanding of what exactly a TCO analysis is in the storage space and how this analysis can then, in-turn, be used to reduce TCO.

TCO is a financial estimate designed to assess direct and indirect costs related to the purchase of any capital investment, such as storage devices. A TCO assessment is a process whereby all financial aspects of financial ownership are evaluated, and usually takes into consideration at a minimum the costs related to:

- Purchase
- Maintenance
- Training (both user and administrator)
- Full-Time Employee (FTE) expenses to run the environment
- Ongoing vendor support
- Backup and contingency in case of failure
- Damage control in case of failure (customers lost/reputation damaged)
- Security (and costs related to potential breaches)
- Floor space
- Electricity consumption
- Development
- Testing
- Implementation
- Quality assurance
- Growth
- Eventual decommissioning

Taking each of these aspects of ownership into consideration is the first step in reducing their overall impact. Oftentimes an organization will find that they failed to measure a potential impact to ownership that ties into the TCO of storage, such as the cost of decommissioning or the cost to ensure adequate security for the lifetime of the environment.

To reduce TCO:

- Focus on one area and do better. As one can easily see from the list provided, there are a great deal of things that go into calculating TCO. Some items will span multiple environments, such as the cost of floor space and electricity consumption. Focusing on any one area and closely evaluating that area for improvement will usually identify an opportunity for improvement.

- Exercise the Six Sigma DMAIC process. Six Sigma, as covered in Question 4.4, is a very powerful tool that can be used to target an area of improvement and may lead your team to cost savings that were otherwise unexpected.

- Forecast to need, then purchase as forecast. This has been stressed elsewhere within this volume but it is simply so very important that due emphasis must be given. To make intelligent storage purchases, you must understand the storage need from a business perspective. Once this understanding has been established, a clear forecast can be gained that can then be used to drive storage procurement from the standpoint of a business need. Purchasing only what is needed, in turn, drives down the TCO.

- Reduce as many niche products and services as possible in favor of vendor-neutral solutions that can cover commoditized storage and save on licensing costs. Although hardware platforms may have become disparate and disorganized, many software products exist today that can make management of the storage infrastructure easier and more cost effective.

Q4.7: What is 'Utility Storage' and how can this, and other strategies like it, be used to reduce capital and operating expenses?

A: Utility storage is a business model whereby storage resources are provided on an on-demand and pay-per-use basis. This is the same concept and model on which utility computing is based and differs from the conventional model in that storage consumers do not have to invest in owning the entire storage infrastructure in order to take advantage of it during their time of peak need.

It is important to note that utility computing is really just beginning to gain solid industry muscle because it aligns so neatly with the concept of Service Oriented Architecture. SOA began as a software architecture that defined the use of loosely coupled software services to support the requirements of business processes and software users. It is a term that today, however, is also used in the realm of service delivery management to define business services and operating models that provide a structure for IT to deliver against the actual business requirements and adapt in a similar way to the business. For example, a complete document management system that can be accessed by multiple line-of-business applications for any number of purposes (from a business perspective) is an example of SOA in infrastructure. Utility storage represents just this kind of extension of SOA that may yield benefits in reducing capital and operating expenses.

As an example, let's focus on an organization that has three internal storage consumers. These storage consumers receive storage as a service that they pay for by the actual capacity used and each one has the need to use an average of 10TB of data on a daily basis. Additionally, these storage consumers may need to flex their storage an additional 2TB each during peak usage, which may be different for each consumer. Rather than purchasing 36TB of storage to meet the average + peak utilization for each consumer and charge them the full price that your organization needs to recover, you could, instead, partner with a Storage Service Provider (SSP). An SSP is a company that provides storage as if it were a utility. The concept, though unoriginal, is novel in that it allows organizations to pay for only what they need and often at a rate less than what they could do on their own. After all, few among us can generate our own electricity cheaper than our local utility can provide it. Utility storage offers an alternative to purchasing and administrating your own storage infrastructure at a rate that is typically much less than an organization can achieve independently. The only large drawbacks to date is that there are very few SSPs competing in the marketplace and the future of storage, as a commodity, is ambiguous at best.

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