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(ACCOUNTING & FINANCE)

SUBJECT NAME: FINANCIAL ANALYTICS & CONTROL

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FINANCIAL ANALYTICS AND CONTROL

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UNIT 1

Accounting Information System (AIS)
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What is an Accounting Information System (AIS)?

An accounting information system (AIS) involves the collection, storage, and processing of financial and accounting data used by internal users, to report information to investors, creditors, and tax authorities. It is generally a computer-based method for tracking accounting activity in conjunction with information technology resources. An AIS combines traditional accounting practices, such as the use of Generally Accepted Accounting Principles (GAAP), with modern information technology resources.

An accounting information system (AIS) is a structure that a business uses to collect, store, manage, process, retrieve, and report its financial data so it can be used by accountants, consultants, business analysts, managers, chief financial officers (CFOs), auditors, regulators, and tax agencies.

How an Accounting Information Systems (AIS) is Used

An accounting information system contains various elements important in the accounting cycle. Although the information contained in a system varies among industries and business sizes, a typical AIS includes data relating to revenue, expenses, customer information, employee information, and tax information. Specific data includes sales orders and analysis reports, purchase requisitions, invoices, check registers, inventory, payroll, ledger, trial balance, and financial statement information.

An accounting information system must have a database structure to store information. This database structure is typically programmed with query language that allows for table and data manipulation. An AIS has numerous fields to input data as well as to edit previously stored data. In addition, accounting information systems are often highly secured platforms with preventative measures taken against viruses, hackers, and other external sources attempting to collect information. Cybersecurity is increasingly important as more and more companies store their data electronically.

The various outputs of an accounting information system exemplify the versatility of its data manipulation capabilities. An AIS produces reports including accounts receivable aging reports based on customer information, depreciation schedules for fixed assets, and trial balances for financial reporting. Customer lists, taxation calculations, and inventory levels may also be reproduced. However, correspondences, memos, or presentations are not included in the AIS because these items are not directly related to a company's financial reporting or bookkeeping.

Specially trained accountants work in-depth with AIS to ensure the highest level of accuracy in a company's financial transactions and record-keeping, as well as make financial data easily available to those who legitimately need access to it—all while keeping data intact and secure.

Benefits of Accounting Information Systems

Interdepartmental Interfacing

An accounting information system strives to interface across multiple departments. Within the system, the sales department can upload the sales budget. This information is used by the inventory management team to conduct inventory counts and purchase materials. Upon the purchase of inventory, the system can notify the accounts payable department of the new invoice. An AIS can also share information about a new order so that the manufacturing, shipping, and customer service departments are aware of the sale.

Internal Controls

An integral part of accounting information systems relates to internal controls. Policies and procedures can be placed within the system to ensure that sensitive customer, vendor, and business information is maintained within a company. Through the use of physical access approvals, login requirements, access logs, authorizations, and segregation of duties, users can be limited to only the relevant information necessary to perform their business function.

KEY TAKEAWAYS

- An accounting information system (AIS) is used by companies to collect, store, manage, process, retrieve, and report financial data.
- AIS can be used by accountants, consultants, business analysts, managers, chief financial officers, auditors, and regulators.
- An AIS helps the different departments within a company work together.
- An effective AIS uses hardware and software to effectively store and retrieve data.
- The internal and external controls of an AIS are critical to protecting a company's sensitive data.

Understanding Accounting Information Systems (AIS)

An accounting information system is a way of tracking all accounting and business activity for a company. Accounting information systems generally consist of six primary components: people, procedures and instructions, data, software, information technology infrastructure, and internal controls. Below is a breakdown of each component in detail.

1. AIS People

The people in an AIS are the system users. An AIS helps the different departments within a company work together. Professionals who may need to use an organization's AIS include:

- Accountants
- Consultants
- Business analysts
- Managers
- Chief financial officers
- Auditors

For example, management can establish sales goals for which staff can then order the appropriate amount of inventory. The inventory order notifies the accounting department of

a new payable. When sales are made in a business, the people and departments involved in the sales process could include the following:

1. Salespeople enter the customer orders into the AIS.
2. Accounting bills or sends an invoice to the customer.
3. The warehouse assembles the order.
4. The shipping department sends the order out to the customer.
5. The accounting department gets notified of a new accounts receivable, which is an IOU from the customer that's typically paid within 30, 60, or 90 days.
6. The customer service department tracks the order and customer shipments.
7. Management uses AIS to create sales reports and perform cost analysis, which can include inventory, shipping, and manufacturing costs.

With a well-designed AIS, everyone within an organization can access the same system and retrieve the same information. An AIS also simplifies the process of reporting information to people outside of the organization, when necessary.

For example, consultants might use the information in an AIS to analyze the effectiveness of the company's pricing structure by looking at cost data, sales data, and revenue. Also, auditors can use the data to assess a company's internal controls, financial condition, and compliance with regulations such as the Sarbanes-Oxley Act (SOX).[1]

The AIS should be designed to meet the needs of the people who will be using it. The system should also be easy to use and should improve, not hinder efficiency.

2. Procedures and Instructions

The procedure and instructions of an AIS are the methods it uses for collecting, storing, retrieving, and processing data. These methods are both manual and automated. The data can come from both internal sources (e.g., employees) and external sources (e.g., customers' online orders). Procedures and instructions will be coded into the AIS software. However, the procedures and instructions should also be "coded" into employees through documentation and training. The procedures and instructions must be followed consistently in order to be effective.

3. AIS Data

An AIS must have a database structure to store information, such as structured query language (SQL), which is a computer language commonly used for databases. SQL allows the data that's in the AIS to be manipulated and retrieved for reporting purposes. The AIS will also need various input screens for the different types of system users and data entry, as well as different output formats to meet the needs of different users and various types of information.

The data contained in an AIS is all of the financial information pertinent to the organization's business practices. Any business data that impacts the company's finances should go into an AIS.

The type of data included in an AIS depends on the nature of the business, but it may consist of the following:

- Sales orders
- Customer billing statements

- Sales analysis reports
- Purchase requisitions
- Vendor invoices
- Check registers
- General ledger
- Inventory data
- Payroll information
- Timekeeping
- Tax information

The data can be used to prepare accounting statements and financial reports, including accounts receivable aging, depreciation or amortization schedules, a trial balance, and a profit and loss statement. Having all of this data in one place—in the AIS—facilitates a business's record-keeping, reporting, analysis, auditing, and decision-making activities. For the data to be useful, it must be complete, accurate, and relevant.

On the other hand, examples of data that would not go into an AIS include memos, correspondence, presentations, and manuals. These documents might have a tangential relationship to the company's finances, but, excluding the standard footnotes, they are not really part of the company's financial record-keeping.

4. AIS Software

The software component of an AIS is the computer programs used to store, retrieve, process, and analyze the company's financial data. Before there were computers, an AIS was a manual, paper-based system, but today, most companies are using computer software as the basis of the AIS.

Small businesses might use Intuit's Quickbooks or Sage's Sage 50 Accounting, but there are others. Small to mid-sized businesses might use SAP's Business One. Mid-sized and large businesses might use Microsoft's Dynamics GP, Sage Group's MAS 90, or MAS 200, Oracle's PeopleSoft, or Epicor Financial Management. Tally ERP 9, Tally Prime, SAP

Quality, reliability, and security are key components of effective AIS software. Managers rely on the information it outputs to make decisions for the company, and they need high-quality information to make sound decisions.

AIS software programs can be customized to meet the unique needs of different types of businesses. If an existing program does not meet a company's needs, the software can also be developed in-house with substantial input from end-users or can be developed by a third-party company specifically for the organization. The system could even be outsourced to a specialized company.

For publicly-traded companies, no matter what software program and customization options the business chooses, Sarbanes-Oxley regulations will dictate the structure of the AIS to some extent. This is because SOX regulations establish internal controls and auditing procedures with which public companies must comply.[9]

5. IT Infrastructure

Information technology infrastructure is just a fancy name for the hardware used to operate the accounting information system. Most of these hardware items a business would need to have anyway and can include the following:

- Computers
- Mobile devices
- Servers
- Printers
- Surge protectors
- Routers
- Storage media
- A back-up power supply

In addition to cost, factors to consider in selecting hardware include speed, storage capability, and whether it can be expanded and upgraded.

Perhaps most importantly, the hardware selected for an AIS must be compatible with the intended software. Ideally, it would be not just compatible, but optimal—a clunky system will be much less helpful than a speedy one. One way businesses can easily meet hardware and software compatibility requirements is by purchasing a turnkey system that includes both the hardware and the software that the business needs. Purchasing a turnkey system means, theoretically, that the business will get an optimal combination of hardware and software for its AIS.

A good AIS should also include a plan for maintaining, servicing, replacing, and upgrading components of the hardware system, as well as a plan for the disposal of broken and outdated hardware, so that sensitive data is completely destroyed.

6. Internal Controls

The internal controls of an AIS are the security measures it contains to protect sensitive data. These can be as simple as passwords or as complex as biometric identification. Biometric security protocols might include storing human characteristics that don't change over time, such as fingerprints, voice, and facial recognition.

An AIS must have internal controls to protect against unauthorized computer access and to limit access to authorized users, which includes some users inside the company. It must also prevent unauthorized file access by individuals who are allowed to access only select parts of the system.

An AIS contains confidential information belonging not just to the company but also to its employees and customers. This data may include:

- Social Security numbers
- Salary and personnel information
- Credit card numbers
- Customer information
- Company financial data
- Financial information of suppliers and vendors

All of the data in an AIS should be encrypted, and access to the system should be logged and surveilled. System activity should be traceable as well.

An AIS also needs internal controls that protect it from computer viruses, hackers, and other internal and external threats to network security. It must also be protected from natural disasters and power surges that can cause data loss.

Real World Examples of Accounting Information Systems

A well-designed AIS allows a business to run smoothly on a day-to-day basis while a poorly designed AIS can hinder its operation. The third use for an AIS is that, when a business is in trouble, the data in its AIS can be used to uncover the story of what went wrong. The cases of WorldCom and Lehman Brothers provide two examples.

The Bottom Line

The six components of an AIS all work together to help key employees collect, store, manage, process, retrieve, and report their financial data. Having a well-developed and maintained accounting information system that is efficient and accurate is an indispensable component of a successful business.

What Is Enterprise Resource Planning (ERP)?

Enterprise resource planning (ERP) is a process used by companies to manage and integrate the important parts of their businesses. Many ERP software applications are important to companies because they help them implement resource planning by integrating all of the processes needed to run their companies with a single system. An ERP software system can also integrate planning, purchasing inventory, sales, marketing, finance, human resources, and more.

Benefits of Enterprise Resource Planning (ERP)

Special Considerations

An ERP system doesn't always eliminate inefficiencies within the business. The company needs to rethink the way it's organized, or else it will end up with incompatible technology. ERP systems usually fail to achieve the objectives that influenced their installation because of a company's reluctance to abandon old working processes that are incompatible with the software. Some companies are also reluctant to let go of old software that worked well in the past. The key is to prevent ERP projects from being split into many smaller projects, which can result in cost overruns.

Enterprise Resource Planning FAQs

What Is an ERP and How Does It Work?

Enterprise resource planning (ERP) consists of technologies and systems companies use to manage and integrate their core business processes. Enterprise resource planning software offer single system solutions that integrate processes across the business. Such applications allow for users to interact within a single interface, share information, and enable cross-functional collaboration.

What Is an Example of an ERP?

With the explosion of the Internet of things (IoT), it's no secret that Internet-fueled or cloud-based applications are on the rise. As a result, more companies are moving away from on-site ERP systems to adopt the more agile, cloud-based ERP system, managed and maintained by the host or vendor. Oracle, widely known in the tech industry, offers several cloud-based ERP products used by many household brands, such as FedEx, Blue Cross, and Blue Shield.

What Are the Benefits of an ERP?

An ERP promotes the **free flow of communication** across an organization and results in increased synergies between different business areas, **increased efficiencies** as processes

are streamlined and information is readily accessible to those that need it; and **reduced costs associated with outdated and ineffective technology.** Adopting an ERP may be a costly endeavor, but the return on investment **(ROI) may be achieved quickly**. Most certainly, the benefits realized (e.g., increased productivity and reduced administrative costs) may far outweigh the costs to introduce an ERP.

What Should an ERP System Include?

The components of an ERP system are dependent on the needs of the organization. However, there are key features that each ERP should include. An ERP system should be automated—to reduces errors—and flexible, allowing for modifications as the company changes or grows. More people are mobile; therefore, the ERP platform should allow users to access it from their mobile devices. Lastly, an ERP system should provide a means for productivity to be analyzed and measured.

The Bottom Line

Enterprise resource planning (ERP) manages and integrates business processes through a single system. With a better line of sight, companies are better able to plan and allocate resources. Without ERP, companies tend to operate in a siloed approach, with each department operating its own disconnected system.

ERP systems promote the free flow of communication and sharing of knowledge across an organization, the integration of systems for improved productivity and efficiencies, and increased synergies across teams and departments. However, moving to an ERP system will be counterproductive if the company's culture does not adjust with the change and the company does not review how the structure of its organization can support it.

Enterprise Performance Management

In 2019, the enterprise says goodbye to Enterprise Performance Management (EPM) as we know it, and it now takes hold of a new best-of-breed approach to enterprise planning and performance management. It no longer matters which Enterprise Resource Planning (ERP) platform you are on, or which spreadsheet-based EPM or Corporate Performance Management (CPM) suite you are struggling to pull together.

Today’s modern enterprise planning platform needs to be cloud-based with advanced yet user-friendly modeling that can support an array of cross-functional and complex business use cases. The move to achieve this criterion aligns with Connected Planning—a next-gen approach to enterprise planning.

What is Enterprise Performance Management?

Enterprise Performance Management (EPM) is a process supported through planning, reporting, and business intelligence software that enables an organization to connect its strategy with planning and execution. This approach came to fruition in the mid-90s and incorporated past, present, and forward-looking information—in addition to business drivers—for a more comprehensive method of financial and operational planning.Some of

the key components of EPM systems include planning, budgeting, and forecasting capabilities and the ability to monitor performance measures (KPIs), provide analysis, and manage reporting.

Enterprise Performance Management also encompasses the financial close, consolidate, and report process. Ultimately, these suites of solutions are to support the business by linking the strategic plan with the annual budget and the periodic forecast using both bottom-up and a top-down methodology.

EPM software is designed to integrate with ERP systems to provide a management layer on top of the transactional ERP modules. EPM systems can support practices that align finance with operations for integrated business planning and establishes the foundation for aspirational, enterprise-wide Connected Planning.

Successful use of EPM software in the finance function allows financial planning and analysis (FP&A) teams to anticipate performance gaps and drill down into root causes, collaborate strategically with the business, and execute timely and reliable planning, analysis, and reporting.

Counting down the top three Enterprise Performance Management technology trends

1. **1. Deployment models remain a challenge.** When rolling out an entirely new EPM solution with different deployment models (cloud vs. on-premises) at a global operation, it can mean replacing some large legacy systems and processes. This effort is no small feat and can result in one to three-year on-prem implementation times (or longer). Fortunately, solutions such as Anaplan can be implemented in a fraction of the time it typically takes to get an on-premises solution up and running due to the agility of the platform and the natural language syntax putting modeling in the hands of the business.
2. **2. All innovation is not created equal.** In addition to the move toward cloud solutions, EPM innovation is evolving along four vectors: user-experience simplicity, social collaboration, advanced analytics, and integration with other business applications. However, these four are often not equal in importance, and many Anaplan customers indicate a preference for the following order:

- **Integration.** Robust and straightforward data and metadata integration are critical.
- **Experience simplicity.** Users have experienced many technology rollouts, and adoption increases when technology aids their work and drives efficiencies.
- **Advanced analytics.** In today's fast-paced world, organizational leaders need insight and flexibility in their planning platform to evaluate scenarios and best courses of action quickly.
- **Social collaboration.** When planning doesn't include the right people at the right time, decision making is delayed and misinformed.

3. Flexible modeling is "The King." As SaaS solutions have become prevalent in EPM, widely acknowledged differentiators provide competitive advantages, such as the robustness and flexibility of modeling, reduction in IT dependence, and management reporting capabilities.

The transition from EPM to CPM

The acronyms have changed, but the concepts remain the same as corporate performance management (CPM) supersedes EPM. Here is Gartner's Definition of CPM from December 2001†:

"'Corporate performance management' is an umbrella term that describes the methodologies, metrics, processes, and systems used to monitor and manage the business performance of an enterprise."

EPM, a suite of methodologies that ranges from strategy maps, planning, activity-based costing, and financial reporting has morphed into CPM as the favored term, and vendors that support the practice of CPM strive to bring all of its methodologies into a single platform. This shift has resulted in many improvements to the CPM space, such as:

- Users have access to all of the CPM methodologies they need in a single workspace.
- Users can quickly customize and deploy applications for finance, sales, operations, and human resources. Now the traditionally finance-centric CPM can extend out into all areas of the business, and it is easier for finance teams to provide support for decision-makers across the enterprise.
- With a central repository to reconcile and synchronize various sources of data, users leverage a single source of truth for all their CPM needs, something that was far from easy in the past.
- Moving past installing on-premises software by loading CDs on your servers, software-as-a-service platforms accelerated deployments and precluded propping up and maintaining four or five different kinds of software on company hardware.

From their "Back to Basics" research†, Gartner noted how they "…originated the concept of corporate performance management in 2001. At that time, CPM was envisaged as a holistic approach to managing the performance of an organization at the corporate level. CPM brought individual applications for financial reporting together with budgeting, management reporting, and strategy management into an integrated suite that complemented business intelligence investments and was ERP solution-agnostic."

From the same research, Gartner advised clients to "Pursue a more targeted approach to selecting FP&A and FC solutions. Don't start with a 'suite is best' mindset. Work with your finance team and focus on its requirements in these areas. Look for areas of differentiation and innovation where you can deliver rapid incremental business benefits by leveraging cloud solutions."

Relaxing the "suite is best" strategy

By relaxing the suite ideal, your organization is free to choose which solution is optimal for each purpose or use case. The cloud has been the great enabler of this best-of-breed approach. The need to spin spreadsheets to fill gaps between platforms is fading as this "postmodern" FP&A approach leverages cloud-born apps as the equalizer for finance.

You can also relax the notion of the software stack as the integration between ERP and EPM/CPM components are, for the most part, equal. Moving away from a central suite frees the business units from reliance on corporate finance to generate their analysis and reports. Anaplan meets the needs of both corporate finance and the business units; bringing both together on a common platform yields Connected Planning.

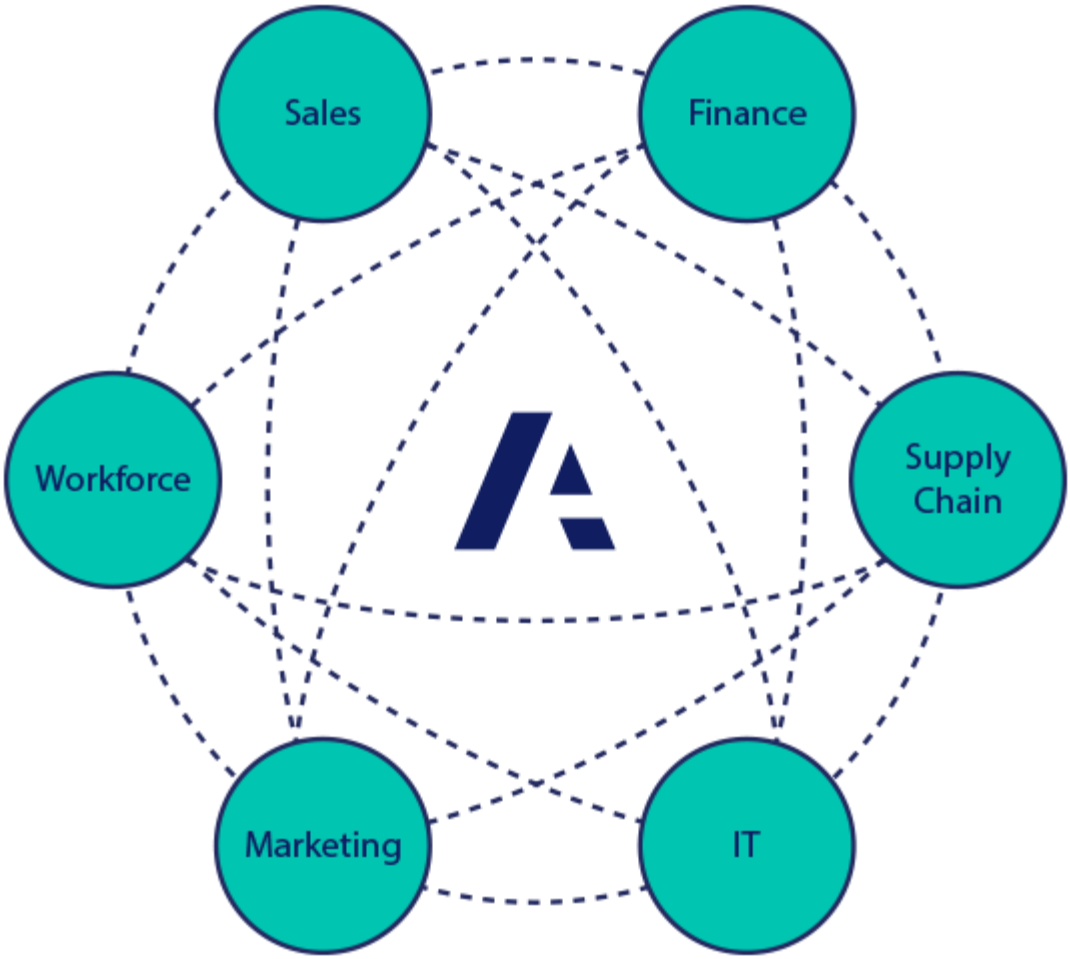
Joining the Connected Planning choir

Organizations have long acknowledged a need for a more adaptive financial planning process. A Harvard Business Review survey revealed that 75 percent of organizations need to plan more frequently, and 85 percent responded that they need to plan faster. Despite this, of those survey participants, only five percent believe their organization is effective at ongoing course corrections.

So, what gives—what is holding finance back?

Some of the specific pain points that a Connected Planning approach can help resolve for an organization include:

- **Lack of planning accuracy and outcome predictability.** Plans are often not agile enough to adapt to changing business conditions and support unexpected scenario modeling needs. With better analytic insights and modeling techniques provided through technology, organizations can drive more valuable performance outcomes.
- **Stale business information.** Batch interfaces and a lengthy close-the-books process can result in delayed reporting and analysis. With Connected Planning technology, real-time data merges with planning for up-to-date, faster, and reliable business insights.
- **Intermittent collaboration.** With e-mail and spreadsheets, collaboration is a challenge and a hindrance to developing plans and forecasts. With accessible technology and appropriate workflows, stakeholders connect with not only one another but the information they need to achieve short- and long-term business objectives.
- **Lack of strategic focus.** With more traditional tools, organizations could fall short on achieving long-term strategic goals. This is because planning and performance measures customarily focused on controlling costs—rather than aligning with strategic growth imperatives.
- **Lack of insight into revenue and operations.** Numerical reports and presentations can provide murky insight into trends and performance indicators, in addition to difficulty in correlating financial, sales, and operational results. Connected Planning technology eliminates this kind of data density by providing clear business insights.



Five key notes of a Connected Planning solution

Technological advancements in multidimensional databases, Web-based visualization, and cloud technology have become top-of-mind for today's finance leaders. How do you know if your organization is leveraging these features effectively?

Here are five distinct signs reflecting that organizations have implemented a successful Connected Planning management approach:

1. **It's integrated.** All areas of the business execute against plans. There is a wide variety of use cases across the enterprise, with opportunities to connect workforce planning, sales compensation, marketing campaigns, project planning, IT costs, and more. Adopting a true Connected Planning platform brings about this benefit.
2. **It's continuous.** Financial plans are living and breathing things that can be refreshed with real-time information. With technology moving to the cloud, we now have better data integration tools. What was historically executed as a batch process is now continuous.
3. **It's collaborative.** Real-time information is shared across the enterprise. Access to shared technology and data can help eliminate spreadsheet errors and inefficiencies. Moving collaboration within a planning platform also allows users to refine their assumptions and act on outcomes more quickly.
4. **It's predictive.** Your team isn't doing all of the hard work anymore. Traditionally, people performed all of the work manually; today's planning and forecasting processes are enhanced with real-time insights and predictive analytics. Progressive technology can do

more of the work with its predictive algorithms and simulations, giving teams more time to focus on value-added work.

5. **It's strategic.** Executive stakeholders can focus on growth opportunities. For many organizations, there is extreme pressure to deliver results that may be at direct odds with what is needed to improve the customer experience. With EPM, CPM, and Connected Planning technology, bottom-up initiatives connect with top-down strategies to ensure business alignment.

Connected Planning brings plans together

Connecting data, people, and plans is imperative to conducting your enterprise with symphonic precision and artistry. Connected Planning is a practice ideally managed enterprise-wide on a common platform, supports agile methods, and enables the digital transformation that the big consulting firms are pitching to your CFO.

If you are looking to be a "post-modern CFO," financial analyst, or FP&A maestro, here are a few reasons to consider implementing Connected Planning with Anaplan:

- Anaplan is a platform that provides the power of a **single code base** to advance enterprise planning across finance, sales, supply chain, and other use cases and functional areas.
- Anaplan brings sales and revenue forecasting to **demand planning**.
- Anaplan is **strategic**. Legal/financial consolidation solutions support the close process and external reporting requirements. Meeting these requirements checks a box but does not provide forward-looking value. Anaplan is your management system for driving insightful decisions to align strategy with action and to drive enterprise value.
- Anaplan provides a robust cloud-deployed platform that can flex, evolve, and provide **future-ready technology** on a multi-tenant architecture that is both in-memory and multidimensional.
    - With Anaplan as your instrument for Connected Planning, you put your whole organization on the same sheet of music by integrating finance with operations—moving from analog processes to digital optimization.
    - As Gartner says in its previously cited "Back to Basics" research, "C-level executives have shifted their focus to digital business transformation, so the original principles of corporate performance management have become less relevant. Application leaders who are modernizing finance applications need to adapt the finance system strategy to accommodate this shift."
    - Gartner goes on with their refrain, "Pursue a more targeted approach to selecting financial planning and analysis (FP&A) and financial close (FC) solutions. Leverage cloud FP&A solutions to enable flexibility and agility."
    - **In conclusion**
    - Connected Planning provides a means to leverage past ERP, EPM, and CPM initiatives with a modern, cloud-born solution that orchestrates the entire enterprise on a common platform for all of your planning needs.

DATA POLICIES AND PROCEDURES

Instead of a negotiation between *people*, think of data governance policies and procedures as a negotiation between your *organization* and your *data*. What's more, it's a negotiation that can be completely automated. So what does this all mean in today's data-driven world and, more importantly, why should you care?

In this blog, I want to discuss data governance as a process, beyond the realm of data policies and government regulation, as well as explore the critical factors that drive organizations to design and implement strong, maintainable data governance policies. I'll also suggest incremental steps to build a policy that's right for you. It's not one size fits all. What is the same, however, is the fact that every organization should have one.

Data Governance Policies and Procedures as a Process

Data governance is not a new concept by any stretch of the imagination, but it has come into sharp focus as the world's data footprint continues to grow exponentially. Today, organizations not only must adhere to strict data policies and regulations (i.e. Sarbanes-Oxley Act, Basil Accord, HIPAA, Government agencies, GDPR), but they're also looking to build a data governance strategy to better manage and properly safeguard their data as a valuable organizational asset.

Efficient access and understanding of your organization's data and its footprint is crucial. Let's take a quick look at what a data governance process strategy can look like through this lens.

Say your company is looking to market a new product by targeting a specific user group from your established customers. There are many aspects to a successful roll-out and launch, but I'll focus solely on the marketing campaign to target specific users interested in the product. Questions you'll ask are: where can I get information about my customers, the previous conversations we've had, and any other relevant information to put a story together to sell them something new? Answers live in a number of places, but they probably include these sources: your CRM, customer support portal, and analytics dashboards.

If you have a data governance policy in place, you're likely to know exactly where all of your data resides (data catalog) and have rules for granting access to such data. What results is a streamlined process to efficiently utilize a protected asset.

However, if you do not maintain a governed environment, you'll instead spend a significant amount of time and resources trying to gather all of the information about the data source and dialogue with the people who really understand them. Putting together a strategy for the marketing campaign after all of that is a little bit more of an undertaking.

The Driving Forces of Data Governance

Above is a useful example to help illustrate why data governance has entered centre stage over the past couple of years. In my opinion, there are two important operational drivers forcing organizations to either create or enhance their data governance policy: risk and maintenance. Let's go into these with the marketing example in mind.

Risk Beyond Regulation

In addition to policy risk and regulations which mandate companies to safeguard certain data in a specific way, organizations are now facing the risk that their most valuable possession, their data, isn't being properly handled. Access rights may be too lenient, there might be no data lineage, or they simply don't know what exists in their infrastructure. With customer data being the most valuable asset for successful targeted marketing campaigns, it's clear these three types of risks can have real repercussions.

Moving beyond risk management is optimization. With the contract defined, organizations can free their resources to improve data analysis. If an organization can understand how its data is being handled and accessed, it can make sure the data is not only protected, but better utilized.

Maintenance

Nobody likes to talk about maintenance because, much like data governance, it's not new. However, it still has its place, marking the difference between being organized or unorganized, between saving time and resources or wasting them and losing opportunities. All existing data in an organization's infrastructure must be maintained; the more you have, the more of an effort it is to maintain it.

With a customized and automated data governance policy, an organization has the ability to do things such as set identity management, setup an audit log, monitor data requests, monitor data quality, flag and alert the appropriate stakeholders, manage the data's structure and content, and more. Committing to a data governance framework that is automated makes maintaining the solution altogether less daunting. Positive results include decreased operational costs and increased efficiency and trust in data insights across the board.

5 Steps for Developing a Strong Data Governance Policy

So your organization has identified that you either need to improve your policy or create a new one. Let's get into how you can get the best bang for your buck and develop a customized policy that's reliable and maintainable.

My first recommendation is to start with your regulatory and operational data risks. Once the risks have been mapped out, you can then start thinking about how to make your data work for you. By this, I mean, think about the data you collect from your customers and explore how you can deliver a better overall experience. Here are some incremental steps to get your process on the right track:

1. **Determine the senior leaders you trust** with creating/updating your policy. Generally, this will include at least a senior leader from IT, business, and management, sharing knowledge from different areas of expertise.

2. T**he data governance team should assess all areas of operational risk** with respect to the data and come up with a plan for using your existing data.
3. **Determine the plan and implementation strategy** with the operational risks clearly communicated and addressed. If you're implementing a new policy, I highly recommend determining how you can automate the entire process. This should also include a plan for maintaining all systems and their data.
4. **Implement the changes** and put your governance strategy into practice.

5. **Re-assess** and change course, if needed.

Note: If you are setting a new policy, start small and grow from there, as this is a highly iterative process.5 STAGES IN THE DATA MANAG

Integrity in the Data Life Cycle

If you are working with data in a Life Sciences organisation it is imperative that you can guarantee its integrity at every stage of the Data Life Cycle. Below we identify the 5 stages of Data Life Cycle Management and what you need to ensure is in place at each stage.

The 5 Stages of Data LifeCycle Management

Data LifeCycle Management is a process that helps organisations to manage the flow of data throughout its lifecycle – from initial creation through to destruction. While there are many interpretations as to the various phases of a typical data lifecycle, they can be summarised as follows:

1. Data Creation

The first phase of the data lifecycle is the creation/capture of data. This data can be in many forms e.g. PDF, image, Word document, SQL database data. Data is typically created by an organisation in one of 3 ways:

- **Data Acquisition**: acquiring already existing data which has been produced outside the organisation
- **Data Entry**: manual entry of new data by personnel within the organisation
- **Data Capture**: capture of data generated by devices used in various processes in the organisation

2. Storage

Once data has been created within the organisation, it needs to be stored and protected, with the appropriate level of security applied. A robust backup and recovery process should also be implemented to ensure retention of data during the lifecycle.

3. Usage

During the usage phase of the data lifecycle, data is used to support activities in the organisation. Data can be viewed, processed, modified and saved. An audit trail should be

maintained for all critical data to ensure that all modifications to data are fully traceable. Data may also be made available to share with others outside the organisation.

4. Archival

Data Archival is the copying of data to an environment where it is stored in case it is needed again in an active production environment, and the removal of this data from all active production environments.

A data archive is simply a place where data is stored, but where no maintenance or general usage occurs. If necessary, the data can be restored to an environment where it can be used.

5. Destruction

The volume of archived data inevitably grows, and while you may want to save all your data forever, that's not feasible. Storage cost and compliance issues exert pressure to destroy data you no longer need. Data destruction or purging is the removal of every copy of a data item from an organisation. It is typically done from an archive storage location. The challenge of this phase of the lifecycle is to ensure that the data has been properly destroyed. It is important to ensure before destroying data that the data items have exceeded their required regulatory retention period.

Having a clearly defined and documented data lifecycle management process is key to ensuring Data Governance can be carried out effectively within your organisation.

At Dataworks our highly skilled CSV & Software Engineers provide a full range of Data Integrity services as part of our offering including: Data Integrity assessments, remediation software and validation services

DATA BREACH

A **data breach** is an incident where information is stolen or taken from a system without the knowledge or authorization of the system's owner. A small company or large organization may suffer a data breach. Stolen data may involve sensitive, proprietary, or confidential information such as credit card numbers, customer data, trade secrets, or matters of national security.

The effects brought on by a data breach can come in the form of damage to the target company's reputation due to a perceived 'betrayal of trust.' Victims and their customers may also suffer financial losses should related records be part of the information stolen.Based on the number of data breach incidents recorded between January 2005 and April 2015, personally identifiable information (PII) was the most stolen record type while financial data came in second.

Breach methods observed across industries

Most data breaches are attributed to hacking or malware attacks. Other frequently observed breach methods include the following:

- **Insider leak:** A trusted individual or person of authority with access privileges steals data.
- **Payment card fraud:** Payment card data is stolen using physical skimming devices.
- **Loss or theft:** Portable drives, laptops, office computers, files, and other physical properties are lost or stolen.
- **Unintended disclosure:** Through mistakes or negligence, sensitive data is exposed.
- **Unknown:** In a small of number of cases, the actual breach method is unknown or undisclosed

Phases of a Data Breach

- **Research**

The attacker, having picked a target, looks for weaknesses to exploit: employees, systems, or the network. This entails long hours of research on the attacker's part and may involve stalking employees' social media profiles to find what sort of infrastructure the company

has.

- **Attack**

Having scoped a target's weaknesses, the attacker makes initial contact either through a network-based or social attack.

In a **network-based** attack, the attacker exploits weaknesses in the target's infrastructure to instigate a breach. These weaknesses may include, but are not limited to SQL injection, vulnerability exploitation, and/or session hijacking.

In a **social** attack, the attacker uses social engineering tactics to infiltrate the target network. This may involve a maliciously crafted email sent to an employee, tailor-made to catch that specific employee's attention. The email can phish for information, fooling the reader into supplying personal data to the sender, or come with a malware attachment set to execute when downloaded.

- **Exfiltrate**

Once inside the network, the attacker is free to extract data from the company's network. This data may be used for either blackmail or cyberpropaganda. The information an attacker collects can also be used to execute more damaging attacks on the target's infrastructure.

5 Effective Ways to Prevent Data Breaches

High-profile data breaches remind us all that data security is a top priority for businesses. If you recently read our security ROI blog, you might have discovered that organizations now face a one in four chance of a data breach that costs approximately $2.21M in the next two years. The aftermath of a breach includes decreased customer loyalty, distrust, a potential loss in revenues, and a negative brand reputatio

In this blog, we share five effective ways how to prevent data breaches with proven methods for prevention.

Asset Inventory

A visibility of what hardware and software assets you have in your network and physical infrastructure will help you gain a greater understanding of your organization's security posture. An asset inventory can also be used to build categories and ratings around the threats and vulnerabilities your assets may encounter. Categories and ratings for these vulnerabilities can help you better prioritize the remediation efforts that will take place on these assets.

Data breaches put a major focus on endpoint protection. Antivirus is just not enough to prevent a major data breach. In fact, if you rely just on anti-virus protection you will leave

your endpoints, like desktops and laptops, exposed. Your desktops and laptops can become a major gateway for breaches.

A comprehensive endpoint solution will use encryption to prevent data loss and leakage, enforce unified data protection policies across all your servers, networks, and endpoints, thereby reducing the risk of a data breach.

Vulnerability and Compliance Management

Using a vulnerability and compliance management (VCM) tool or at the very least completing a vulnerability assessment will help you identify the gaps, weaknesses, and security misconfigurations within your physical and virtual environments. VCM can continuously monitor your infrastructure and IT assets for vulnerabilities and compliance weaknesses and configuration best practices.

Some of the benefits that will help mitigate a data breach include allowing your security team to better understand the security vulnerability risks of the environment, i.e. Threat Landscape, and priorities around what requires remediation. A good VCM will allow you to create an action plan to remediate these vulnerabilities and assign them to appropriate staff members.

Regular Audits on Security Posture

Completing regular audits to identify potential new gaps in compliance or governance will help in validating your security posture. A security audit will be more a more thorough assessment of your security policies compared to the vulnerability assessment or penetration testing. A security audit considers the dynamic nature of the organization as well as how the organization handles information security.

Common questions that may come up in the security audit could include:

- Does your organization have documented information security policies?
- Do you have a management process in place, escalation profiles, and procedures documented and tracked, a playbook in place in the event of incidents or breaches?
- Do you have network security mechanisms in place (next-gen firewalls, IDS/IPS, EPP, etc.)?
- Do you have security and log monitoring setup?
- Are there an encryption and password policies?
- Is there a Disaster Recovery & Business Continuity Plan?
- Are applications tested for security flaws?
- Is there a change management process in place at every level within the IT environment?
- How are files and media backed up? Who will be able to access this backup? Are restore procedures tested?
- Are the auditing logs reviewed? When are the security auditing logs reviewed?

Train & Educate Your Staff

After completing your security policy audits, you can then enforce a written employee policy around data privacy and security. You will want to hold regular security trainings so that all employees are aware of these newly created policies – after all, people cannot voluntarily comply with unfamiliar policies. When establishing your security policy for employees, you might consider training on the following:

- Controlling end user access and privileges as it relates to the common policy called “least privilege”
- The use of various, unique passwords on computers or other devices used for work purposes
- Implement a documented system for departing employees, and vendors/contractors (passwords, key cards, laptop access, etc.)
- Train employees on the importance of reporting suspicious data security leakage or data security breaches
- Create a policy that describes how employees should handle, dispose of, retrieve, and send data

Employees also need training on the types of modern phishing attacks. As discussed in our ransomware blog, phishing is the most common way for ransomware to spread within an organization. If you can train and educate your employees about the pitfalls and indicators to look for in a “phishy” looking email, your organization will be well served.

You might also consider creating an ambassador within your organization that can lead and oversee these various information security training topics to successful completion.

It may seem like a tedious operation to prevent data breaches. If you take a layered approach to security with various measures, policies, and procedures to mitigate security threats, you will be in a much better state than if you allow your organization to remain slack to an ever-changing threat landscape.

10 ways to control against security breaches

I ’ve listed out 10 simple yet powerful steps you can take which will help in preventing disruptive cyber intrusions across your network. Let’s get into it!

1. Good password policy

Maintaining an unpredictable and complex password is a huge step in the right direction. Make sure that you **never reuse passwords and change them regularly as and when you’re prompted by an expiry alert.** Choosing a strong password is itself the best security measure of all.

2. Update regularly

The pop-ups that we get from time to time notifying us of updates are not just there to pester us. Such updates do numerous things to help you improve security. One of the best ways to foil breach attempts is to **update your operating system and all application software as the new versions** have most likely been fine tuned to prevent current threats.

3. Securing the router

Cybercriminals could easily compromise your data without setting foot inside your premises. They can do this by breaking into your network, and it’s far easier for them to do it if your network is unsecured. **You can secure all the devices in your network by ensuring that encryption is enabled on your wireless traffic.**

4. Proper backing up of data

Data is the most valued asset of any organization and it’s what criminals want to exploit. Storing and backing up such assets with private information is critical. **Backing up data can be considered as another line of defense protecting** you against ransomware.

5. Educating the employees

Educating your employees about the deadly consequences of security breaches is vital about the deadly consequences of security breaches is vital. If a culture of security is adopted at all levels of the organization, from junior staff to the CEO, then it will be far less likely you'll suffer an otherwise avoidable data breach.

6. Breach response

With the surge of high-profile attacks targeting sensitive data assets, **developing a breach response plan in advance helps in triggering a quick response in the wake of an incident.** Such plans assist in identifying and analyzing attacks which otherwise would go undetected.

7. Installing centralized firewalls

Firewalls are the first line of defense in network security. A suitably configured firewall acts as a barrier between networks with differing levels of trust. It is vital that **you keep the local firewall on all the time as this is the best way you can arm your network against malicious attacks.**

8. Encrypted transmission

Stolen **encrypted data is of no value** for cybercriminals. The power of **cryptography is such that it can restrict access to data and can render it useless to those who do not possess the key.** Using encryption is a big step towards mitigating the damages of a security breach.

9. Antivirus software

Make sure that you have **updated antivirus, antispyware and anti-malware software installed so that your server is continuously protected and monitored**. Such software prevents malicious programs from stealing or destroying data assets.

10. Proactive and continuous auditing

Identifying and analysing suspicious activity enables you to spot potentially dangerous situations which could result in a serious breach in the future**. Auditing your network environment on a regular basis is a best practice which can save money and uphold the reputation of your business.**

SYSTEM DEVELOPMENT LIFE CYCLE

An effective System Development Life Cycle (SDLC) should result in a high quality system that meets customer expectations, reaches completion within time and cost evaluations, and works effectively and efficiently in the current and planned Information Technology infrastructure.

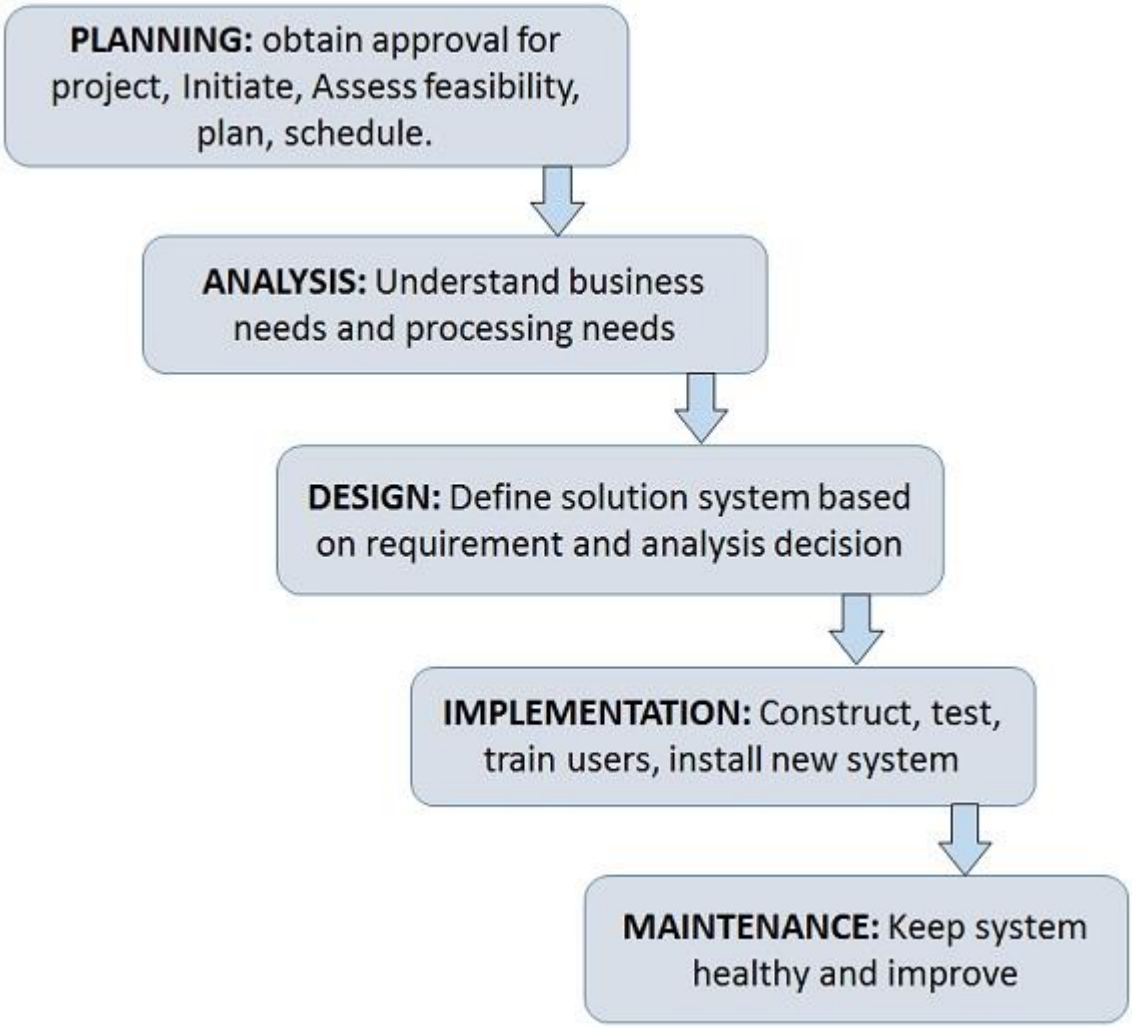
System Development Life Cycle (SDLC) is a conceptual model which includes policies and procedures for developing or altering systems throughout their life cycles.

SDLC is used by analysts to develop an information system. SDLC includes the following activities −

- requirements
- design
- implementation
- testing
- deployment
- operations
- maintenance

Phases of SDLC

Systems Development Life Cycle is a systematic approach which explicitly breaks down the work into phases that are required to implement either new or modified Information System.



Feasibility Study or Planning

- Define the problem and scope of existing system.
- Overview the new system and determine its objectives.
- Confirm project feasibility and produce the project Schedule.
- During this phase, threats, constraints, integration and security of system are also considered.

- A feasibility report for the entire project is created at the end of this phase.

Analysis and Specification

- Gather, analyze, and validate the information.
- Define the requirements and prototypes for new system.
- Evaluate the alternatives and prioritize the requirements.
- Examine the information needs of end-user and enhances the system goal.
- A Software Requirement Specification (SRS) document, which specifies the software, hardware, functional, and network requirements of the system is prepared at the end of this phase.

System Design

- Includes the design of application, network, databases, user interfaces, and system interfaces.
- Transform the SRS document into logical structure, which contains detailed and complete set of specifications that can be implemented in a programming language.
- Create a contingency, training, maintenance, and operation plan.
- Review the proposed design. Ensure that the final design must meet the requirements stated in SRS document.
- Finally, prepare a design document which will be used during next phases.

Implementation

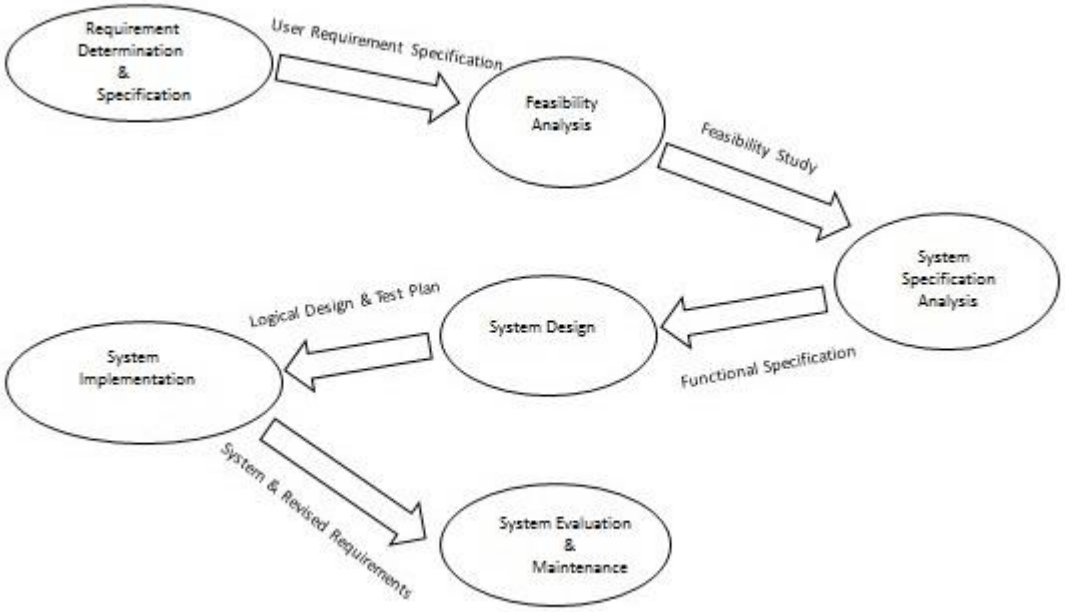
- Implement the design into source code through coding.
- Combine all the modules together into training environment that detects errors and defects.
- A test report which contains errors is prepared through test plan that includes test related tasks such as test case generation, testing criteria, and resource allocation for testing.
- Integrate the information system into its environment and install the new system.

Maintenance/Support

- Include all the activities such as phone support or physical on-site support for users that is required once the system is installing.
- Implement the changes that software might undergo over a period of time, or implement any new requirements after the software is deployed at the customer location.
- It also includes handling the residual errors and resolve any issues that may exist in the system even after the testing phase.
- Maintenance and support may be needed for a longer time for large systems and for a short time for smaller systems.

Life Cycle of System Analysis and Design

The following diagram shows the complete life cycle of the system during analysis and design phase.



Role of System Analyst

The system analyst is a person who is thoroughly aware of the system and guides the system development project by giving proper directions. He is an expert having technical and interpersonal skills to carry out development tasks required at each phase.

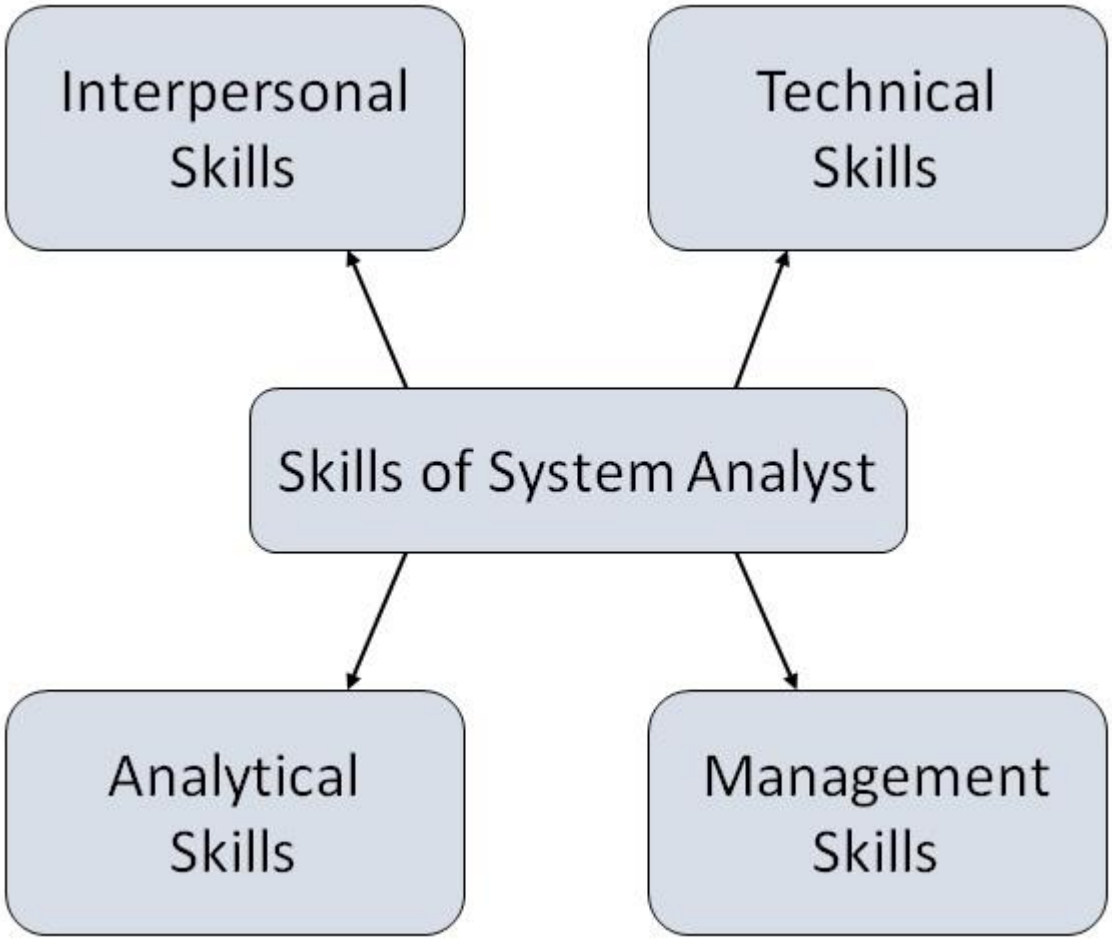
He pursues to match the objectives of information system with the organization goal.

Main Roles

- Defining and understanding the requirement of user through various Fact finding techniques.
- Prioritizing the requirements by obtaining user consensus.
- Gathering the facts or information and acquires the opinions of users.
- Maintains analysis and evaluation to arrive at appropriate system which is more user friendly.
- Suggests many flexible alternative solutions, pick the best solution, and quantify cost and benefits.
- Draw certain specifications which are easily understood by users and programmer in precise and detailed form.
- Implemented the logical design of system which must be modular.
- Plan the periodicity for evaluation after it has been used for some time, and modify the system as needed.

Attributes of a Systems Analyst

The following figure shows the attributes a systems analyst should possess −



Interpersonal Skills

- Interface with users and programmer.
- Facilitate groups and lead smaller teams.
- Managing expectations.
- Good understanding, communication, selling and teaching abilities.
- Motivator having the confidence to solve queries.

Analytical Skills

- System study and organizational knowledge
- Problem identification, problem analysis, and problem solving
- Sound common sense
- Ability to access trade-off
- Curiosity to learn about new organization

Management Skills

- Understand users jargon and practices.
- Resource & project management.
- Change & risk management.

- Understand the management functions thoroughly.

Technical Skills

- Knowledge of computers and software.
- Keep abreast of modern development.
- Know of system design tools.
- Breadth knowledge about new technologies.

Process automation

Process automation refers to the use of digital technology to perform a process or processes in order to accomplish a workflow or function. The term "business process automation" is also used to describe digital process automation.

A wide variety of business processes and activities can be automated, or more often, they can be partially automated with human intervention at strategic points within workflows. Sales, marketing, production, supply chain, inventory control, administration, IT and management process are among those benefitting from digital process automation.

What is Business Process Automation (BPA)?

Business process automation is the use of technology to execute recurring tasks or processes in a business where manual effort can be replaced. It is done to minimize costs, increase efficiency, and streamline processes.

Business process automation is not to be confused with business process management, which is a larger discipline involving the management of complex organization-wide processes using different methodologies.

Business process automation examples

For a better understanding of business process automation, here are a couple of use cases.

1. Employee on boarding

Although hiring employees may seem like a fuss-free process, it involves multiple tasks. Filling out employee information forms, setting up induction sessions, arranging training sessions, setting up bank accounts, collecting relevant documents, and assigning mentors are just a few of the activities involved.

Without automation, the entire process can become quite chaotic and result in:

- Endless paperwork
- Missing out on some tasks
- Employee dissatisfaction
- Low productivity

Applying business process automation to employee onboarding will ensure smooth transitions from one task to the next, keeping relevant employees in the loop and providing visibility into the status of the process.

2. Purchase orders

Purchase order requests are recurring processes in most organizations. The requesting team fills out a form and sends it to the purchasing team. The approving authority then examines the request and rejects the request in case information is inadequate or if there are budgetary

constraints. It is then sent back to the requesting team. If approved, a purchase order is created and copies are sent to the supplier as well as the inventory team.

Without automation, the following issues could crop up:

- Delayed PO approval
- Impacted productivity
- Incomplete records
- Errors in the PO
- Errors while taking delivery of the supplies

Business process automation can help improve accountability, transparency, and enable accurate data recording, which can be accessed by relevant stakeholders when necessary. It will also retain all process-related communication within the workflow to make execution easier and faster.

Why should you automate business processes?

Need for business automate process:

Here are some compelling reasons to automate your business processes.

Stepping stone to digital transformation

Digital transformation can seem like a lofty overwhelming goal to organizations that aren't on that path. Business process automation can be a stepping-stone to adopting that culture of continuous transformation. You can start with a few processes that are clearly in need of course correction and gradually work your way up.

Get more clarity

Automation demands a certain amount of clarity about the process right at the designing stage. If you don't know the tasks involved and the people responsible for running the process, you can't design and automate the workflow effectively.

Further, process mapping can provide clarity to all employees and serve as a training resource as well. The insights you gain from analyzing an automated process can clearly show you the gap between your process as is and as it should ideally be.

Streamline processes

One of the great outcomes of a process automation system is streamlined processes. Clear accountability, customizable notifications, valuable insights, and faster turnaround times make it easier to eliminate wasteful activities and focus on enhancing tasks that add value.

Get compliance records

With business process automation, every detail of a particular process is recorded. This information can be presented to demonstrate compliance during audits.

Standardize operations

When you automate a business process, you can expect a consistent standard of outcomes every time. Standardization helps position your organization as reliable, which in turn can help increase your customer base.

Increase customer satisfaction

Customer satisfaction is a key differentiator in any industry. Focusing on process and operational excellence helps you exceed customer expectations with ease. When you

consistently meet promised standards, customers are more likely to develop a preference for your company.

What business processes should you automate?

Business process automation is not restricted to a handful of functions. Some factors that can indicate the need for automation include

1. High-volume of tasks
2. Multiple people required to execute tasks
3. Time-sensitive nature
4. Significant impact on other processes and systems
5. Need for compliance and audit trails

If an activity meets all the criteria listed above, it's very likely you need to automate your business process.

To give you a clearer picture, here are some commonly automated processes in organizations.

- E-mail and push notifications
- Helpdesk support
- Creating customer case studies
- Data aggregation and migration
- Backup and restoration
- Employee leave requests
- Procurement
- Call center processes
- Sales orders
- Time and attendance tracking
- Payroll
- Invoicing
- Collections
- Product launches
- Lead nurturing

Benefits of using business process automation tools

Once you have automated your business processes, you can expect to see multiple benefits.

1. **You'll see a boost in productivity brought about by enhanced access.** Cloud-based business process automation tools store your data in a central database. This helps you access data from any location or device whenever you need it.
2. **Your** business processes **will become much more transparent.** You can track and monitor processes while they are running, which can improve accountability and visibility.
3. The ability to monitor processes on the go will also **help you keep a lookout for errors,** fixing them as they occur. **Performance reports will arm you with insights so you can take preventive measures against recurring errors.**
4. From a long-term perspective, you'll begin to notice **faster turnaround times and a reduction in costs due to fewer manual interventions**.

5. You'll also find yourself in a position to **enhance your workforce allocation** since the application will handle all mundane recurring tasks. This way you can redirect your employees into tasks that necessitate human effort and judgment.
   A business process automation system will ultimately enable growing business efficiency. Since it is based on the notion of continuous process improvement, efficiency levels will keep increasing in response

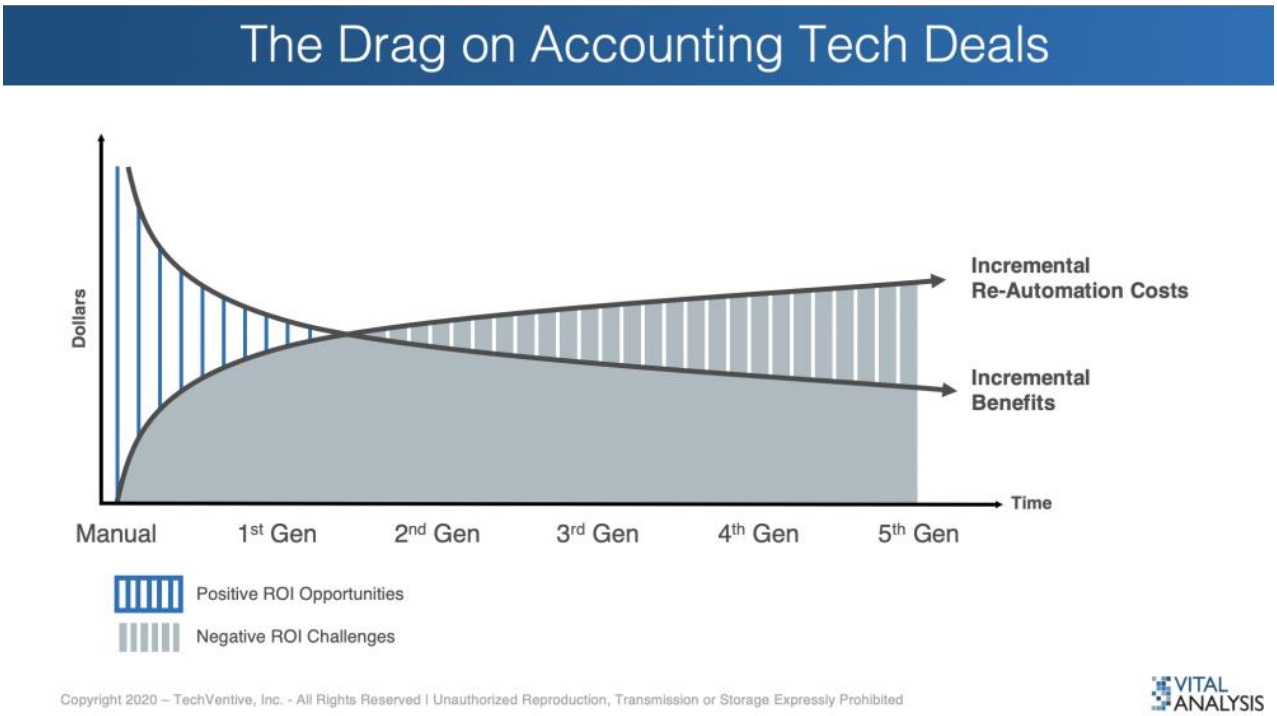
Best practices for business process automation

Merely signing up for a business process automation tool may not guarantee success. You'll need to take a pragmatic thorough approach to automate your business processes.
Here are some pointers on how you can make automation a success.

- Start with a clear understanding of what tasks are involved, who is responsible, and when each task is to be executed.
- Ensure that you have clearly defined goals when you automate a business process. This will save a lot of time in course correction.
- Measure results with a phased approach. Many organizations are disappointed when the results don't materialize overnight.
- Invest adequate time in training employees and factor in an adjustment period.
- Adopt a long-term outlook to experience good ROI.
- Use readymade solutions where available.

Innovative applications

For decades, innovation in financial accounting software was defined by a product's ability to process and report accounting transactions more efficiently. Early on, these innovative solutions could deliver a solid return on investment as these applications freed up countless accounting clerks' time and dramatically reduced the amount of rekeying and error correction activities that were required. These solutions achieved widespread adoption as their cost savings exceeded the cost to implement and operate these products.
Today, that cost/benefit relationship is now inverted for many core financial applications. How is this possible? The incremental cost to implement a replacement financial accounting solution often dwarfs the limited incremental benefits that a customer might achieve from re-automating a process. Re-automating an application just isn't a great return on investment. *Financial software vendors and their customers have to look beyond basic journal entry transaction processing as a means to deliver value*.

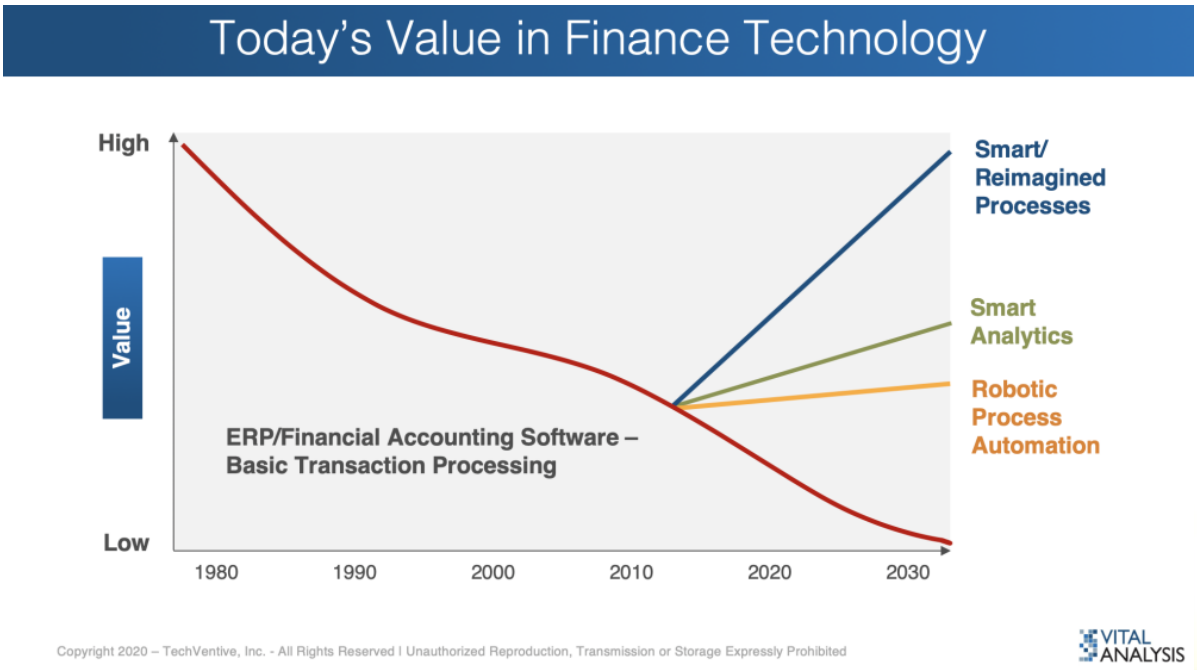


Accounting organizations were able to find a few pockets of incremental savings over the preceding decades. Perhaps the most beneficial change that larger firms implemented involved the use of a single, global shared services software solution. This capability was only possible once telecommunications costs had dropped, hardware became commoditized and Internet access was more ubiquitous. These users were able to eliminate numerous local accounting solutions and reduce their software support needs. They achieved a level of scale that helped lower transaction costs. It was, in a phrase, another efficiency play.

So, if many efficiency-driven solutions are no longer cost-effective, what should vendors create and what technology should software buyers acquire? Savvy vendors realize that the new value-creating frontier in financial applications rests along these areas:

- technologies that dramatically and imaginatively alter long-standing financial processes
- financial applications that serve more than Finance department users (e.g., board of directors, operations executives, employees, suppliers, etc.)
- "smart" financial applications that use machine learning to further automate clerical tasks (e.g., intelligent data recognition and capture from documents instead of manual data entry)
- Delivering new business insights via smart analytics (i.e., analytics powered by algorithms, big data, machine learning or other tools)

New Finance processes are being materially improved with new technologies like machine learning, big data, workflow processing, exception handling, data visualization and more. In fact, combinations of these technologies can create the opportunity for seriously improved processes. Delivering these new solutions via the cloud makes them even easier to deploy.



Robotic process automation (RPA) generally involves a machine-learning tool coupled with a solid and commonly used process design. What customers get is a relatively efficient process where a tool interprets source documents (e.g., an invoice) and determines an appropriate accounting distribution for its component line items. If the tool can't make a definitive decision as to the needed accounting treatment of this transaction/document, it will forward the document to a human subject matter expert. The tool will learn how the human encoded this transaction and use this knowledge to process similar transactions in the future. RPA helps in accounting closes, invoice entry and other repetitive tasks.

Smart analytics are also showing a lot of promise. These applications often marry operational, external and internal data into a very visual format. Business users use the insights these tools offer to improve their competitive position, enhance margins, increase reliability, foster better customer service, etc. For accounting professionals, smart analytics offer a way for them to add value to the board, operational leaders and more.

Reimagined processes are an intriguing option, too. These solutions take a (long-overdue) fresh look at how a common financial accounting process can be designed to deliver new, outsized value. The best of these are not incremental solutions – they are focused on delivering material savings, insights and value to their users and they do this with an array of new and old technologies.

Examples of these reimagined processes include:

- Payment processing
- Bribery prevention
- T&E fraud detection
- Smart revenue forecasting
- Smart cash forecasting
- Sales territory optimization
- Etc.

Let's look at one of these: accounts payable management. Instead of focusing exclusively on the entry of invoices and creation of journal entries, a reimagined solution would instead focus on other opportunities. These opportunities might include:

- **Focus on speed** – A reimagined process should work faster and deliver faster, positive outcomes for its constituents. In payment management, checks are often the slowest method of payment as (non-value-added) time is spent printing, stuffing, mailing and depositing payments. Removing wasted time usually generates benefits for everyone in the process.
- **Use of alternative pay methods** – Traditionally, accounts payable and other systems have used checks as their main payment method. Reimagined solutions take advantage of the myriad of new payment options available today: ACH, international wires, virtual credit cards, etc. Some of these options cost far less to use than checks as they eliminate postage costs, paper supply costs, bank processing fees, etc. Alternate solutions may also be easier to reconcile and less subject to fraud, loss or other events that warrant people-intensive follow-up by accounting personnel.
- **Go digital and avoid paper** – Paper checks, paper remittance stubs, envelopes, etc. all require human handling and cost more than digital methods. A reimagined payment management process must consider digital options.
- **Ability to involve the entire organization** – Many software applications built for finance professionals seem overly complex to employees outside of the finance team. A reimagined payment process makes it easy for staff throughout the organization to understand, enter, and approve bills that need to paid by presenting the information in a modern interface and allowing approvals on the go from a mobile device.

Buyers should resist the urge to clone current business practices and systems. Those methods were valid in a different time but may not be so today. Nostalgia is fine for some things but rarely a good idea with technology and business processes. Don't be surprised if some on your team like things just the way they are. Change is uncomfortable for many people. However, without new ideas, new approaches, etc. your firm may fall behind competitively and cease to advance in the market. If your software selection yields no new ideas, then you did something wrong.

Software buyers need to first determine what they want a reimagined process to be/contain. New solutions will challenge long-held business practices, controls and other procedures. An unwillingness to confront these long-established business artifacts will doom the firm to stay stuck in the past with all of the limitations that the old process triggered. Don't repave an old cow path!

Today's software buyer needs to adopt a new set of software selection practices. Instead of documenting the hundreds of things your current accounting solution does (or doesn't do!) into a request for proposal or spreadsheet, buyers should canvas the market and look for all-new capabilities not found in old-school accounting products.

This means the search for new software must start with a discovery effort. Buyers should first start by investigating all manner of new solutions on the Internet. Intriguing or different approaches should get additional scrutiny as they may offer unique, novel approaches and use modern technologies in all-new ways. The point of the discovery effort is surface new ideas, new process designs and new solutions.

Also, don't be surprised if the software vendor (and implementer) that's been part of your accounting technology stack the last 2-3 decades isn't one of the finalist vendors. Too many of these vendors are overly focused on delivering many, small innovations so that existing customers can be eased into a more modern world. Unfortunately, this approach takes too much

time, delivers out-of-date solutions and costs a lot. It's a death by a thousand cuts. You'll want a modern solution and you'll want it all now.

Bottom line: Get out of the office and see what the new art of the possible is re: financial software. The amount of change and the new innovations out there may surprise you. Invite team members to attend webinars from new age vendors and, if appropriate, get the vendor(s) to deliver a personal web demonstration for your firm once they know a bit more about your specific circumstances.

To get the most value from these demonstrations, be prepared to discuss with these vendors:

- The other financial systems their software may have to integrate with
- The number, kinds and complexities of your firm's banking relationships
- Key statistics like the number of vendors, customers, etc. your firm interacts with
- The geographic scope of your firm and its value chain participants

And, once you make your decision, plan the implementation well. You may need different implementers who possess a different kind of knowledge, understand the requirements of new processes and can bring new innovative technologies (e.g., workflow) to life.

That's how you'll make the next generation of financial accounting technology deliver value.

Business intelligence

Business intelligence (BI) analysts transform data into insights that drive business value. Through use of data analytics, data visualization and data modeling techniques and technologies, BI analysts can identify trends that can help other departments, managers and executives make business decisions to modernize and improve processes in the organization.

The BI analyst role is becoming increasingly important as organizations move to capitalize on the volumes of data they collect. BI analysts typically discover areas of revenue loss and identify where improvements can be made to save the company money or increase profits. This is done by mining complex data using BI software and tools, comparing data to competitors and industry trends and creating visualizations that communicate findings to others in the organization.

Who Is a Business Intelligence Analyst and How To Become One?

By SimplilearnLast updated on Sep 29, 20205347

The proliferation of IoT-connected devices, IoT-based sensors, ever-increasing internet users, and a sharp rise in social media engagements are all boosting opportunities for businesses to capture massive amounts of data.

Many industry analysts see data as the 'new oil' that drives organizational efficiency in today's information age, optimizes performance, profitability, and experiences.

However, having a vast amount of data is useless if businesses cannot analyze it to extract actionable insights that enable data-driven, informed decision-making.
The emerging need to leverage data for accomplishing organizational goals is bringing Business Intelligence (BI) in the spotlight.
BI includes the operation and management of data processing tools and systems, such as data visualization tools, data modeling tools, decision-support systems, database management systems, and data warehousing systems.
In recent years, Business Intelligence is witnessing the widespread adoption in diverse sectors for its capability to facilitate intelligent decision-making, which accelerates process enhancements, improves productivity, and boosts the end-user experience.
Because of BI's increased popularity, the demand for business intelligence professionals is also on the rise, as demonstrated in studies by the global research and advisory firm Gartner, Inc., and the U.S. Bureau of Labor Statistics.
While Gartner, Inc. forecasts that the business intelligence market will reach $22.8 billion by the end of 2020, the U.S. Bureau of Labor Statistics predicts that BI analysts' demand will grow by 21 percent between 2014 and 2024.
With business intelligence analyst roles gaining heightened prominence, the demand is outpacing the supply of talent, and organizations worldwide are facing a severe shortage of skilled BI analysts.
Unfortunately, not the best-case scenario for companies, but the acute talent gap broadens the career opportunities for individuals seeking to enter the exciting field of Business Intelligence. This document provides you with the information you need to start a successful career as a business intelligence analyst.

What is a Business Intelligence Analyst?

A business intelligence analyst is an individual proficient in computer programming languages, BI tools, technologies, and systems.
BI analysts determine business-critical priorities and requirements, define KPIs (Key Performance Indicators), implement DW (Data Warehouse) strategies, and identify BI (Business Intelligence) by mining Big Data using advanced software and tools.
A business intelligence analyst's primary goal is to empower decision-makers with accurate, real-time, actionable insights that enhance workforce efficiency, increase productivity, strengthen market positioning, improve the competitive edge, and augment customer experience.
Business Intelligence (BI) can be described as ***the sets of information provided through data analysis and knowledge management, which can inform decision makers on areas for response. This can be in relation to emerging external trends or changing internal performance demands.***

Business intelligence analyst job requirements

BI analysts typically handle analysis and data modeling design using data collected in a centralized data warehouse or multiple databases throughout the organization. It's a role that combines hard skills like programming, data modeling and statistics with soft skills like communication, analytical thinking and problem-solving. Candidates need a well-rounded background to balance the line between IT and the business.
You'll need at least a bachelor's degree in computer science, business, mathematics, economics, statistics, management, accounting or in a related field. If you have a degree in an unrelated field but have completed courses in these subjects, that can suffice for an entry-level role in some organizations. Other senior positions may require an MBA, but there are plenty of BI jobs that look only for an undergraduate degree.

Business intelligence analyst job description

Job descriptions will vary by company, but these are some of general responsibilities you can prepare yourself for, according to a sample BI analyst job description from Indeed:

- Review and validate customer data as it's collected
- Oversee the deployment of data to the data warehouse
- Develop policies and procedures for the collection and analysis of data
- Create or discover new data procurement and processing programs
- Cooperate with IT department to deploy software and hardware upgrades that make it possible to leverage big data use cases
- Monitor analytics and metrics results
- Implement new data analysis methodologies
- Review customer files to ensure integrity of data collection and utilization
- Perform data profiling to identify and understand anomalies

Business intelligence analyst skills

To become a successful BI analyst, you'll need a mix of technical, soft and analytical skills. The job requires you to mine data using complex tools and software and then analyze that data to find trends. Once you spot data trends, you'll need to effectively communicate your findings to others in the organization. You'll also be responsible for suggesting possible solutions to fix issues that you find — especially if they're tied to revenue loss.

Popular BI analyst skills include:

- Data warehouse
- Data modeling
- Data mining
- Business intelligence
- Tableau and data visualization
- Hadoop, SQL, Python and C#
- Data analysis
- Business analysis
- Database management and reporting
- Business administration
- Microsoft Office and Excel
- Critical-thinking and problem-solving
- Communication skills

Business intelligence analyst certification

Offered by Transforming Data with Intelligence (TDWI), the Certified Business Intelligence Professional (CBIP) certification is currently one of the only professional certifications available that is specifically tailored to BI analysts. You can be certified as a practitioner, which is the designation awarded if you score above 50 percent on all three exams. This level demonstrates working knowledge of relevant BI concepts, techniques and tools. If you score a 70 percent or higher on all three exams, you'll be certified at the Mastery level. This level demonstrates your "ability to effectively lead a team at the project and program levels," and that you have the skills to mentor others, according to TDWI.

To earn your CBIP certification, you'll need two or more years of full-time experience in CIS, data modeling, data planning, data definitions, metadata systems development, enterprise resource planning, systems analysis, application development and programming or IT management. Candidates are also required to have at least a BA or MA in information systems, computer science, accounting, business administration, engineering, mathematics, sciences or statistics.

You can also choose to get certified in specific BI tools such as Hadoop, SAS, Python, R, and other programming languages or software designed for data analysis and data visualization. If you notice a

specific tool or framework is included on the job descriptions you're interested in, it might be worth getting certified to improve your chances of landing an interview.

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- Review customer files to ensure integrity of data collection and utilization
- Perform data profiling to identify and understand anomalies

What Does a Business Intelligence Analyst Do?

Using data modeling, data analysis, and data visualization techniques, a business intelligence analyst unearths trends and patterns in data, enabling managers, executives, and departments to make intelligent business decisions.

Besides taking care of data analysis, data modeling designs, organizational databases, and data warehouses, other day-to-day activities of a business intelligence analyst involve interacting and collaborating with all stakeholders, giving presentations on key performance metrics, and writing reports to share knowledge gained from data.

The business intelligence analyst job description includes:

- Mining and analyzing organizational data, including financial, employment, expenditure, and revenue reports
- Compiling data about reported problems and recommending solutions that increase the efficiency of processes and performance of systems
- Performing cost-benefit analysis on projects aimed to optimize the performance of the organization
- Collaborating with management and coworkers to enforce improvements
- Assessing the efficacy of adopted strategies
- Engaging with teams to determine resources, personnel, equipment, and facilities needed
- Consulting with relevant stakeholders and management to map strategic goals
- Conducting interactive presentations and preparing reports for effective communication of data to a diverse audience

Data mining

What Is Data Mining?

Data mining is a process used by companies to turn raw data into useful information. By using software to look for patterns in large batches of data, businesses can learn more about their

customers to develop more effective marketing strategies, increase sales and decrease costs. Data mining depends on effective data collection, warehousing, and computer processing.

Data mining processes are used to build machine learning models that power applications including search engine technology and website recommendation programs.

How Data Mining Works

Data mining involves exploring and analyzing large blocks of information to glean meaningful patterns and trends. It can be used in a variety of ways, such as database marketing, credit risk management, fraud detection, spam Email filtering, or even to discern the sentiment or opinion of users.

The data mining process breaks down into five steps. First, organizations collect data and load it into their data warehouses. Next, they store and manage the data, either on in-house servers or the cloud. Business analysts, management teams and information technology professionals access the data and determine how they want to organize it. Then, application software sorts the data based on the user's results, and finally, the end-user presents the data in an easy-to-share format, such as a graph or table.

Data Warehousing and Mining Software

Data mining programs analyze relationships and patterns in data based on what users request. For example, a company can use data mining software to create classes of information. To illustrate, imagine a restaurant wants to use data mining to determine when it should offer certain specials. It looks at the information it has collected and creates classes based on when customers visit and what they order.

In other cases, data miners find clusters of information based on logical relationships or look at associations and sequential patterns to draw conclusions about trends in consumer behavior.

Warehousing is an important aspect of data mining. Warehousing is when companies centralize their data into one database or program. With a data warehouse, an organization may spin off segments of the data for specific users to analyze and use.

However, in other cases, analysts may start with the data they want and create a data warehouse based on those specs. Regardless of how businesses and other entities organize their data, they use it to support management's decision-making processes.

Example of Data Mining

Grocery stores are well-known users of data mining techniques. Many supermarkets offer free loyalty cards to customers that give them access to reduced prices not available to non-members. The cards make it easy for stores to track who is buying what, when they are buying it and at what price. After analyzing the data, stores can then use this data to offer customers coupons targeted to their buying habits and decide when to put items on sale or when to sell them at full price.

Data mining can be a cause for concern when a company uses only selected information, which is not representative of the overall sample group, to prove a certain hypothesis.

Definition of 'Data Mining'

Definition: In simple words, data mining is defined as a process used to extract usable data from a larger set of any raw data. It implies analysing data patterns in large batches of data using one or more software. Data mining has applications in multiple fields, like science and research. As an application of data mining, businesses can learn more about their customers and develop more effective strategies related to various business functions and in turn leverage resources in a more optimal and insightful manner. This helps businesses be closer to their objective and make better

decisions. Data mining involves effective data collection and warehousing as well as computer processing. For segmenting the data and evaluating the probability of future events, data mining uses sophisticated mathematical algorithms. Data mining is also known as Knowledge Discovery in Data (KDD).

Description: Key features of data mining:

- Automatic pattern predictions based on trend and behaviour analysis.
- Prediction based on likely outcomes.
- Creation of decision-oriented information.
- Focus on large data sets and databases for analysis.
- Clustering based on finding and visually documented groups of facts not previously known.

The Data Mining Process: Technological Infrastructure Required: 1. Database Size: For creating a more powerful system more data is required to processed and maintained. 2. Query complexity: For querying or processing more complex queries and the greater the number of queries, the more powerful system is required. Uses: 1. Data mining techniques are useful in many research projects, including mathematics, cybernetics, genetics and marketing. 2. With data mining, a retailer could manage and use point-of-sale records of customer purchases to send targeted promotions based on an individual's purchase history. The retailer could also develop products and promotions to appeal to specific customer segments based on mining demographic data from comment or warranty cards.

KEY TAKEAWAYS

- Data mining is the process of analyzing a large batch of information to discern trends and patterns.
- Data mining can be used by corporations for everything from learning about what customers are interested in or want to buy to fraud detection and spam filtering.
- Data mining programs break down patterns and connections in data based on what information users request or provide.

Advantages of Data Mining

Data mining has many enormous advantages, as explained below

1. Marketing/Retails

To create models, marketing companies use data mining. This was based on history to forecast who will respond to new marketing campaigns such as direct mail, online marketing, etc. This means that marketers can sell profitable products to targeted customers.

2. Finance/Banking

Since data extraction provides financial institutions information on loans and credit reports, data can determine good or bad credits by creating a model for historical customers. It also helps banks detect fraudulent transactions by credit cards that protect a credit card owner.

3. Researchers

Data mining can motivate researchers to accelerate when the method analysis the data. Therefore they can work more time on other projects. Shopping behaviours can be detected. Most of the time, you may experience new problems while designing specific shopping patterns. Therefore data mining is used to solve these problems. Mining methods can find all the information on these shopping patterns. This process also creates an area where all the

unexpected shopping patterns are calculated. This data extraction can be beneficial when shopping patterns are identified.

4. Determining Customer Groups

We are using data mining to respond from marketing campaigns to customers. It also provides information during the identification of customer groups. Some surveys can be used to begin these new customer groups. And these investigations are one of the forms of data mining.

5. Increases Brand Loyalty

In marketing campaigns, mining techniques are used. This is to understand their own customers ' needs and habits. And from that, customers can also choose their brand's clothes. Thus, you can definitely be self-reliant with the help of this technique. However, it provides possible information when it comes to decisions.

6. Helps in Decision Making

People use these data mining techniques to help them make some decisions in marketing or business. Today, with the use of this technology, all information can be determined. Also, using such technology, one can decide precisely what is unknown and unexpected.

7. Increase Company Revenue

Data mining is a process in which some kind of technology is involved. One must collect information on goods sold online; this eventually reduces product costs and services, which is one of data mining benefits.

8. To Predict Future Trends

All information factors are part of the working nature of the system. The data mining systems can also be obtained from these. They can help you predict future trends, and with the help of this technology, this is entirely possible. And people also adopt behavioural changes.

9. Increases Website Optimization

We use data mining to find all kinds of unseen element information. And adding data mining helps you to optimize your website. Similarly, this data mining provides information that may use the technology of data mining.

Important Points to Remember

- If the user has managed to interact directly with the data mining tool, then the user can choose better and smart marketing choices for some corporation.
- Communication is important when dealing directly with data mining so that strong relationships and connections can be determined.
- Due to the 80/20 principle, if there are 20% of customers, then the profit will be 80%.
- The customers that are important with 20% are lossless. The company should aim at increasing profit by an additional 80%.
- There are two concepts called segmentation and clustering that are important in advertising and customers' connection to use the data mining on the details successfully.
- Data mining was also used as part of the strategy for preventing health fraud, waste and abuse in society in the area of CMIP of the Medicaid Integrity Program.
- If you know data mining techniques, you can manage applications in various areas such as Market Analysis, Production Control, Sports, Fraud Detection, Astrology, etc.

- If you have a website for shopping, then data mining will help in defining a shopping pattern. If you have issues with designing or selecting the products, data mining techniques can help identify all the shopping patterns.
- Data mining also helps in data optimization.
- One of the most important factors of data mining is that it determines hidden profitability.
- The risk factor in business can be taken care of because data mining provides clear identification of hidden profitability.
- Frauds and malware are the most dangerous threats on the internet, which are increasing day by day. Credit card services and telecommunication are the main reasons for that. With the help of the Data mining techniques, professionals can get fraud-related data such as caller ID, location, duration of the call, exact date and time, etc. which can help find a person or group responsible for that fraud.
- Also, in the Corporate world, where time is money, data mining techniques can help organizations in real-time plan finances and resources, evaluate assets, an idea about business competitors, etc.

Conclusion

Data mining has so many advantages in the area of businesses, governments as well as individuals. In this article, we have seen places where we can efficiently use data mining.

Types of Data Mining

Data mining can be performed on the following types of data:

1. Smoothing (Prepare the Data)

This particular method of data mining technique comes under the genre of preparing the data. The main intent of this technique is removing noise from the data. Here algorithms like simple exponential, the moving average are used to remove the noise. During exploratory analysis, this technique is convenient to visualize trends/sentiments.

2. Aggregation (Prepare the Data)

As the term suggests, a group of data is aggregated to achieve more information. This technique is employed to overview business objectives and can be performed manually or using specialized software. This technique is generally employed on big data, as big data don't provide the required information as a whole.

Popular

3. Generalization (Prepare the Data)

Again, as the name suggests, this technique is employed to generalize data as a whole. This is different from aggregation, so the data during generalization is not grouped to achieve more information, but the entire data set is generalized. This will enable a data science model to adapt to newer data points.

4. Normalization (Prepare the Data)

In this technique, special care is employed to data points to bring them into the same scale for analysis. For example, a person's age and salary fall in different measurement scales; hence plotting them on a graph won't help us attain any useful info about the trends present as a collective feature. Using normalization, we can bring them into an equal scale to perform apple to apple comparison.

5. Attribute/Feature selection (Prepare the Data)

In this technique, we employ methods to select features so that the model used to train the data sets can imply value to predict the data it has not seen. This is very analogous to choosing the right outfit from a wardrobe full of clothes to fit oneself right for the event. Non-relevant features can negatively impact model performance, let alone improving performance.

6. Classification (Model the Data)

In this technique of data mining, we will group know as "classes". In this technique, we employ the features selected (as discussed in the above point) collectively to groups/categories. For example, in a shop, if we have to evaluate whether a person will buy a product or not, there are "n" number of features we can collectively use to get a result of True/False.

7. Pattern Tracking

This is one of the basic techniques employed in data mining to get information about trends/patterns which the data points might exhibit. For example, we can determine a trend of more sales during a weekend or holiday time rather than on weekdays or working days.

8. Outlier Analysis or Anomaly Detection

Here and the name suggests, this technique is used to find or analyse outliers or anomalies. Outliers or anomalies are not negative data points; they are just something that stands out from the entire dataset's general trend. On identifying the outliers, we can either remove them completely from the dataset, which occurs when data preparation is done. Or else this technique is extensively used in model datasets to predict outliers as well.

9. Clustering

This technique is pretty much similar to classification, but the only difference is we don't know the group in which data points will fall post grouping after collection of features. This method is typically used in grouping people to target similar product recommendations.

10. Regression

This technique is used to predict the likelihood of a feature with the presence of other features. For example, we can formulate the likelihood of an item's price concerning demand, competition, and a few other features.

11. Neural Network

This technique is based on the principle of how biological neurons work. Similar to what neurons in the human body does, the neurons in a neural network in data mining work also acts as the processing unit and connecting another neuron to pass on the information along the chain.

12. Association

In this data mining method, the relation between different features is determined and, in turn, used to find either hidden patterns or related analysis is performed as per business requirement. For example, we can find features correlated to each other using the association and thus emphasize removing anyone to remove some redundant features and improve processing power/time.

Conclusion

To conclude, there are different requirements one should keep in mind while data mining is performed. One needs to be very careful of what the output is expected to be so that

corresponding techniques can be used to achieve it. Though data mining is an evolving space, we have tried to create an exhaustive list of all types of data mining tools above for readers.

Data visualization

Data visualization is the graphical representation of information and data. By using visual elements like charts, graphs, and maps, data visualization tools provide an accessible way to see and understand trends, outliers, and patterns in data.

In the world of Big Data, data visualization tools and technologies are essential to analyze massive amounts of information and make data-driven decisions.

Data visualization is the practice of translating information into a visual context, such as a map or graph, to make data easier for the human brain to understand and pull insights from. The main goal of data visualization is to make it easier to identify patterns, trends and outliers in large data sets. The term is often used interchangeably with others, including information graphics, information visualization and statistical graphics.

Data visualization is one of the steps of the data science process, which states that after data has been collected, processed and modeled, it must be visualized for conclusions to be made. Data visualization is also an element of the broader data presentation architecture (DPA) discipline, which aims to identify, locate, manipulate, format and deliver data in the most efficient way possible.

Data visualization is important for almost every career. It can be used by teachers to display student test results, by computer scientists exploring advancements in artificial intelligence (AI) or by executives looking to share information with stakeholders. It also plays an important role in big data projects. As businesses accumulated massive collections of data during the early years of the big data trend, they needed a way to quickly and easily get an overview of their data. Visualization tools were a natural fit.

Visualization is central to advanced analytics for similar reasons. When a data scientist is writing advanced predictive analytics or machine learning (ML) algorithms, it becomes important to visualize the outputs to monitor results and ensure that models are performing as intended. This is because visualizations of complex algorithms are generally easier to interpret than numerical outputs.

The advantages and benefits of good data visualization

Our eyes are drawn to colors and patterns. We can quickly identify red from blue, square from circle. Our culture is visual, including everything from art and advertisements to TV and movies.

Data visualization is another form of visual art that grabs our interest and keeps our eyes on the message. When we see a chart, we quickly see trends and outliers. If we can see something, we internalize it quickly. It's storytelling with a purpose. If you've ever stared at a massive spreadsheet of data and couldn't see a trend, you know how much more effective a visualization can be.

Big Data is here and we need to know what it says

As the "age of Big Data" kicks into high-gear, visualization is an increasingly key tool to make sense of the trillions of rows of data generated every day. Data visualization helps to tell stories by curating data into a form easier to understand, highlighting the trends and outliers. A good visualization tells a story, removing the noise from data and highlighting the useful information.

However, it's not simply as easy as just dressing up a graph to make it look better or slapping on the "info" part of an infographic. Effective data visualization is a delicate balancing act between form and function. The plainest graph could be too boring to catch any notice or it make tell a powerful point; the most stunning visualization could utterly fail at conveying the right message or it could speak volumes. The data and the visuals need to work together, and there's an art to combining great analysis with great storytelling.

Why data visualization is important for any career

It's hard to think of a professional industry that doesn't benefit from making data more understandable. Every STEM field benefits from understanding data—and so do fields in government, finance, marketing, history, consumer goods, service industries, education, sports, and so on.

While we'll always wax poetically about data visualization (you're on the Tableau website, after all) there are practical, real-life applications that are undeniable. And, since visualization is so prolific, it's also one of the most useful professional skills to develop. The better you can convey your points visually, whether in a dashboard or a slide deck, the better you can leverage that information.

The concept of the citizen data scientist is on the rise. Skill sets are changing to accommodate a data-driven world. It is increasingly valuable for professionals to be able to use data to make decisions and use visuals to tell stories of when data informs the who, what, when, where, and how. While traditional education typically draws a distinct line between creative storytelling and technical analysis, the modern professional world also values those who can cross between the two: data visualization sits right in the middle of analysis and visual storytelling.

The different types of visualizations

When you think of data visualization, your first thought probably immediately goes to simple bar graphs or pie charts. While these may be an integral part of visualizing data and a common baseline for many data graphics, the right visualization must be paired with the right set of information. Simple graphs are only the tip of the iceberg. There's a whole selection of visualization methods to present data in effective and interesting ways.

Common general types of data visualization:

- Charts
- Tables
- Graphs
- Maps
- Infographics

- Dashboards

More specific examples of methods to visualize data:

- Area Chart
- Bar Chart
- Box-and-whisker Plots
- Bubble Cloud
- Bullet Graph
- Cartogram
- Circle View
- Dot Distribution Map
- Gantt Chart
- Heat Map
- Highlight Table
- Histogram
- Matrix
- Network
- Polar Area
- Radial Tree
- Scatter Plot (2D or 3D)
- Streamgraph
- Text Tables
- Timeline
- Treemap
- Wedge Stack Graph
- Word Cloud
- And any mix-and-match combination in a dashboard!

Why is data visualization important?

Data visualization provides a quick and effective way to communicate information in a universal manner using visual information. The practice can also help businesses identify which factors affect customer behavior; pinpoint areas that need to be improved or need more attention; make data more memorable for stakeholders; understand when and where to place specific products; and predict sales volumes.

Other benefits of data visualization include the following:

- the ability to absorb information quickly, improve insights and make faster decisions;
- an increased understanding of the next steps that must be taken to improve the organization;
- an improved ability to maintain the audience's interest with information they can understand;
- an easy distribution of information that increases the opportunity to share insights with everyone involved;
- eliminate the need for data scientists since data is more accessible and understandable; and
- an increased ability to act on findings quickly and, therefore, achieve success with greater speed and less mistakes.

Data visualization and big data

The increased popularity of big data and data analysis projects have made visualization more important than ever. Companies are increasingly using machine learning to gather massive amounts of data that can be difficult and slow to sort through, comprehend and explain. Visualization offers a means to speed this up and present information to business owners and stakeholders in ways they can understand.

Big data visualization often goes beyond the typical techniques used in normal visualization, such as pie charts, histograms and corporate graphs. It instead uses more complex representations, such as heat maps and fever charts. Big data visualization requires powerful computer systems to collect raw data, process it and turn it into graphical representations that humans can use to quickly draw insights.

While big data visualization can be beneficial, it can pose several disadvantages to organizations. They are as follows:

- To get the most out of big data visualization tools, a visualization specialist must be hired. This specialist must be able to identify the best data sets and visualization styles to guarantee organizations are optimizing the use of their data.
- Big data visualization projects often require involvement from IT, as well as management, since the visualization of big data requires powerful computer hardware, efficient storage systems and even a move to the cloud.
- The insights provided by big data visualization will only be as accurate as the information being visualized. Therefore, it is essential to have people and processes in place to govern and control the quality of corporate data, metadata and data sources.

Examples of data visualization

In the early days of visualization, the most common visualization technique was using a Microsoft Excel spreadsheet to transform the information into a table, bar graph or pie chart. While these visualization methods are still commonly used, more intricate techniques are now available, including the following:

- infographics
- bubble clouds
- bullet graphs
- heat maps
- fever charts
- time series charts

Some other popular techniques are as follows.

Line charts. This is one of the most basic and common techniques used. Line charts display how variables can change over time.

Area charts. This visualization method is a variation of a line chart; it displays multiple values in a time series -- or a sequence of data collected at consecutive, equally spaced points in time.

Scatter plots. This technique displays the relationship between two variables. A scatter plot takes the form of an x- and y-axis with dots to represent data points.

Treemaps. This method shows hierarchical data in a nested format. The size of the rectangles used for each category is proportional to its percentage of the whole. Treemaps are best used when multiple categories are present, and the goal is to compare different parts of a whole.

Population pyramids. This technique uses a stacked bar graph to display the complex social narrative of a population. It is best used when trying to display the distribution of a population.

Common data visualization use cases

Common use cases for data visualization include the following:

Sales and marketing. Research from the media agency Magna predicts that half of all global advertising dollars will be spent online by 2020. As a result, marketing teams must pay close attention to their sources of web traffic and how their web properties generate revenue. Data visualization makes it easy to see traffic trends over time as a result of marketing efforts.

Politics. A common use of data visualization in politics is a geographic map that displays the party each state or district voted for.

Healthcare. Healthcare professionals frequently use choropleth maps to visualize important health data. A choropleth map displays divided geographical areas or regions that are assigned a certain color in relation to a numeric variable. Choropleth maps allow professionals to see how a variable, such as the mortality rate of heart disease, changes across specific territories.

Scientists. Scientific visualization, sometimes referred to in shorthand as SciVis, allows scientists and researchers to gain greater insight from their experimental data than ever before.

Finance. Finance professionals must track the performance of their investment decisions when choosing to buy or sell an asset. Candlestick charts are used as trading tools and help finance professionals analyze price movements over time, displaying important information, such as securities, derivatives, currencies, stocks, bonds and commodities. By analyzing how the price has changed over time, data analysts and finance professionals can detect trends.

Logistics. Shipping companies can use visualization tools to determine the best global shipping routes.

Data scientists and researchers. Visualizations built by data scientists are typically for the scientist's own use, or for presenting the information to a select audience. The visual representations are built using visualization libraries of the chosen programming languages and

tools. Data scientists and researchers frequently use open source programming languages -- such as Python -- or proprietary tools designed for complex data analysis. The data visualization performed by these data scientists and researchers helps them understand data sets and identify patterns and trends that would have otherwise gone unnoticed.

The science of data visualization

The science of data visualization comes from an understanding of how humans gather and process information. Daniel Kahn and Amos Tversky collaborated on research that defined two different methods for gathering and processing information.

System 1 focuses on thought processing that is fast, automatic and unconscious. This method is frequently used in day-to-day life and helps accomplish:

- reading the text on a sign;
- solving simple math problems, like 1+1;
- identifying where a sound is coming from;
- riding a bike; and
- determining the difference between colors.

System 2 focuses on slow, logical, calculating and infrequent thought processing. This method is used in one of the following situations:

- reciting a phone number;
- solving complex math problems, like 132 x 154;
- determining the difference in meaning between multiple signs standing side by side; and
- understanding complex social cues.

Data visualization tools and vendors

Data visualization tools can be used in a variety of ways. The most common use today is as a business intelligence (BI) reporting tool. Users can set up visualization tools to generate automatic dashboards that track company performance across key performance indicators (KPIs) and visually interpret the results.

The generated images may also include interactive capabilities, enabling users to manipulate them or look more closely into the data for questioning and analysis. Indicators designed to alert users when data has been updated or when predefined conditions occur can also be integrated.

Many business departments implement data visualization software to track their own initiatives. For example, a marketing team might implement the software to monitor the performance of an email campaign, tracking metrics like open rate, click-through rate and conversion rate.

As data visualization vendors extend the functionality of these tools, they are increasingly being used as front ends for more sophisticated big data environments. In this setting, data visualization software helps data engineers and scientists keep track of data sources and do basic exploratory analysis of data sets prior to or after more detailed advanced analyses.

The biggest names in the big data tools marketplace include Microsoft, IBM, SAP and SAS. Some other vendors offer specialized big data visualization software; popular names in this market include Tableau, Qlik and Tibco.

While Microsoft Excel continues to be a popular tool for data visualization, others have been created that provide more sophisticated abilities:

- IBM Cognos Analytics
- Qlik Sense and QlikView
- Microsoft Power BI
- Oracle Visual Analyzer
- SAP Lumira
- SAS Visual Analytics
- TibcoSpotfire
- Zoho Analytics
- D3.js
- Jupyter
- MicroStrategy
- Google Charts

UNITIV

SUPPLYCHAINMANAGEMENTANDBUSINESSPROCESSIMPROVEMENT

Meaning

Lean manufacturing is a methodology that focuses on minimizing wastewithinmanufacturingsystemswhilesimultaneouslymaximizingproductivity.

Lean manufacturing was introduced to the Western world via the 1990publicationof ***TheMachineThatChangedtheWorld,***whichwasbasedonanMIT study into the future of the automobile detailed by Toyota's lean productionsystem.

The term Lean coined by **John Krafcik**in the year of 1988 and defined in1996 by **James Womack and Daniel Jones.**It is a production method derivedfrom Toyota'a 1930 operating model.Lean manufacturing is also known leanproduction.

Waste is seen as anything that customers do not believe adds value and are notwilling to pay for. Some of the benefits of lean manufacturing can include reducedlead times,reducedoperating costs andimprovedproductquality.

Since that time, lean principles have profoundly influenced manufacturingconcepts throughout the world, as well as industries outside of manufacturing,includinghealthcare,softwaredevelopment and serviceindustries.

BASICPRINCIPLESOFLEANMANUFACTURING

- Synchronizeflow
- Minimizebothtransactionandproductioncosts
- Establishcollaborativerelationshipswhilebalancingcooperationandcompetition
- Ensurevisibilityandtransparency
- Developquickresponsecapability
- Manageuncertaintyandrisk
- Aligncorecompetenciesandcomplementarycapabilities
- Fosterinnovationandknowledge-sharing

FIVEPRINCIPLESOFLEAN MANUFACTURING

A widely referenced book, *Lean Thinking: Banish Waste and Create Wealth inYour Corporation*, which was published in 1996, laid out five principles of lean,which many in the field reference as core principles. They are value, the valuestream,flow,pullandperfection.Thesearenowusedasthebasisforleanimplementation.

1. Identifyvaluefromthecustomer'sperspective. Valueiscreatedbytheproducer, but it is defined by the customer. Companies need to understandthevalue the customer places on their products and services, which, in turn, can helpthemdeterminehowmuchmoneythe customer is willingto pay.

Thecompanymuststrivetoeliminatewasteandcostfromitsbusinessprocessesso that the customer's optimal price can be achieved -- at the highest profit to thecompany.

2. Map the value stream. This principle involves recording and analyzing theflow of information or materials required to produce a specific product or servicewith the intent of identifying waste and methods of improvement. Value streammapping encompasses the product's entire lifecycle, from raw materials through todisposal.

Companies must examine each stage of the cycle for waste. Anything that does notadd value must be eliminated. Lean thinking recommends supply chain alignmentas partof thiseffort.

3. Create flow. Eliminate functional barriers and identify ways to improve leadtime. This aids in ensuring the processes are smooth from the time an order isreceived through to delivery. Flow is critical to the elimination of waste. Leanmanufacturing relies on preventing interruptions in the production process andenabling a harmonized and integrated set of processes in which activities move in aconstantstream.

4. Establish a pull system. This means you only start new work when there isdemandforit.Leanmanufacturing uses apullsysteminstead ofapushsystem.

Push systems are used in manufacturing resource planning (MRP) systems. With apushsystem,inventoryneedsaredeterminedinadvance,andtheproductismanufactured to meet that forecast. However, forecasts are typically inaccurate,which can result in swings between too much inventory and not enough, as well assubsequent disruptedschedulesand poorcustomer service.

In contrast to MRP, lean manufacturing is based on a pull system in which nothingisboughtormadeuntilthereisdemand.Pullreliesonflexibilityandcommunicatio n.

5. Pursue perfection with continual process improvement, or Kaizen. Leanmanufacturing rests on the concept of continually striving for perfection, whichentails targeting the root causes of quality issues and ferreting out and eliminatingwasteacrossthe value stream.

LEANPRODUCTION

Lean production is an approach to management that focuses on cutting out waste orwhilst ensuring quality. This approach can be applied to all aspects of a business –

fromdesign,throughproductiontodistribution.Leanmanufacturingisaproductionproce ssbasedonanideologyofmaximisingproductivitywhilesimultaneouslyminimizingwas tewithinamanufacturingoperation.Theleanprinciple sees waste is anything that doesn't add value that the customers arewillingtopayfor.The benefitsofleanmanufacturing include reducedleadtimes andoperating costsandimprovedproductquality.

Leanproductionaimstocutcostsbymakingthebusinessmoreefficientand responsivetomarketneeds.

Thisapproachsetsoutto **cutoutorminimiseactivitiesthatdonotadd** valueto theproductionprocess,suchasholdingofstock,repairingfaultyproductand unnecessarymovementofpeopleandproductaroundthebusiness.

Leanproductionoriginatedinthemanufacturingplantsof Japan,buthasnow beenadoptedwell beyondlargeandsophisticated manufacturing activities.

Theleanapproachtomanagingoperationsisreallyabout:

- Doingthesimplethingswell
- Doingthingsbetter
- Involvingemployeesinthecontinuousprocessofimprovement
- …andasaresult,avoidingwaste

Theconceptofleanproductionisanincrediblypowerfuloneforanybusinessthatwants tobecome and/orremaincompetitive.

Why?**Becausewaste=cost**

Lesswastethereforemeanslowercosts,whichisanessentialpartofanybusinessbeing competitive.

Over-production:m akingmorethanisneeded–leadstoexcessstocks

Waitingtime: equipmentandpeoplestandingidlewaitingforaproduction processtobecompletedorresources toarrive

Transport: movingresources(people,materials)aroundunnecessarily

Stocks: oftenheldasanacceptablebuffer,butshould notbeexcessive

Motion: aworkerwhoappearsbusybutisnot actuallyadding anyvalue

Defects:outputthatdoesnotreachtherequiredqualitystandard–oftena significantcosttoanuncompetitivebusiness

ThepioneeringworkofToyota(aleaderinleanproduction)identifieddifferent kindsofwastewhichcanbeappliedtoanybusinessoperation.Theseare:Thekeyaspectsof leanproductionthatyou shouldbe awareof are:

- Timebasedmanagement
- Simultaneousengineering
- Justintimeproduction(JIT)
- Cellproduction
- Kaizen(Continuousimprovement)
- Qualityimprovementandmanagement
-

HowDoesLeanManufacturingWork?

The core principle in implementing lean manufacturing is to eliminate waste tocontinuallyimproveaprocess.Byreducingwastetodeliverprocessimprovements,lea nmanufacturingsustainablydeliversvalueto thecustomer.

The types of waste include processes, activities, products or services that requiretime, money or skills but do not create value for the customer. These can coverunderusedtalent,excessinventoriesorineffectiveorwastefulprocessesandproced ures.

Removingtheseinefficiencies shouldstreamlineservices,reducecostsandultimately provide savings for a specific product or service through the supplychaintothe customer.

IMPORTANCEOFLEANMANUFACTURING

Waste in industry, whether that is idle workers, poor processes or unused materialsare a drain on productivity, and lean manufacturing aims to eliminate these.
Themotivesbehindthisvarydependingonopinion,fromincreasingprofitstoproviding benefits to customers.However, whatever the over-arching motives,thereare four keybenefitsto leanmanufacture:

- **EliminateWaste**:Wasteisanegativefactorforcost,deadlinesandresources.Itpro videsnovaluetoproductsorservices
- **Improve Quality**: Improved quality allows companies to stay competitiveand meet the changing needs and wantsof customers. Designing processesto meet these expectations and desires keep you ahead of the competition,keeping qualityimprovementatthe forefront
- **Reducing Costs**: Overproduction or having more materials than is requiredcreates storage costs, which can be reduced through better processes andmaterials management
- **Reducing Time**: Wasting time with inefficient working practices is a wasteof money too, while more efficient practices create shorter lead times andallowfor goodsand servicestobedelivered faster

EnterpriseResourcePlanning

Supply chain management has been an integral part of ERP solutions adopted byseveralenterprises.Manufacturersneedtointeractwithvarioussuppliersandpartnersto obtaintherawmaterialsandresourcesattherighttimeandattherightamounttobring finished goods to market. Businesses are actively focusing on several supplychainstrategiestoboostplantproductivity,enhanceproductquality,andcutdowno n

manufacturing costs. As the operations become more extensive and globalized, theintegration of SCM becomes all the more important. ERP solution can supportmultiplemodes,suchasmake-to-order,engineer-to-orderandconfigure-to-orderandprovideoperationssupportacrossmultiplesitesinrealtime.ERPsolutionstreamlinesthepaththeirproductsgothroughfromsuppliertowarehouseandfinallytostoreforcustomer.Asaresult,businessescanavoidsupplychaindisruption.

Demandandplanning

An ERP system meant for supply chain management can automatically createdemand when orders are received. ERP streamlines supply chain management bycreating effective job scheduling. As a result, supervisors can know in real timewhat resources are being consumed and which resources are used. This helps themto plan product delivery dates. Production should ideally begin when inventory andraw materials are full. ERP ensures that production policies are consistent withdemand,replenishmentisdone at therighttime,and inventoryislean.

2. Procurement

An ERP meant for SCM offers more effective way to manage procurement andsupply of the goods, services, and other resources across the chain. From handlingmanufacturing and warehouse resources to managing transportation and executionprocesses, ERP solution takes care of all elements of supply chain. Several manualtasks such as communicating with vendors and suppliers and keeping track of thecommunications caneasilybeautomatedwithERP.

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3. Production

TheERPsystemenablesthecreationofbillofmaterial(BOM)foreachitem.After production starts, all records for machine and labor resources are created andupdated in real time. All shipping documents are recorded through the ERP systemforpropersupplychainmanagement,eliminatingerrorsduetomanualprocess.The system can ensure that products are sent out in time which can be delivered onthe due date. Feature-rich ERP helps in modifying work orders and job tasks toaccommodatealllastminutealterations,sothatproductionprocessiscompletedontime.

4. Shipment

Once the item has been shipped, the ERP software can create an invoice that has tobe finally sent to the customer. An ERP system helps in maintaining a centralrepository for customer shipments and all delivery details to ensure that items aredelivered on time. Furthermore, functionalities in the system helps in decidingpackaging methods and set criteria for quality check for both internal and externalpackages. With the help of ERP, companies can resolve resource conflicts in thetask list.

CompetitiveBenefitsofERPinSupplyChainManagement

Modern ERP solutions add value across each part of supply chain by augmentingefficiencyacrossdifferentdepartmentsandkeystakeholdersconsistingofsuppliers and partners. Automation of the entire workflow from procurement toproduct delivery leads to a significant reduction of overhead and operational costs.A modern ERP streamlines the path that the materials, finances and informationtakefromsuppliertocustomers.Attheend,arobustERPsolutionmeantfor

supply chain management help retailers keep a total control of cost of storage andmeet customer demand.

Someofthekeybenefits that ERPofferstosupplychain forbusinesses are:

- **Effective demand forecasting and lean inventory:** An ERP solution in SCMimproves the accuracy of demand forecasting and ensures that the cost ofinventoryisminimizedincaseoflarge-batchproductionprocess.Aleaninventory is essential to address just-in-time production method to reduce thecostof productionand keepsupplychain flexible.
- **Reduce production bottlenecks:** ERP for supply chain significantly reducesthe bottlenecks between internal processesand external suppliers. Modernsolutionhelpsinhandlingproperprocurementandsupplyofthegoods,services and otherresourcesthat areneeded across thesupplychain.
- **Transparency through the business:** The consolidated view of the supplychainenablesthebusinessexecutivemakemoreinformedandbalanceddecisions withERP for supplychain.

ERPforSupplyChainManagementHelpsinOverallOrganizationGrowth

Companies need to make substantial improvements in logistics performance foroverall organizational growth.The key tomaximizethe operationalefficiency isby minimizing space wastage on store shelves and in reducing costs spent onwarehouses or distribution centers. As per a recent statistics, businesses spend atleast 25% of their budget on ERP which has robust supply chain managementfeatures. ERP solution is an integral part of managing supply chain risk making theentire chain more resilient to accommodate changes in market demand. An agilesupplychainnotonlybringsproductivitytothemanufacturingprocessbutalso

enables better tracking of resource utilization. Furthermore, a synergybetweenERP and supply chain provides store owners better supply chain managementefficiencies leadingtosignificantROI.Ultimately,anERPsolutionoffersah olisticviewofthe entirebusinessoperations.

THETHEORYOFCONSTRAINTS

The Theory of Constraints is a methodology for identifying the most importantlimiting factor (i.e. constraint) that stands in the way of achieving a goal andthen systematically improving that constraint until it is no longer the limitingfactor.Inmanufacturing,theconstraintisoftenreferredtoasabottleneck.

TheTheoryofConstraintstakesascientificapproachtoimprovement.Ithypothesiz es that every complex system, including manufacturing processes,consistsofmultiplelinkedactivities,oneofwhichactsasaconstraintupon theentiresystem(i.e.theconstraintactivityisthe“weakestlinkinthechain”).

TheTheoryofConstraintsprovidesapowerfulsetoftoolsforhelpingtoachievethatg oal,including:

- TheFiveFocusingSteps(amethodologyforidentifyingandeliminatingconstra ints)
- TheThinkingProcesses(toolsforanalyzingandresolvingproblems)
- ThroughputAccounting(amethodformeasuringperformanceandguidingma nagement decisions)

Dr.EliyahuGoldrattconceivedtheTheoryofConstraints(TOC),andintroduceditto a wideaudiencethroughhisbestselling1984 novel, “TheGoal”. Since then, TOC has continued to evolve and develop, and today it is asignificantfactorwithin the world ofmanagement bestpractices.

One of the appealing characteristics of the Theory of Constraints is that itinherently prioritizes improvement activities. The top priority is always thecurrent constraint. In environments where there is an urgent need to improve,TOCoffersahighly focusedmethodologyforcreatingrapidimprovement.

A successful Theory of Constraints implementation will have the followingbenefits:

- Increasedprofit(theprimarygoalofTOC formostcompanies)
- Fastimprovement(aresultoffocusingallattentionononecriticalarea–thesystemconstraint)
- Improvedcapacity(optimizingtheconstraintenablesmoreproducttobemanufactured)
- Reducedleadtimes(optimizingtheconstraintresultsinsmootherandfasterproductflow)
- Reduced inventory (eliminating bottlenecks means there will be less work-in-process)

BASICSOFTOC

CoreConcept

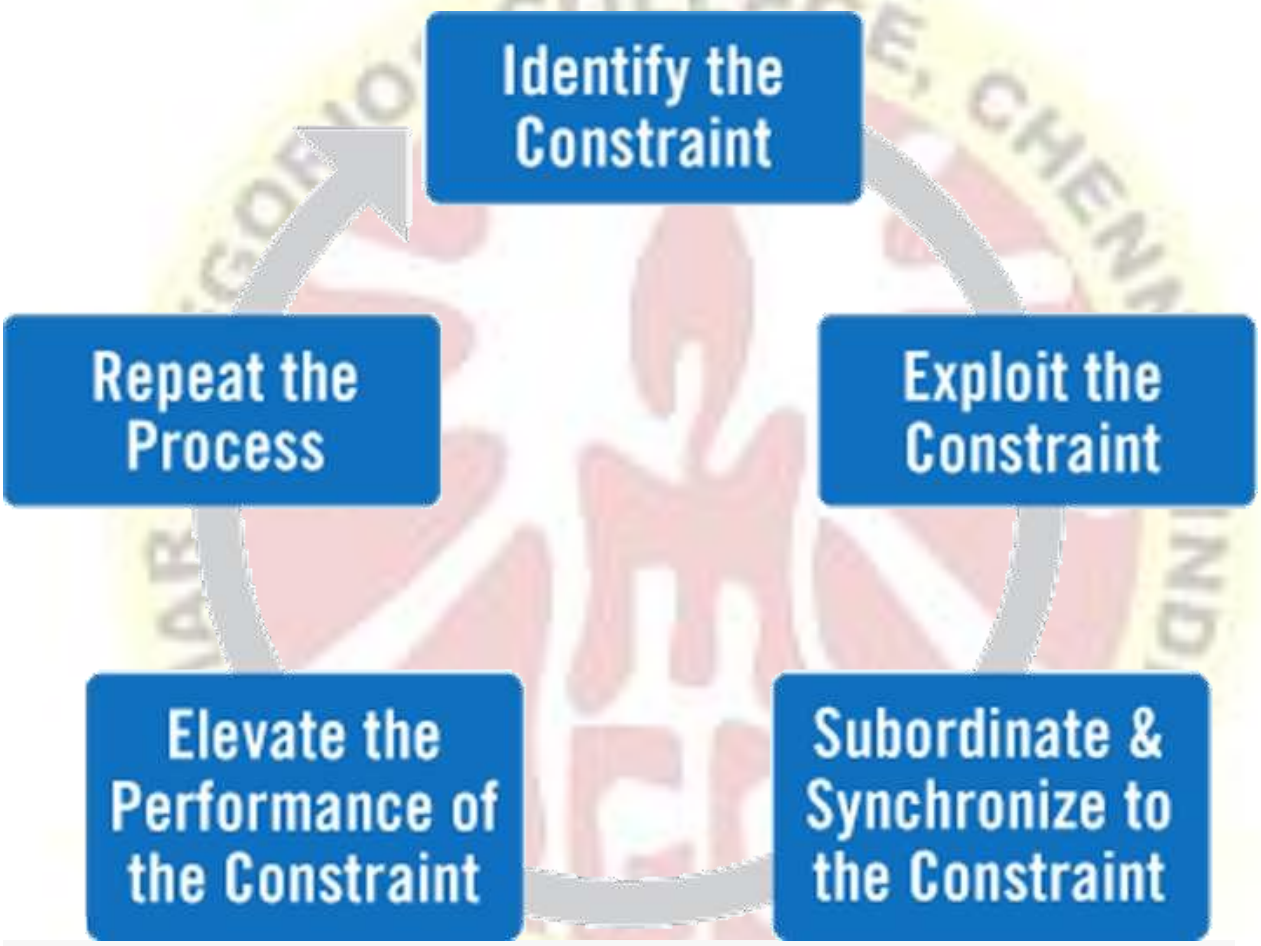
The core concept of the Theory of Constraints is that every process has a singleconstraint and that total process throughput can only be improved when theconstraintisimproved. A veryimportantcorollarytothisisthatspendingtimeoptimizingnon-constraintswillnotprovidesignificantbenefits;onlyimprovementstotheconstraintwillfurtherthegoal(achievingmoreprofit).

Thus, TOC seeks to provide precise and sustained focus on improving thecurrentconstraint untilit nolonger limitsthroughput,atwhichpointthefocusmovestothenextconstraint.TheunderlyingpowerofTOCflowsfrom

itsabilitytogenerateatremendouslystrongfocustowardsasinglegoal(profit)andto removingtheprincipalimpediment(theconstraint)toachieving more of that goal. In fact, Goldratt considers focus to be the essenceof TOC.

TheFiveFocusingSteps

The Theory of Constraints provides a specific methodology for identifying andeliminatingconstraints,referredtoastheFiveFocusingSteps.Asshowninthefo llowing diagram,it isa cyclicalprocess.



TheTheoryofConstraintsusesaprocessknownastheFiveFocusingSt epstoidentifyandeliminateconstraints(i.e.bottlenecks).

TheFive FocusingStepsarefurtherdescribedinthe followingtable.

Step	Objective
Identify	Identifythecurrentconstraint(thesinglepartoftheprocessthatlimitsthera teatwhich thegoalisachieved).
Exploit	Makequickimprovementstothethroughputoftheconstraintusingexistin gresources(i.e.make themostof whatyouhave).
Subordinate	Reviewallotheractivitiesintheprocesstoensurethattheyarealignedwith andtrulysupporttheneedsoftheconstraint.
Elevate	If the constraint still exists (i.e. it has not moved), consider whatfurtheractionscanbetakentoeliminateitfrombeingtheconstraint. Normally, actions are continued at this step until theconstraint has been "broken" (until it has moved somewhere else).Insomecases,capitalinvestmentmaybe required.
Repeat	TheFiveFocusingStepsareacontinuousimprovementcycle.Therefore, once a constraint is resolved the next constraint shouldimmediately be addressed. This step is a reminder to never becomecomplacent– aggressivelyimprovethecurrentconstraint…andthenimmediatelymov eon tothenextconstraint.

TheThinking Processes

TheTheoryofConstraintsincludesasophisticatedproblemsolvingmethodology called the Thinking Processes. The Thinking Processes areoptimizedforcomplexsystemswithmanyinterdependencies(e.g.manufacturing lines). They are designed as scientific "cause and effect"tools, which strive to first identify the root causes of undesirable effects(referred to as UDEs), and then remove the UDEs without creating newones.

TheThinkingProcessesareusedtoanswerthefollowingthreequestions,whichareessentialtoTOC:

- **Whatneedstobe changed?**
- **Whatshoulditbechangedto?**
- **Whatactionswillcausethechange?**

Examples of tools that have been formalized as part of the ThinkingProcessesinclude:

Tool	Role	Description
Current RealityTree	**Documents the currentstate.**	**Diagramthatshowsthecurrentstate, which is unsatisfactory and needs improvement. When creating the**

Tool	Role	Description
		diagram,UDEs(symptomsoftheproblem)areidentifiedandtracedbacktotheirrootcause(theunderlyingproblem).
Evaporating CloudTree	Evaluatespotentialimprovements.	Diagramthathelpstoidentifyspecificchanges (called injections) that eliminateUDEs.Itisparticularlyusefulforresolvingconflictsbetweendifferentapproachestosolvingaproblem.Itisusedaspartoftheprocessforprogressingfromthe CurrentRealityTreetotheFutureRealityTree.
FutureRealityTree	Documents the future state.	Diagramthatshowsthefuturestate,whichreflectstheresultsofinjectingchanges into the system that are designedtoeliminateUDEs.
Strategy and TacticsTree	Provides anaction plan for	Diagramthatshowsanimplementationplan for achieving the future state.

Tool	Role	Description
	improvement.	**Creates a logical structure that organizesknowledgeandderivestacticsfromstrategy.Note:thistoolisintendedtoreplacetheformerlyusedPrerequisiteTreeintheThinkingProcesses.**

ThroughputAccounting

Throughput costing considers only direct materials as true variable cost and otherreamingcostsasperiodcoststobechargedintheperiodinwhichtheyareincurred. Thus, in throughput costing, only direct materials costs are inventoriablecosts. In this costing, contribution is equal to revenue minus all variable directmaterials costof goodssold.

Throughput costing is not used for external reporting because it gives significantdifferent net income figures than those revealed by absorption costing. It providesless incentive to produce for inventory than variable or absorption costing sinceinventory value figures are very low. Throughput costing has relevance only forinternal usesof management.

Throughput Accounting is an alternative accounting methodology that attempts toeliminate harmful distortions introduced from traditional accounting practices – distortions that promote behaviors contrary to the goal of increasing profit in thelong term.

In traditional accounting, inventory is an asset (in theory, it can be converted tocashbysellingit).Thisoftendrivesundesirablebehavioratcompanies–manufacturing items that are not truly needed. Accumulating inventory inflatesassets and generates a "paper profit" based on inventory that may or may not everbe sold (e.g. due to obsolescence) and that incurs cost as it sits in storage. TheTheory of Constraints, on the other hand, considers inventory to be a liability –inventoryties upcashthat couldbeused moreproductivelyelsewhere.

In traditional accounting, there is also a very strong emphasis on cutting expenses.The Theory of Constraints, on the other hand, considers cutting expenses to be ofmuch less importance than increasing throughput. Cutting expenses is limited byreachingzeroexpenses,whereasincreasingthroughputhasnosuchlimitations.

TheseandotherconflictsresultintheTheoryofConstraintsemphasizingThroughput Accounting, which uses as its core measures: Throughput, Investment,and OperatingExpense**.**

CoreMeasures	Definition
Throughput	The rate at which customer sales are generated less truly variablecosts (typically raw materials, sales commissions, and freight).Labor is not considered a truly variable cost unless pay is 100%tiedtopiecesproduced.
Investment	Moneythatistiedupinphysicalthings:productinventory,machineryandequipment,realestate,etc.Formerlyreferredtoin

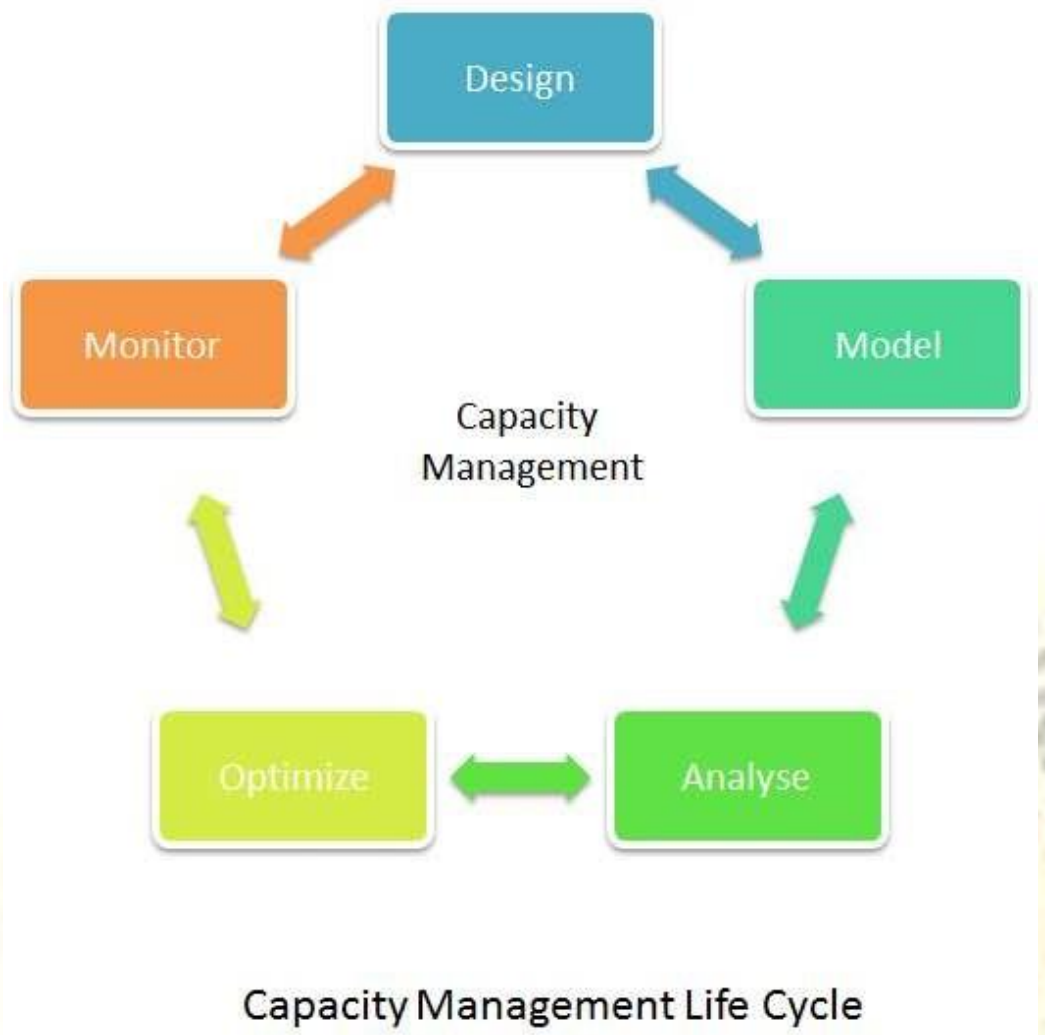
CoreMeasures	Definition
	TOCasInventory.
Operating Expense	Money spent to create throughput, other than truly variable costs(e.g. payroll, utilities, taxes, etc.). The cost of maintaining a givenlevelofcapacity.

In addition, Throughput Accounting has four key derived measures:NetProfit,ReturnonInvestment,Productivity,andInvestmentTurns.

Net Profit = Throughput − Operating ExpensesReturn on Investment = Net Profit / InvestmentProductivity=Throughput/Operating ExpensesInvestmentTurns=Throughput/Investment

CAPACITYMANAGEMENT

Capacity management refers to the wide variety of planning actions used to ensurethat a business infrastructure has adequate resources to maximize its potentialactivities andproduction outputunderanycondition.



Capacity Management Life Cycle

Capacitymanagementtheoryconsistsoftheplanning,ITmonitoring,andadministration actions undertaken to ensure that information technology resourceshave the capacity to handle data processing requirements across the entire servicelifecycle.

The goal of capacity planning management is to ultimately balance costs incurredagainstresourcesrequired,andbalancesupplyagainstdemand.Thecapacityma nagement procedure concerns performance, memory, and physical space, andshouldcoverboththeoperationalanddevelopmentenvironment,includinghardware ,humanresources,networkingequipment,peripherals,andsoftware.

Themainobjectivesofprojectmanagementcapacityplanninginclude:

- IdentifyITcapacityrequirementstomeetcurrentandfutureprojectedworkloads.
- Developandmaintainacapacitymanagementplan.
- Ensureperformancegoalsaremetontimeandwithinbudget.
- Monitorcapacitycontinuouslytosupporttheservicelevelmanagement.
- Assistindiagnosingandresolvingincidents.
- Analyzetheimpactofvariancesoncapacityandtakeproactivemeasurestoimprov eperformancewhere itis mostcost-effective.

TypesofCapacityPlanninginOperationsManagement

Therearethreemaintypesofcapacityplanningandcontrolinoperationsmanagement that ensure there are adequate resources for both the short- and long-term.

- Product capacity planning -- ensures that there are adequate products oringredients fordeliverables.
- Workforce capacity planning -- helps estimate the most efficient number ofteam members and hours required to complete jobs, and the most ideal timeframe in which to start recruiting new employees, including consideration oftheonboardingprocess.
- Tool capacity planning -- ensures that there is always adequate equipment tocomplete jobs, e.g., assembly line components, manufacturing machinery,and transportvehicles fordeliveryofproducts.

WhatisthePrimaryFocusofBusiness CapacityManagement?

Capacity planning decisions in operations management for businesses focus onmeasuringhowmuchacompanycanachieve,produce,orsellwithinagivenperiod of time.Thisincludes:

- Managementandpredictionoftheperformanceandcapacityofindividualelement sof ITtechnology
- Managementandpredictionoftheperformanceandcapacityoflive,operational ITservices
- Analysis of capacity supplier agreements and supplier management contractsbyacapacitymanagementanalyst
- Thetimelyquantification,design,andimplementationoffuturebusinessrequirem ents for ITservices

WhyIsCapacityManagementImportant?

Capacity Management refers to the actions of ensuring a business maximises itspotential activities and output at all times and under all conditions to ultimatelyachievemaximumprofit.

The challenge for capacity management is how to increase a production unit'scapacity to maximum without increasing the costs to the point at which there is nooverall financialbenefit.

If every production line has a constraint (bottleneck) then focusing improvementeffort on that constraint is the fastest and most effective path to increasing capacityand improvedprofitability.

WHATARETHERESPONSIBILITIESOFCAPACITYMANAGEMENT?

Managing the capacity of a production unit involves achieving as close to thedesigncapacitymeasureaspossiblebyoptimisingthepeople,machinesandprocesses tobesteffect.

It should also factor in the requirement of the production unit to meet demand fromthecustomer.Demandisacomplexfunctioninfluencedbyawiderangeofvariabless uchasweather,consumerbuyingpower,economicconditions,promotions, competitor performance etc. These factors are constantly changingmaking the entire demand planning and consequently capacity management, a verychallenging activity.

Many internal factors such as machine downtime or staff sickness, or externalfactors such as a sudden upturn in demand from the marketplace or a change in theregulatory environment, can alter the balance between supply and demand andchange the objective for capacity managers. If this situation carries on over thelonger term and threatens the profitability of the unit then steps must be taken toimprovecapacity.

THREEFACESOFCAPACITYMANAGEMENT

Thisprocessisbuiltonseveralsub-processes,including **businesscapacitymanagement,servicecapacitymanagement,componentcapacity management,andcapacitymanagementreporting**.Theseprocessessharecommonac tivities,suchasmodeling,workloadmanagement,analysis,andoptimization.`

Business capacity management is the sub-process that turns the needs of thebusinessintoITservicerequirements.Itisinvolvedinservicestrategyandservice

design, reviewing the data to ensure that there will not be any changes in demandbeforetheITserviceisimplemented.Thissub-processworkswithdemandmanagementtoensurethattheserviceismeetingbusinessneeds.Othersub-processes make sure that the service meets service-level targets; this sub-processensuresthattheservice-leveltargetsmeetthebusinessneeds.Athoroughunderstanding of the business and the service-level agreements is necessary toeffectivelyperformthe activitiesin thissub-process.

Service capacity management is the sub-process that focuses on the operation oftheservice.Unlikecomponentcapacitymanagement,thisprocessfocusessolelyon the service itself. It ensures that the end-to-end service provided meets agreed-upon service-level targets. For example, this process would monitor, control, andpredict aticketing systemto ensureit was up and running efficiently.

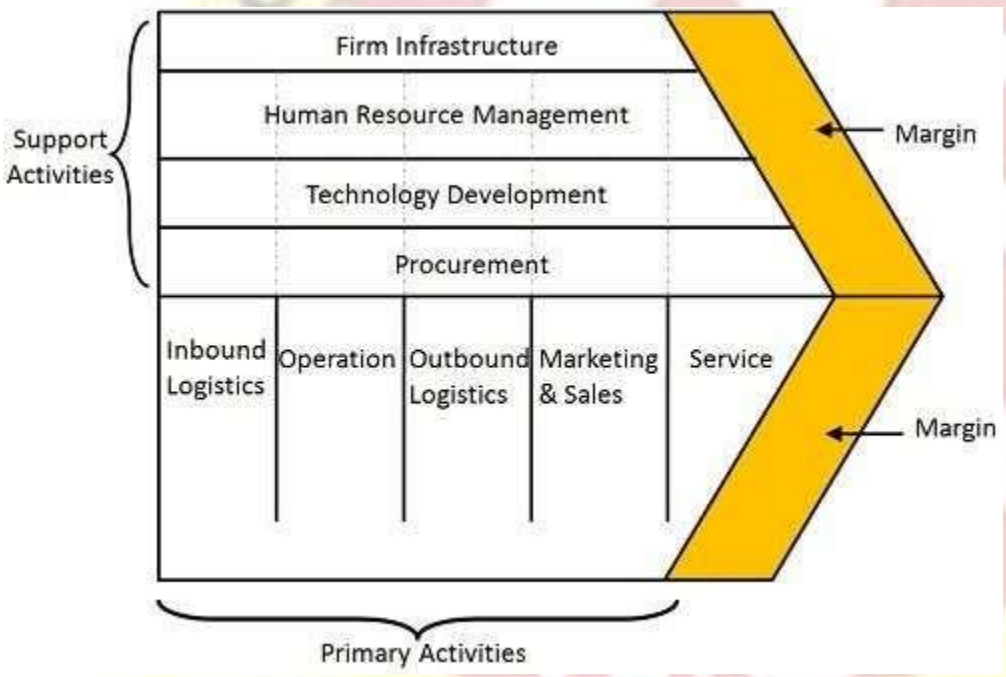
Component capacity management focuses on the technology that provides theperformance and capacity to the IT service. Components are things like hard disks,phones,anddatabases.Thissub-processrequiresknowledgeofhoweachcomponent individually contributes to service performance. It manages, controls,and predicts performance usage and capacity of individual components rather thanthe service as a whole (as seen in service capacity management). The goal of thissub-processistoreducethetotalamount ofservice downtimebymonitoringcurrent performance and predicting future performance. Component capacities aredesigned aroundservicecapacitiesandnottheother wayaround.

Capacitymanagementreporting is the final sub-process. It gathers and thenprovides other stages with the data related to service capacity, service usage, andserviceperformance.Theoutputofthissub-process istheservicecapacityreport.

VALUECHAINANALYSIS

Definition: Value chain analysis is a process of dividing various activities of thebusiness in primary and support activities and analyzing them, keeping in mind,their contribution towards value creation to the final product. And to do so, inputsconsumed by the activity and outputs generated are studied, so as to decrease costsand increasedifferentiation.

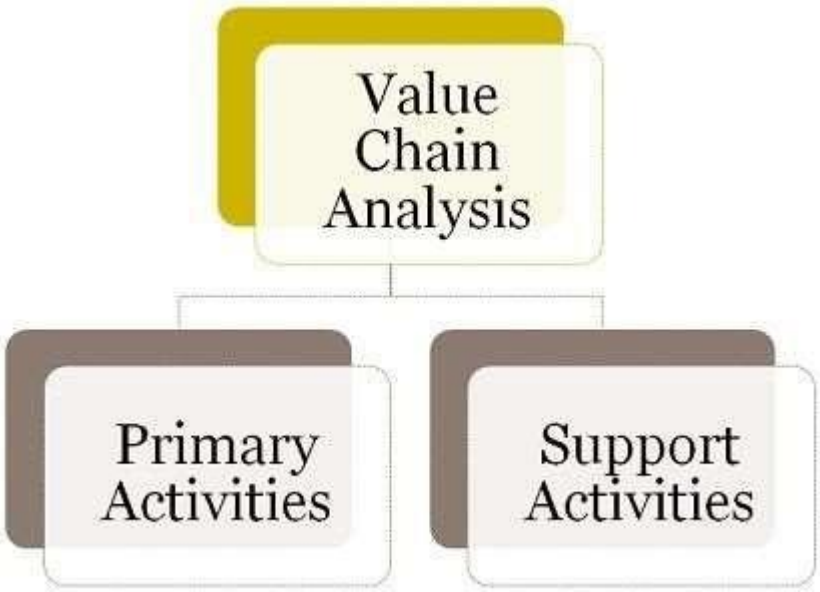
Value chain analysis is used as a tool for identifying activities, within and aroundthefirmandrelatingtheseactivitiestoan assessment ofcompetitivestrength.



As shown in the figure, Michael Porter classified the entire value chain into nineactivitieswhichareinterrelatedtooneanother.Whileprimaryactivitiesincludethe activities that are performed to satisfy external demand, secondary activities arethosewhichareperformedtosatisfyinternalrequirements.

ClassificationofValueChainAnalysis

ValueChainAnalysisisisgroupedintoprimaryorlineactivities,andsupportactivities discussedasunder:



1. **PrimaryActivities**:Thefunctionswhicharedirectlyconcernedwiththeconversionofin putintooutputanddistributionactivitiesarecalledprimaryactivities.Itincludes:

- **InboundLogistics**:Itincludesarangeofactivitieslikereceiving,storing,distributing,etc .whichmakeavailablegoodsandservicesforoperationalprocesses. Some of those activities are material handling, transportation, stockcontrol,etc.
- **Operations**: The activity of transforming input raw material to final product readyforsale,istermedasoperation.Machining,assembling,packagingaretheactivities coveredunderoperations.

- **Outbound Logistics**: As the name suggests, the activities that help in collecting,storageanddelivering theproducttothecustomeris outboundlogistics.
- **MarketingandSales**:Alltheactivitieslikeadvertising,promotion,sales,marketing research, public relations, etc. performed to make the customer aware oftheproduct or serviceandcreatedemand for it,comesundermarketing.
- **Service**: Service means service provided to the customer so as to improve ormaintain the value of the product. It includes financing service, after-sales serviceand soon.

2. **SupportActivities**:Thoseactivitieswhichassistprimaryactivitiesinaccomplishment,are support activities.These are:

- **Procurement**: This activity serves the organization, by supplying all the necessaryinputs like material, machinery or other consumable items, that required by theorganization for performingprimaryactivities.
- **Technology Development**: At present, technology development requires heavyinvestment, which takes years for research and development. However, its benefitscanbeenjoyed forseveralyears and byamultitudeofusersintheorganization.
- **Human Resource Management**: It is the most common plus important activitywhich excel all primary activities of the organization. It encompasses overseeingtheselection,retention,promotion,transfer,appraisalanddismissalofstaff.
- **Infrastructure**: This is the management system, which provides, its services to thewholeorganizationandincludesplanning,finance,informationmanagement,quality control,legal,governmentaffairs,etc.

In the fast paced world, the main focus of the organization is customer satisfaction,andvaluechainanalysisisthetechniquethathelpstoattainthatlevel.Underthis,

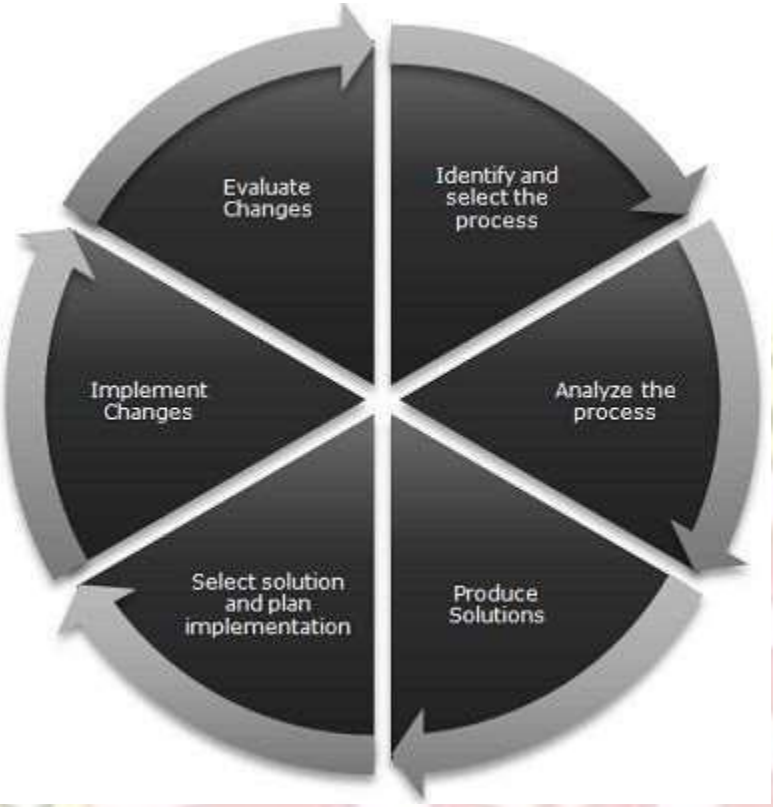
each business activity is considered as essential, which contributes value and isconstantlyanalyzed,to increasevalueas regardsthe costincurred.

PROCESSANALYSIS

Definition: Process Analysis can be understood as the rational breakdown of theproduction process into different phases, that turns input into output. It refers to thefull-fledgedanalysisofthebusinessprocess,whichincorporatesaseriesoflogically linked routine activities, that uses the resources of the organization, totransformanobject,withtheaimofachievingandmaintainingtheprocessexcellence.

ProcessAnalysisisnothingbutareviewoftheentireprocessflowofanorganization to arrive at a thorough understanding of the process. Further, it is alsohelpful to set up targets for the purpose of process improvement, which is possiblebyeliminatingunnecessaryactivities,reducewastageandincreasingefficiency.

Thus,itultimatelyendsupimprovingtheoverallperformanceofthebusiness



activities.

ObjectivesofProcessanalysis

1. Identifythefactors thatmakeitdifficultto understandtheprocess.
2. Ascertaincompletenessoftheprocess.
3. Removebottlenecks
4. Findredundancies
5. Ascertaintheallocationofresources
6. Checkoutprocess time

Understanding,QualityandEfficiencyarethethreebasiccriterion,throughwhichonec an analysetheprocessanddeterminetheareas thatrequirechange.

StepsInvolvedinProcessAnalysis

- **Step 1 – Interview major participants of the process**: Discuss the participantsabout what they do, why they do and how they do it. Identify the information andinputsrequired by the workers to perform the taskassigned to them. Researchabout the sourceof input andoutputsof each task.
- **Step 2 – Carry out group discussion**: Group interview and brainstorming sessionareconducted,withtheaimofgeneratingideas,validatingandrefiningtheinforma tion collected,atthefirststep.
- **Step 3 – Identify bottlenecks and redundancies**: Find out the bottlenecks in eachtask that causes delay and various measures to remove it. Further, identify theunnecessaryactivities,whose elimination caneasetheprocess.

- **Step4–CreateSketch**:Makeasketchrightfrom thescratchoftheentireprocess, depending upon the business process requirements, which came into lightafterinterviewsanddiscussions.
- **Step 5 – Compare**: At the end, compare the latest process flow with the previousone,and mark theareas that requirechanges,aspertheresearchconducted.

ProcessAnalysisisamethodicalapproachtoenhancetheunderstandingandredesigning of the workflow of the organization. It acts as a tool to maintain andimprovethebusinessprocessesandalsohelpinattainingtheincrementaltotransforma tional benefits, such as cost reduction, optimum utilisation of resources,effectivehuman resourceallocationandprocess efficiency.

Activity-basedmanagement(ABM)isusedtodeterminetheprofitabilityofevery aspectofabusiness,sothatthose areascanbe upgradedoreliminated.The intent is to achieve a more fine-tuned organization with a higher level ofprofitability.TheinformationusedinanABManalysisisderivedfromactivity-basedcosting,wheregeneraloverheadcostsareassignedtocostobjectsbased on their use ofactivity drivers. A cost object is anything aboutwhichabusinesswantstocollectcostinformation,suchasprocesses,customers,products,productlines,andgeographicsalesregions.

ExamplesofActivity-BasedManagement

Onewaytouseactivity-basedmanagementistodeterminethetotalprofitability of acustomer, based on its purchases, sales returns, and use of thetimeofthecustomerservice department.Another possible useistodeterminethe total profitability of a new product, based on its sales, warranty claims, andrepairtimerequiredforreturnedgoods.Athirdoptionistodeterminethetotal

profitabilityoftheR&Ddepartment,basedonthefundsinvestedandoutcomeof new products developed. A fourth possible use is to carry the informationderivedfromanABManalysisintoacompany'sforecastingmodelsandbudgets, which gives management a better idea of the future prospects of thebusiness.

Activity-basedmanagementisanapproachthatidentifiesandevaluatesactivities carried out by a business and uses activity-based costing to achieve avalue chain analysis or take up a re-engineering initiative in order to improvestrategicandoperationaldecisions.Itisasystemthatanalysesanddeterminesthe profitability of every aspect of a business to highlight its losses and gains insuchawaythattheefficiencyofanorganizationcanbeimprovedbyfocusingontheprofitableaspects.

Howdoesitfunction?

Activity-basedmanagementisusedtoanalyzethecostofanactivityincomparisontothevalue-addedbytheactivitywiththegoalofstrategicimprovement.

Itcanbedoneinthefollowingways

1. **IdentificationandAnalysis:**Inactivity-basedmanagement,itisimportant to identify the activities that have a significant impact on thefinancesofabusiness.Itreferstolistingoutacompany’sbusinessactivitiesinordertofindtheonesthathavethemosteffect.

The next step is identifying the cost that drives each activity based on the costincurred.Costdriversarethereasonwhythecostofactivityvaries.

2. **Evaluation and Value-Chain Analysis**: In order to analyzefurther, themanager needstoanalyzethe costofevery activity by appropriatingalldirectandindirectcostsrelatedtotheactivity.

Forexample,ifatailorrunssewingmachinesallday,thatwillbeconsideredanimportantactivity,thecostanalysiswillincludethecostoflaborandelectricity.

This is knownasactivity-based costing, whereamethod is used toassign thecostsofeveryactivityaccordingtoactualconsumption,basedonoverheadexpensesincurredduringtheactivity.

Additionally,thevaluegeneratedbyeveryactivityshouldbequantifiedinrelation to the cost incurredtoanalyzeitsimpact. Thisiscalledvaluechainanalysis,wherevalueisaddedbyaparticularactivity.

3. **IdentifyingOpportunitiestoImprove**

Theinformationgatheredfromtheaforementionedprocessescanbeusedtofurtheridentifyandimplementprocessesinthefollowingways

- **OperationalABM**

OperationalABMallowsmanagerstorecognizeanyirregularitiesinthecostingprocessandexamineaccordingly.OperationalABMrequiresthe

scrutinizationofeveryactivityandincreasedoperationalefficiencybyenhancedvalue-generating

- **StrategicABM**

StrategicABMinvolvestheuseofABMtorecognizetheirprofitableproductsandtargetaudience.Itinvolvesstrategicmanagementtounderstandthe genre of a product, the channels through which it should be advertised, andtargetingacertaindemographicgroupofcustomers.

ProblemswithActivity-BasedManagement

ThetroublewithABMisitsunderlyingassumptionthatallofthebenefitsandcosts of a cost object can be translated into monetary terms. For example, theoutcome of an ABM analysis might lead management to the conclusion that theworkplaceshouldbedowngradedtoalower-gradepropertyinordertosavemoney; in reality, a fancier office space is useful for attracting recruits to thecompany.

For the same reason, it can be difficult to apply ABM to strategic thinking. Theprobleminthisareaisthatanewstrategicdirectionmaybequiteexpensiveintheshort-term,buthasprospectsforalong-termpayoffthataredifficulttoquantifyunderanABManalysis.

For the two indicated reasons, the information generated by an ABM analysiscannot be used to drive all management decisions- it is simply information thatcan then be inserted into the general context of how an organization should beoperated.Thus,itisoneofseveraldecisiontoolsthatmanagementcanuse.

The Cost Improvement Programme is designed to take unnecessary cost out of thebusiness,yetstillmaintainhighstandardsofbusinessandservicedelivery.Ourcost improvement initiatives are generic and transferable and can be implementedin anyarea of the Publicor Private Sectors.

Wereducecostandmaximiseefficiencybyimprovingprocess,minimisinginefficiencies , reducing waste and bureaucracy and improving pathways to deliverimproved businessandservices.

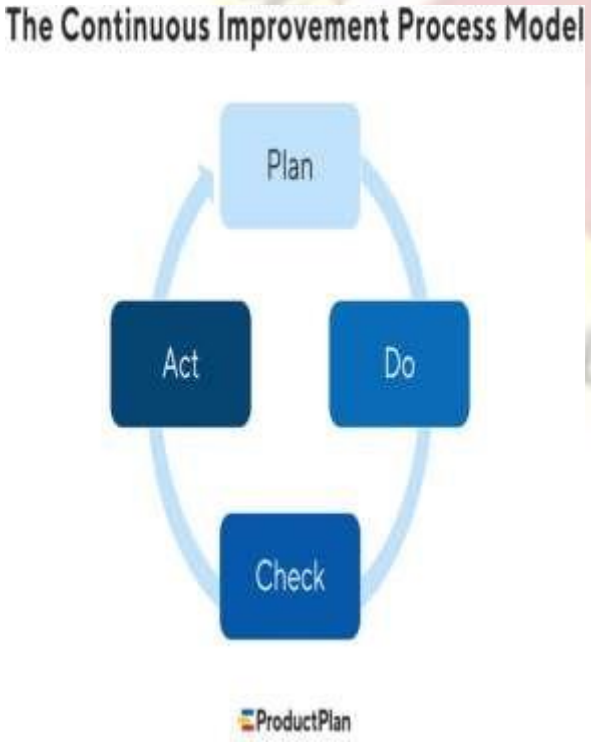
The Cost Improvement programme has led to new collaborative ways of workingand a more efficiently run and productive business, with re-engineered workingpractices andautomatedprocesses.

CHALLENGES

Most organisations suffer inefficiencies, incur excessive costs or do not maximiserevenue opportunities. However many of these organisations do not have the timeor the expertise to carry out a review of their core and non-core process costs. OurTeam will review your business processes and costs and offer sustainable solutionsthat focus on minimising operation costs by improving the performance of yourpeople,processesandprocedures.

Organisations can also be driven by increasing sales and business turnoverand often overlook the costs incurred in getting their product to market and as suchhaveadetrimentaleffectonprofitmarginsandthebottomline.Ourcostimprovement initiativeshelpcompaniesidentify andreduceunnecessary costswithin their activitiesandtheirsupplychain activities.

ContinuousImprovement



Continuous improvement is a company culture that encourages all employees tolook for ways to enhance the business's operations. This includes suggesting ideasto improve efficiencies, evaluating current processes, and finding opportunities tocutunproductive work.

The modern business concept of continuous improvement dates back to Toyota'sinnovative manufacturing processes. The company used the term kaizen, whichmeans"changeforthebetter."Toyotawantedtofocusitsemployees'attentiononas inglegoal:lookfor ways toimprovethebusiness.

Continuous improvement refers to a companywide effort to enhance operationsacross the business. But product managers can use this strategy to improve boththeirteam'sprocessesand theproductstheybuild.

Themostpopular continuous improvementmethod is afour-step frameworkcalledPDCA:Plan,Do,Check,Act.

Imagine a product team looking for an agile process to iterate on their productsregularly.Hereishowtheycanusethisapproachtointroduceincrementalimprovementsandlearnwhethertheyresonate withusers.

Plan

This is the stage where the productmanagers will research the market, analyzedata, and develop an idea for an improvement to their product. You can also thinkofthisasthe hypothesisstage.

When they have their hypothesis—let's say an idea for a new feature—the productmanagers will develop a plan to build it. The plan will include making sure theteamhasthe budget,time,andresourcestoexecute.

Do

The Do stage is when the product team takes action. In the case of a new productfeature, this means working with the development team to build a working versionofthe feature readyfor testinganduserfeedback.

Check

This is the test phase. With a working version of the feature, the team now puts itintousers'hands,monitorstheirusage,and encourages theirfeedback.

If users have criticismsof the new functionality, the team will needtoreevaluateitsplanandhypothesis.If the featurereceives positive reviewsfrom users, theteamcanmove ontothe finalstage ofthiscycle….

Act

The team will now make needed adjustments to the new feature, build it into theproduct,andpushittocustomers.

Finally, the team will start the cycle over. They'll return to the first phase—Plan—and beginlookingfornewfunctionalitytheir market mightneed

The influential PMI community of business analysts defines the business analysisas "theapplication ofknowledge,skills,tools andtechniquesto:

- Determineproblemsandidentifybusinessneeds;
- Identifyandrecommendviablesolutionsformeetingthoseneeds;
- Elicit,document,andmanagestakeholderrequirementsinordertomeetbusiness andprojectobjectives;
- Facilitate the successful implementation of the product, service, or end resultoftheprogramof project.

In short, business analysis is the set of activities performed to identify businessneedsandrecommendrelevantsolutions;andtoelicitdocumentandmanagereq uirements"(PMI,2015,p.3).

However, a broader understanding of business analysis is provided by the IIBA – International InstituteofBusinessAnalysis:

Business analysis is the practice of enabling change in an enterprise by definingneeds and recommending solutions that deliver value to stakeholders. Businessanalysis enables an enterprise to articulate needs and the rationale for change,
andtodesignanddescribesolutionsthatcandelivervalue.Businessanalysisisperformedo navarietyofinitiativeswithinanenterprise.Initiativesmaybestrategic, tactical, or operational. Business analysis may be performed within theboundariesofaprojectorthroughoutenterpriseevolutionandcontinuousimproveme nt. It can be used to understand the current state, to define the futurestate, and to determine the activities required to move from the current to the futurestate.(IIBA,2015,p.2)

Exhibit1–Businessanalysissetting.

Businessanalysisaimstounderstandhowanorganizationisworkingwhileachieving its strategic objectives and enabling the creation of those indispensablecapabilities, allowing it to provide stakeholders with product and services required.Furthermore,businessanalysisprinciplesandpracticesareusedtoassesstheorg anization's current state (as is) and how it can be evolved toward a desiredscenario (to be), projected through the application of solutions able to bring valueand satisfytheorganization'sbusiness needs(Exhibit1).

THEBUSINESSANALYSTROLE

It is natural to say that the business analyst is the professional who performsbusiness analysis tasks. In the past, as well as recently in some organizations,businessanalystactivitieshavebeenperformedbyseveralprofessionalslikesystemanalysts,requirementengineers,processanalysts,productmanagers,product owners, enterprise analysts, business architects, management consultants,inadditiontoperformingtheirowntasks.Today,morematureorganizationsrecognizethebusinessanalyst asaspecificindividual role.

Actually, many organizations are realizing that one of the reasons is because theexpectedaddedvaluethatissupposedtobebroughtbytheimplementedsolution,is in reality much lower than expected. That is because of the higher cost ofownership they have to bear in order to make the solution work properly. Theythink that this problem could be solved only by appointing somebody to be incharge of the solutions life cycle and able to have an end-to-end view from theorigin of the business need until the satisfaction of it. As a matter of fact, thebusiness analyst should be the star center of a triad of communities that share theirliveswithintheorganization:thebusinesscommunity,themanagementcommunity, andthe technical community(Exhibit2).

Let's start with the first because it is at the heart of the whole organization, withoutthe businesscommunity,infact, therewouldbe noreasonfor the other twotoexist. Typically, the business community raises the e-business need (e.g., a newproduct or service or being compliant with regulatory prescriptions), or better, thebusinessanalystofferstosolveabusinessproblem(e.g.,businessprocessimprovement). Due to the strong technological impact, the business communityengagesthetechnicalcommunitytoobtainasolutiontotheirproblem.Ingeneral,

within the technical community, everything is managed by project and programmanagementtacticsandthefocusisonbudgetanddeliveryconstraints,andresources optimization; in short, it is taken for granted that the solution underimplementation will bring the value expected by the involved stakeholders. On theother side, the business community thinks that the solution, sometimes suggestedbytechnicians,is whatis expectedtosolve thebusiness problem.

CostofQualityAnalysis

Cost of Quality is a methodology used to define and measure where and what amountof an organization's resources are being used for prevention activities and maintainingproduct quality as opposed to the costs resulting frominternal and external failures.The Cost of Quality can be represented by the sum of two factors. The Cost of GoodQuality and the Cost of Poor Quality equals the Cost of Quality, as represented in thebasicequationbelow:

CoQ=CoGQ+CoPQ

The Cost of Quality equation looks simple but in reality it is more complex. The Costof Quality includes all costs associated with the quality of a product from preventivecosts intended to reduce or eliminate failures, cost of process controls to maintainqualitylevels and thecostsrelated to failures bothinternaland external.

ImplementCostofQuality (COQ)

EffectiveuseandimplementationofCostofQualitymethodologyenablesanorganization to accurately measure the amount of resources being used for Cost ofGoodQualityandCostofPoorQuality.WiththisvaluableinformationtheorganizationcandetermineWhere to allocate resources to improve product quality andthe bottom line. To further illustrate the value of cost of quality, review the followingexample. The name of the company has been changed but the content represents actualevents andresults.

Alpha Company once measured Cost of Quality as the amount of warranty cost versustotal sales. This method only examined the Cost of Poor Quality. This data did reveal aproblem area in the facility. It was discovered that customer part shortages originatingfromoneworkcellwereresultinginwarrantycostsofover$400,000inoneyear.A

team wasformedtoinvestigateandperform **RootCauseAnalysis(RCA)** oftheshortagesandaplanwasdevelopedtoredesigntheworkcellforanestimatedcostof $60,000. With management approval, the work cell was redesigned with a revisedlayout, pick bins, dedicated locations for all the parts, process controls were definedandimplementedandseveraladditionalimprovementsweremade.Thechangesredu ced tact times and the number of operators required for the process. This providedresources for the addition of quality technicians to regularly audit and maintain theprocess onall shifts. Within thefirstyearof operation,shortageswerereduced by50%equalinga$200,000reductioninwarrantycosts.Theprojectresultedinapositive impact on the bottom line of $140,000 in the first year. Alpha Company hassince implemented processes to measure and reduce scrap, improved process controlsandintroducednewqualitymetricsthroughouttheorganization.Theyarenowactive lymeasuring andevaluatingboththecostofgoodqualityandpoorquality.

In the example above, the Cost of Poor Quality (CoPQ) was having a major impact onthe bottom line. Through an investment in the Cost of Good Quality (CoGQ), AlphaCompanyachievedasignificantreductionintheCostofQuality.Thereareopportunitie sforimprovementinprocessesatmostorganizations.Ithasbeenestimated that the Cost of Quality usually amounts to between 15-40% of businesscosts. The goal of implementing Cost of Quality methodology is to maximize productquality while minimizing cost. Cost of Quality methodology provides the detailedinformation that management needs to accurately evaluate the effectiveness of theirqualitysystems,identifyproblemareas andopportunitiesforimprovement.

MeasureCostofQuality(COQ)

The methods for calculating Cost of Quality vary from company to company. In manycases,organizationsliketheonedescribedinthepreviousexample,determinetheCosto fQualitybycalculatingtotalwarrantydollarsasapercentageofsales.Unfortunately this method is only looking externally at the Cost of Quality and notlooking internally. In order to gain a better understanding, a more comprehensive lookat allqualitycostsisrequired.

The Cost of Quality can be divided into four categories. They include Prevention,Appraisal, Internal Failure and External Failure. Within each of the four categoriesthere are numerous possible sources of cost related to good or poor quality. Someexamplesof typicalsourcesofCostof Qualityarelistedbelow.

TheCostofGoodQuality(CoGQ)

1. **PreventionCosts**– costsincurredfromactivitiesintendedtokeepfailurestoaminimum.Thesecaninclude, but arenotlimited to,the following:
   - EstablishingProductSpecifications
   - QualityPlanning
   - NewProductDevelopmentandTesting
   - DevelopmentofaQualityManagement System(QMS)
   - ProperEmployeeTraining
2. **AppraisalCosts**– costsincurredtomaintainacceptableproductqualitylevels.Appraisal costs can include,but arenot limited to,thefollowing:
   - IncomingMaterialInspections
   - ProcessControls
   - CheckFixtures
   - QualityAudits
   - SupplierAssessments

TheCostofPoorQuality (COPQ)

3. **Internal Failures** – costs associated with defects found before the product orservicereachesthecustomer.InternalFailuresmayinclude,butarenotlimitedto,the followingexamples:
   - ExcessiveScrap
   - ProductRe-work
   - Wasteduetopoorlydesignedprocesses
   - Machinebreakdownduetoimpropermaintenance
   - Costsassociatedwithfailureanalysis
4. **ExternalFailures**–costsassociatedwithdefectsfoundafterthecustomerreceives the product or service. External Failures may include, but are not limitedto,the followingexamples:
   - ServiceandRepairCosts
   - WarrantyClaims
   - CustomerComplaints
   - ProductorMaterialReturns
   - IncorrectSalesOrders
   - IncompleteBOMs
   - ShippingDamageduetoInadequatePackaging

These four categories can now be applied to the original Cost of Quality equation. Ouroriginalequation statedthat the Cost of Quality is thesum ofCost ofGoodQualityandCostofPoorQuality.Thisisstilltrueheoverthebasicequationcanbeexp anded by applyingthe categorieswithin both theCost of GoodQuality andtheCostof Poor Quality.

- TheCostofGoodQualityisthesumofPreventionCostandAppraisalCost(CoGQ=PC +AC)
- TheCostofPoorQualityisthesumofInternalandExternalFailureCosts(CoPQ=IFC +EFC)

By combiningtheequations,CostofQuality canbemoreaccurately defined,asshowninthe equationbelow:

COQ= (PC+ AC)+ (IFC+ EFC)

One important factor to note is that the Cost of Quality equation is nonlinear. Investingin the Cost of Good Quality does not necessarily mean that the overall Cost of Qualitywill increase. In fact, when the resources are invested in the right areas, the Cost ofQuality should decrease. When failures are prevented / detected prior to leaving thefacilityand reachingthecustomer,CostofPoorQualitywill be reduced.

EFFICIENTACCOUNTINGPROCESS

AutomateRepetitiveTasks

Technology is amazing! And that's quite an understatement. Every department inanybusinesscanbenefitfromtechnology—includingtheFinancedepartment.Technology can provide more data access and security. For example, cloud storageallowsyoutoprotect sensitivedatawhilebeingabletoaccess itfromanywhere.

Another side of technology is automation. Automation allows you to completerepetitive tasks quickly and efficiently. This is especially the case in accountingwhere programs and applications like Microsoft Excel and other such programs arecommon. Automating these simple tasks can save your company hundreds of hoursinlabor.This timecanbespent on morerevenue-generatingactivities.

Outsource

One of the best ways to improve your accounting process is to outsource. Firstly,outsourcinggivesyouaccesstohighly-skilledF&Aexpertswithsolid&deep

experience in a variety of industries. Also, outsourcing means you save valuablecapital that wouldotherwisebespent trainingan in-house team.

The Finance department usually has a lot of activities going on to ensure therevenue flow. Some of these tasks are non-core functions, such as data entry.Outsourcing such non-core functions free up time for your in-house staff, allowingthemtofocus onlargertasksthat drive businessgrowth.

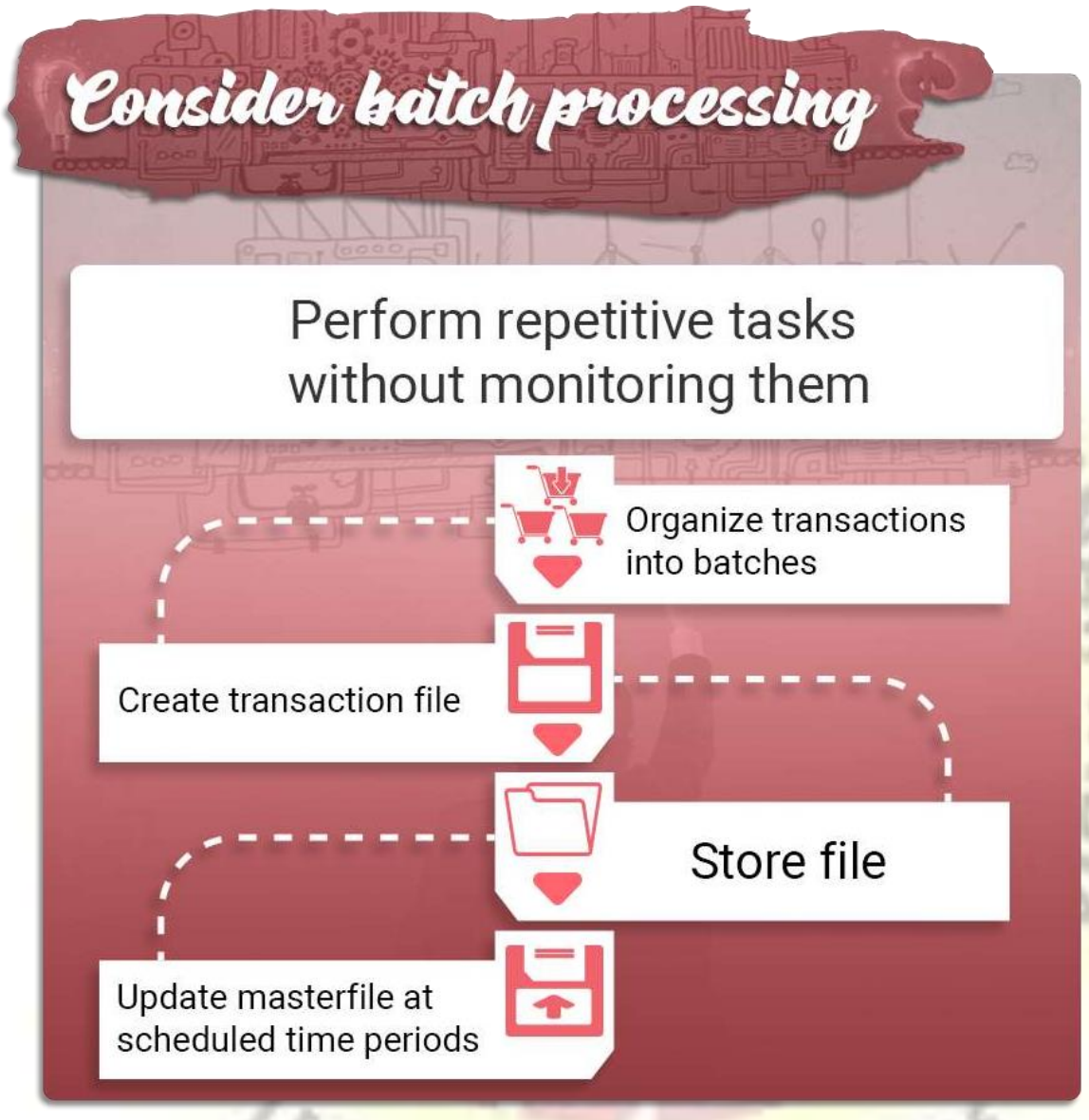
Be sure to look for a F&A solutions partner that can help you build a team ofexperts with a strong background in business trends that will make your businessgrow and maintain operations. An ideal partner has the right processes that canmatch yours, in any stage of growth, and also has the right technology to properlymonitorandevaluateyourrevenue andexpenditures.

InvestinTrainingandDevelopment

Training is necessary for any field if employees want to stay abreast of industrychanges.Thiscanbeexpensivebutisusuallywellworththeexpense.Trainingyour staff builds their knowledge and confidence in their field of work. This, inturn, allows them to work smarter and more efficiently. This is especially true iftheyreceivetrainingonhowtousenewtechnology,learnaboutupdatedcompliances and regulations, and other issues they should know about to moveforward intheir respective careers.

But what if you don’t have the time and budget to train your newly-recruited teammembers? The alternative to this is to outsource your workforce. There’s no goingaroundit—trainingyourstaffisahugeexpense.Whenyououtsourcetoa

trustworthypartner,youcanrestassuredthattheywillprovidewell-trainedstaffforthe job.Andyou don'thavetobearthecostof the training.Win-win.



ConsiderBatchProcessing

Finance and Accounting is all about revenue and expenditure. As a result, there's alot of receipts and invoices to be dealt with on a regular basis. Just imagine tryingtoprocesshundredsof individual invoicesaweek.Verytedious.

To get past this, aim to batch process. Group invoices and process them at a settime everydayor week.

The Finance department is the backbone of your business. So it is in your bestinterest to ensure that this department is functioning optimally. Consider teamingup with a finance solutions company that can help you focus on core competenciesand achievingoptimalbusiness growth

UNITV

INTERNALCONTROL

Internal control is best regarded as indicating the whole system of controls,financial and otherwise, estimated by the management in the conduct of a businessincludinginternal check,internal audit andotherformof control.

Internal control in a broader term is generally used to encompass both internalcheck andinternalaudit.

Everyorganizationdevelopsinternalcontrolstoachievethefollowingobjectives:

- Reliabilityoffinancialreporting
- Safeguardingofassets
- Complyingwithlawsandregulations
- Effectivenessandefficiencyofoperations

These controls should be re-evaluated on a routine basis to ensure that they areoperatingproperlyandstill meettheir objectives.

The internalauditfunctionconstitutesa separate componentof internalcontrolwith the objective of determining whether other internal controls are well designedand properlyoperated.

Internalcontrolsystemconsistsofinterrelatedcomponentsas follows:

- Control(orOperating)environment.
- Riskassessment.
- Controlobjectivesetting.

- Eventidentification.
- Controlactivities.
- Informationandcommunication.
- Monitoring.
- Riskresponse.

Thesystemofinternalcontrolmustbeundercontinuoussupervisionbymanagement to determine that it is functioning as prescribed and is modified, asappropriate, for changes in environment. It extends beyond those matters whichrelatedirectlytothefunctions oftheaccountingsystemand comprises:

"Controlenvironment"meanstheoverallattitude,awarenessandactionsofdirectors and management regarding the internal control system and its importanceinthe entity.

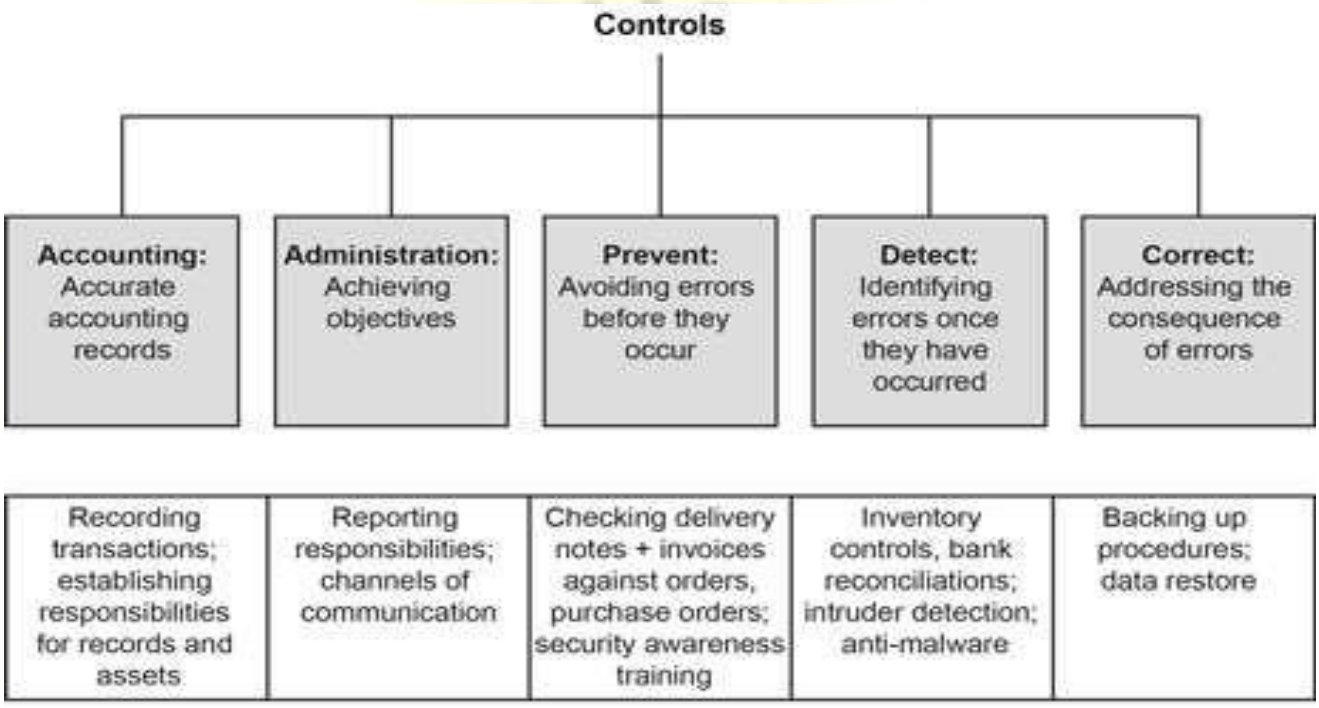
The control environment has an effect on the effectiveness of the specific controlproceduresandprovidesthebackgroundagainstwhichothercontrolsareoperated .

Factorsreflectedinthecontrol environmentinclude:

- Theentity'sorganisationalstructureandmethodsofassigningauthorityandresponsibility(includingsegregationofdutiesandsupervisoryfunctions).
- Thefunctionoftheboardofdirectorsanditscommittees,inthecaseofacompanyorthecorrespondinggoverning bodyin caseofanyotherentity.
- Management'sphilosophyandoperatingstyle.
- Management's control system including the internal audit function,personnelpoliciesandprocedures.

- Integrityand ethicalvalues.
- Commitmenttocompetence.
- Humanresourcepoliciesandpractices.

INTERNALCONTROLSTRUCTURE



OBJECTIVESOFINTERNALCONTROL

- Transactionsareexecutedinaccordancewithmanagement'sgeneralorspecificauthorisation.
- Alltransactionsandothereventsarepromptlyrecordedinthecorrectamount, in the appropriate accounts andinthe proper accounting period soastopermitpreparationoffinancialstatementsinaccordancewiththeapplicable accountingstandards,otherrecognisedaccountingpoliciesand

practicesandrelevantstatutoryrequirements,ifany,andtomaintainaccountabilityfor assets.

- Assetsandrecordsaresafeguardedfromunauthorisedaccess,useordisposition.Recordedassetsarecomparedwiththeexistingassetsatreasonableintervalsandappropriateactionistakenwithregardtoanydifferences.
- Systemsandproceduresareeffectiveindesign andoperation.
- Risksaremitigatedtoareasonableextent
- InternalControlEvaluation

Internal control is a process. Internal control can be expected to provide onlyreasonableassurance, notabsoluteassurance. Internalcontrolis geared to theachievement of objectives. Internal control is effected by people and not by policymanualsand forms alone.Inherent Limitations ofInternal Controls

LIMITATIONSOFINTERNALCONTROL

- Management's consideration that the cost of an internal control does notexceedtheexpectedbenefitsto bederived.
- The fact that most internal controls do not tend to be directed at transactionsofunusualnature.Thepotentialforhumanerror,suchas,duetocarelessness, distraction, mistakes of judgement and misunderstanding ofinstructions.
- The possibility of circumvention of internal controls through collusion withemployeesor withpartiesoutside theentity.
- The possibility that a person responsible for exercising an internal controlcouldabusethatresponsibility,forexample,amemberofmanagementoverriding aninternalcontrol.

- Manipulationsbymanagementwithrespecttotransactionsorestimatesandjudgements requiredin thepreparation offinancialstatements.

Management'sphilosophyandoperatingstyle

Characteristics that form part of a management's philosophy and operating styleandwhichhaveanimpactonthecontrolenvironmentincludethemanagement's:

- Approachtothetakingandmonitoringofbusinessrisks;
- Reliance on informal face to face contacts with key managers versus aformal system of written policies, performance indicators and exceptionreports;
- Attitudesandactionstowardfinancialreporting;
- Conservativeoraggressiveselectionofaccountingprinciplesfromavailablealternatives;
- Conscientiousnessandconservatismindevelopingaccountingestimates;
- Attitudes towards information process ing and accounting functions andpersonnel.

Internalcontrolrisks

Internal control risk are risks that affect the effectiveness and efficiency of internalcontrols andthus affecttheachievementofobjectives.

Theyareapartofoperationrisk andcompliancerisk.

- ✓ Operationriskreferstotheunexpectedfailureinorganisation’sdailyoperation,which couldbecaused bhypersonnel orprocesses.

- ✓ Complianceriskistheriskofnotmaintaincompliancewithlawsforregulations, such as the Sarbenes Oxley Act (SOX) or the Foreign CorruptPolicies Act(FCPA).

For example, if the Accounts Payable process in an organisation is broken the riskof fraudulent vendors and unauthorized payments would be higher.If a publicorganisation fails to have effective internal controls over financial reporting, theorganizations face aserious compliance risk.

Followingaresomemoreexamplesofcircumstancesthatmaybedeficiencies,significantdeficiencies or material weaknesses:

- ✓ Theplandoesnotadequatelysegregateaccountingdutiesamongpersonnel,increasingtheriskthatfraudcouldoccurandgoundetected.
- ✓ The plan lacks internal expertise in the areas of financial accounting,reportingandinternalcontrol,increasingtheriskthatamaterialmisstatementoffinancialinformationcouldoccurandwillnotbedetected.
- ✓ Theplandoesnoteffectivelymonitortheactivitiesofthird-partyadministrators or custodians, increasing the risk that errors in informationprovidedbythe serviceorganizationwillgo undetected.
- ✓ The plan audit identifies material misstatements in accounting records,which were not identified by the plan's internal control, indicatingthattheplan's controlsarenotfunctioningeffectively.

An effective internal control system can minimize the risks that may affectsachievement of the objectives.The common internal control risks in businessincludelackofsoundinternalcontrolenvironment,poorlydesignedbusiness

processes, IT security risk, integrity and ethic risk, human errors and fraud riskamongothers.

When designing internal control policies, there are some common risks thateveryorganizationshould consider,including:

1. **Management Override of Controls** – Management is primarily responsiblefor the design, implementation, and maintenance of internal control andtherefore, there is the inherent potential for management to override thesecontrols. If an executive has the ability and an incentive – such as earningstargetsorpersonalfinancialissues– tooverridecontrolsandcommitfraud,it is a risk not easily overcome. It requires those charged with governance,such as the shareholders, Board of Directors, or Audit Committee, to take anactiveapproachinevaluatingthepossibilityoffraudoccurringattheorganizatio nanddevelopingadditionalstepstocontroltheriskofmanagement override if these fraud risks are identified. In addition, settingthepropertoneatthetopcanhelptheorganizationanditsemployeesmaintai n their integrity.
2. **Limited Segregation of Duties** – No single person should be responsible forthe authorization of transactions, recording of transactions, and custody oftheimpactedassetsoftransactions.Smallerorganizationsmayhavedifficultiesi mplementingpropersegregationofdutiesduetolimitedstaffing, although larger companies can also have issues if the segregation isnotproperlydesigned.Smallerorganizationsneedtoimplementcompensatingc ontrolstohelpensuretheobjectivesaremet,suchasoversight,supervision,andmon itoringbymanagementorthosechargedwith governance.

3. **Overreliance on Detective Controls vs. Preventative Controls** – Althoughdetective controls will identify whether something is wrong, it may be toolate and the damage may have already been done. A good internal controlsystem not only has detective controls, but also has preventative controls.Preventive controls can include things such as ongoing training of policiesand procedures, implementing user names and passwords to limit access tothesystemormoduleswithinthesystem,requiringdualsignaturesondisbursements, or conducting a review and approval of purchase requestspriortopurchase.

4. **Informalvs.FormalControls** –Smallerorganizationsmayhavekeycontrols that are performed at the entity level vs. at the activity level. Theseentity level controls are typically less formal and performed by one or twokeyindividuals,suchastheownerormanager.Regardlessofwhethercontrols are informal or formal, they need to be actively monitored to ensuretheyarebeingperformed.

5. **OverlyTrusting** –Whenwehearstoriesoffraud,quiteoftentheperpetrator is described as being honest, trustworthy, and a great employeewhom you never suspected. An organization should trust its employees to begood employees and do their job to the best of their ability, but this trustshould not reduce its internal controls. In the words of Ronald Reagan,“Trust,butverify.”

Internalcontrolsserveasthefirstlineofdefenseinpreventingfraudandensuringthevia bilityofyourorganization.Evenorganizationswithexistingcontrols in place need to reevaluate them from time to time to ensure the objectivesarestillbeingmetandidentifyanyareasofweaknessornewrisks.Considerthe

internal controls risks outlined above when evaluating your organization's existinginternal controls. It's important to be proactive in assessing what risks need to
beaddressed,designingthecontrolsnecessarytomitigatethoserisks,andimplementing those controls successfully.

EXTERNALAUDITREQUIREMENTS

Definition

External audit is defined as: 'a periodic examination of the books ofaccount and records of an entity carried out by an independent third party(the auditor), to ensure that they have been properly maintained, are accurateand comply with established concepts, principles, accounting standards, legalrequirementsandgive atrue andfair viewofthefinancial stateoftheentity.'

To assist in the evaluation of this experience, three aspects of externalaudit workhave been identified:

1. Statutoryaudit
2. Managementofauditactivities
3. Consultancy

1. **Statutory audit** Statutory audit has always been the traditional role of anexternalauditor. Itcoversallexternalauditactivities, toensurethattheentitycomplieswiththeappropriatefiscalrequirements,accounti ngstandards, and other legislation governing the financial records of the entity.Applicants who wish their work in these areas to be considered in relation totheir total practical experience must demonstrate that they have analysed arangeofsub-systemsrelatingtoprofitandlossaccounts,balancesheets,

sales ledgers, trial balances, and payroll etc. They should have constructed,organised and carried out sample tests of relevant transactions in order todetermine the accuracy and functioning of the system and the adequacy ofinternalcontrolswithinit.Theymustalsodemonstratetheirabilitytoprepare and examine the accounts of an entity in line with legal requirementsand accountingstandards.

2. **Management of audit activities** Management of an audit team or auditdepartment at senior, supervisory or management level is likely to reinforcethe quality and levelofexperience in otherareas ofexternalaudit,forexample statutory audit. In order for experience to count towards the PER,applicants must show that they have been required to define, with clients, thescopeofinterimandannualaudits,toestablishthemethodologyandapproach to be taken and the resources to be used, to ensure that verificationproceduresarecarriedoutadequately,toexaminethepreparationofac count,andtoprepare theauditreport.

3. **Consultancy** The recent growth of consultancy work in audit firms hasbeenanimportantdevelopment,andthereisusuallyanaccountingconnotation to this work. Although auditors sometimes undertake such work,there are many firms in which specialist consultancy departments (or evenseparate consultancy firms) have been set up. Work of this nature will haveveryspecific termsof reference.
   - ❖ Applicantswhowishtheirworkinthisareatobeconsideredinrelationto their total practical experience must clearly identify its objectives andcontent,andhowitcontributestotheareasandelementsofexperience

setoutinthePER.Consultancyworkshouldbeforclients,andconductedinthefo rmofprojectsin,forexample,managementaccountancy, marketing, distribution, production control, data processing,personnel and/ortreasurywork.

- ❖ Applicants must demonstrate the extent to which they have personallyplanned course of action, made or implemented recommendations, andbeen responsible foroutcomes
- ❖ Applicantsworkinginaconsultancyenvironmenthaveanexcellentopportunit y to acquire relevant experience, which may be in one or moreareas of the PER. Whether such work belongs in Basic (Area 1), Core(Area2), or Supplementary (Area3) will depend on the scope of thework asdeterminedbyitsoriginaltermsofreference.

SYSTEMCONTROLANDSAFEGUARDMEASURES

CreatingInternalControlsToMinimizeSecurityRisk

Security controls are safeguards designed to avoid, detect, or minimize securityrisks to physical property, digital information (e.g. sensitive customer data or acompany'sIP),computersystems, mobiledevices,servers andotherassets.

Securitycontrolscouldfallintooneofthefollowingcategories:

- **Physicalcontrols**:doors,locks,securitycameras
- **Procedurecontrols:** incidentresponseprocesses, managementoversight,securityawarenessandtraining,backgroundchecksforpe rsonnelwhohandlecriticalsystems
- **Technical controls:** user authentication (login) and logical access controls,antivirus software,firealls

- **Legalandregulatorycontrols**:policies,standards,etc.

Security controls can also be classified according to the time that they act, relativeto asecurityincident:

- Before the event: **preventative controls** are intended to stop an incidentfromoccurring,e.g.bylocking outunauthorizedusers
- Duringtheevent: **detectivecontrols** areintendedtoidentifyandcharacterize an incident in progress, e.g. by sounding the intruder alarm andalerting the appropriate personnel such as system administrators, securityguards or police
- Aftertheevent: **correctivecontrols** areintendedtolimittheextentofdamage caused by an incident, e.g. restoring a system to normal workingstatus asfastaspossible

As we mentioned earlier, internal controls need to be tailored to the specific risksyou want to mitigate. Having said that, here are the key considerations for creatingeffectivecontrolsforprotecting yourdataassetsand informationsystems:

Understandwhatyourrisksare: Beforeyoucantakestepstoprotectyourelectronic assets, you need to understand what you're protecting them against andhowtoeffectivelyguardthem.Performingan informationsecurityriskassessmentwill give you a detailed look at your risks and help you decide how tobest mitigate them.

Takebothphysical and electronic threats into consideration: When itcomestoinformationsecurity,it'snotjustaboutwhohaselectronicaccesstodataoremail policies. In the course of their jobs, many employees come into contact withhardcopiesofsensitiveinformationorhaveaccesstoplaceswhereassetsare

stored, and your business needs to have policies and controls that protect physicalassets as wellaselectronicthreats.

Workonyourcomplianceprocesses: Goingthroughathoroughcomplianceprocess will give you the opportunity to uncover gaps in your security program.When we talk about a compliance process, we are really talking about identifying acybersecurity framework you want to implement, understanding the requirementsand controls outlined in the framework, taking inventory of your own internalcontrols and security measures to understand the gaps in your program, and thenputtingmeasuresinplaceto fix orrefinedeficientcontrols and processes.

When you decide to become compliant with a cybersecurity framework, you willgo through a process that forces you to inventory your strengths and weaknesses.You will educate yourself on modern security best practices, and the exercise
canserveasaspringboardtoputinplaceorrefinedeficientcontrolsandprocesses.

TheImportanceofKeepingInternal ControlsUptoDate

Even if you've developed the most comprehensive set of security controls, they areeffectiveonlyas longas your environmentstaysstatic.

As soon as change happens within your environment, you will need to re-evaluateyour internal controls. When your organization rolls out a new process, technologyor operating procedures you'll need to assess whether the inherent risk that yourbusinessfaceshasincreased andupdateyourinternal controlsaccordingly.

To mitigate risk effectively on an ongoing basis, you need to build a sustainablecompliance program, one that can monitor new risks effectively, test and documentcontrols asnecessary,andguide remediation efforts.