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IT INFRASTRUCTURE ASSESSMENT APPROACH IN ENTERPRISE



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In today's business operations, there is an increase in the use of information technology to deliver on the constantly changing customer demands resulting in the high investment in IT infrastructure within enterprises in order to gain competitive advantage, across industries. Nevertheless, these investments call for the need of IT transformation projects and assessments in existing infrastructures to evaluate its entirety before initiating any changes.

In this thesis, the practice and theory of assessment is presented to evaluate components of technology infrastructure in enterprises. A particular aim is to elaborate on the functions and benefits of assessing information technology components such as computer servers, networks, operation systems, storage devices, software applications and other computing hardware, within any IT transformation project.

The combination of the research theory, methodology and best practices highlighted in this paper is meant to assist business managers, engineers and IT decision makers understand the significance of assessment and the value it creates in exchange for money and time.

Finally, it serves as a theoretical guide on how to effectively conduct assessments within enterprises.

Keywords: (Assessment ,Transformation,Optimization)

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CONTENTS

Table of Contents.....	4
List of Figures.....	6
Terminology.....	7
1. Introduction.....	8
1.1 Thesis Overview.....	8
1.2 Aims and Objectives.....	9
1.3 The Beneficiaries and Need for Assessment.....	10
1.4 Structure of Thesis.....	11
2. Research Question and Phases of transformation.....	12
2.1 Research Question.....	12
2.2 Functions os Assessment.....	12
2.3 Assessment - A tool for analysis.....	13
2.4 Assessment as a Pivot for Change.....	14
2.5 Assessment as transformation tool.....	14
2.6 Assessment as an educating tool.....	14
3. Literature Review.....	15
3.1 IT Infrastructure and Assessment Hypothesis.....	15
4. Forms of Assessment.....	24
4.1 Virtualization Assessment.....	24
4.2 Server consolidation Assessment.....	25

4.3 Risk Assessment.....	28
4.4 Security Assessment.....	32
5. Research Methodology.....	39
5.1 Study Population/Participant.....	42
5.2 Sampling Techniques.....;	42
5.3 Assessment Strategy.....	43
5.4 Data collection.....	43
6. Analysis.....	44
7. What Next? Migration.....	46
8 Result and Conclusion.....	47
References.....	49
Appendix A – Assessment Questionnaire (Template)	

FIGURES

Figure 1: Thesis Structure

Figure 2: Research Question and Functions of assessment

Figure 3: Brockway and McKay (1989) 3-layer Model

Figure 4: IT Portfolio – Weill and Broadbent (Microsoft Solutions Forum, 2004)

Figure 5: Structure of IT Infrastructure –Weill and Broadbent (1998)

Figure 6 - Server Virtualization

Figure 7- Three type of Consolidation (blu.org)

Figure 8: Constructive Research (Hair and Money) (2007)

Figure 9: Enterprise Assesment Statistics

Terminology

Term	Description
ROI	Return on Investment
SLA	Security Related Procedure
ISA	Internet security and Acceleration
OS	Operating system
CMM	Capability maturity Model
CMMI	Capability Maturity Model Integration
SEI	Software Engineering Institute
ICT	Information and Communication Technology
IT	Information Technology
LAN/WAN	Local Area Network/Wide Area Network
R,W,X	Read,Write,Execute
ERP	Enterprise Resource Planning
EAI	Enterprise Application Integration
NT	Near Term
ACL	Access List
ID	Identity
VPN	Virtual Private network
MIT	Massachusetts Institute of technology
ICF	Internet connection firewall
BYOD	Bring your own device
IQ/OQ	Installation Qualification/Operation qualification
IC	Installation Configuration
IPSec	Internet Protocol Security
USB	Universal Serial Bus

1 Introduction

1.1 Thesis Overview

As enterprises struggle to meet up with today's business challenges such as competition, rapid demand for new services, efficient management, high availability of services, security etc. the need for a robust and agile IT infrastructure optimization becomes the fundamental bedrock required to support businesses. The ability of firms to conform to certain pressures and the strains placed on their back-end components (e.g. networks, servers, middleware, security) depends on the stability of the IT infrastructure in use. Despite this fact, investment in IT infrastructure poses a major challenge for many firms. Enterprises must either optimize their IT infrastructure resources at higher utilization rate or scale down, in order to achieve a better ROI which refers to "money invested in a company and the returns realized on that money based on the net profit of the business" (Entrepreneur, 2011).

IT infrastructure optimization is a structured and systematic process for assessing enterprise IT facilities across capabilities in order to provide an optimization roadmap toward a dynamic IT (Wikipedia, 2011). IT infrastructure optimization helps companies define and implement optimization initiatives that will enable proactive IT management, deliver cost and risk reductions across the IT enterprise. These assessment initiatives also enhance user needs and user experience in order to increase productivity and amplify the impact of employees.

In order to meet with the demands of their business model as well as the constantly changing customer needs (to better fit in modern competitive market space), enterprises tend to technically transform their IT infrastructure with the deployment of newer technology proven practices on their operating environment, either by *consolidating systems/services* – which provides a more efficient and stable foundation for growth and new solution development or

upgrading delivery tools/process - which sets up a platform to speed up business process executions etc. In any case, IT infrastructure assessment solution becomes the first logical steps towards actualizing either of the stated IT transformation processes (Data-trend, 2011).

For instance, system consolidation is more than just replacing many smaller systems with a few larger ones. It is about simplifying and optimizing existing end-to-end IT infrastructures, including servers, storage, databases; applications, networks, and systems management processes. The goal is to reduce both cost and complexity; for example, physical servers and other equipment littered in a typical IT environment (Ajay Murali and Amitava Ghosh, January 2011). Other roadmaps such as LAN/WAN upgrades, application packaging, application or desktop virtualization etc. could lead to the new wave that has been a buzzword in the IT industry quite recently - cloud computing (Hrmagazine, 2011).

1.2 Aims and Objectives

This study is a theoretical analysis of the circumstances that surrounds IT infrastructural assessment in businesses. The main purpose is to review relevant literature with the aim of identifying the best practices in IT infrastructure assessment. The study also aims at providing a clearer direction for businesses and IT assessors, server managers and stakeholders on the purposes and rationale for IT infrastructure assessment. Like most studies that make use of literature review, this study also aims at solving the controversies that surround methods and functions of IT infrastructure assessment by the unbiased presentation of expert opinions. These aims are further served by the application of expert interview as part of its research methodology.

1.3 The Beneficiaries and Need for Assessment

The beneficiaries of an IT infrastructure assessment are not limited to only enterprises that render IT services in large organisations across different geographical local, but all businesses that rely on IT systems for execution of their daily operations. This could either be large, medium or small enterprises/businesses such as academic institutions, medical institutions, banking, military, commissions, corporations, training firms, research institutes, government-owned companies, trading companies, multinational companies etc. (Open methodology, 2011).

However, there is a number of scenarios that identify the need for assessment opportunities; below are situations that might trigger the implementation of an infrastructural assessment.

1. A situation where a high performance IT issue has been diagnosed within an enterprise and indicating the necessity for deeper infrastructural assessment.

2. A situation where an enterprise requires a thorough overhaul of its Information technology infrastructure. Some reasons for infrastructural overhaul might be due to:
 - Introduction/Implementation of new technology, e.g., ERP, EAI, Data warehouse, BYOD etc.
 - Determination of root cause of known or unknown issues.
 - Altering enterprise IT strategy to enhance the ability to support her business.
 - Green IT - practice of using computers and IT resources in a more efficient and environmentally responsible way.
 - Pre/Post merger IT Integration.
 - Development of business cases to rationalize applications. (Open methodology, 2011).

1.4 Structure of Thesis

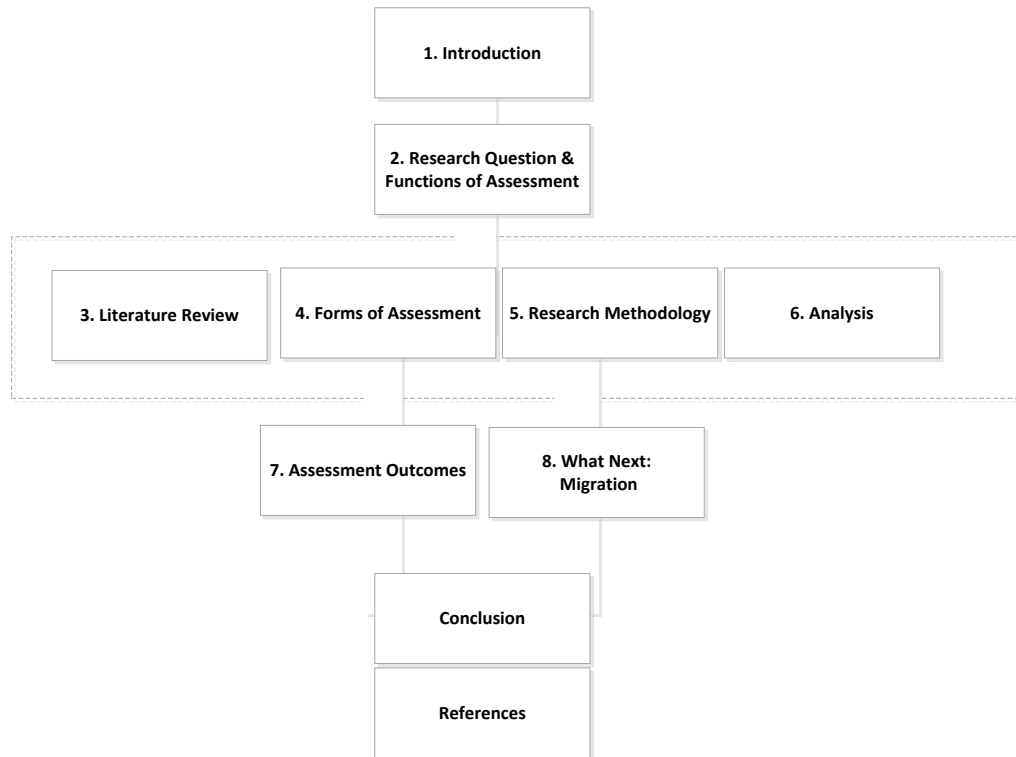


Figure 1 Thesis Structure

The structure of this thesis presents the main research questions in Chapter 2 The research question and functions of transformation. Chapter 3 reviews the theoretical definitions of assessment, processes of assessment creation, a broader perspective of IT infrastructure and components that makes up an IT infrastructure. Chapter 4 forms of assessment an exploration of different types of assessment process. Chapter 5 presents Research methodology. Chapter 6 deals with the Analysis. Chapter 7 discusses the Assessment outcomes. Chapter 8 deals with the implications for the future.

2. Research Question and Phases of transformation

2.1 Research Question

The method and approach in carrying out an assessment in heterogeneous environment found in large enterprise IT infrastructure is the foundation of this thesis. The fundamental assessment approaches are:

- Identify the IT components to be assessed, for instance, computer hardware such as servers, desktops, networks and hosted applications etc.
- Collect data on sites by manually developing an inventory report
- Crosscheck the collected data validity with IT stakeholders
- Generate a final assessment report.

With reference to the four research objectives stated above, the research question was developed into the following research question:

1. Is there a preferred method/approach used in assessing IT infrastructure component in large enterprises”?
 - a. Why is it necessary to conduct IT infrastructure assessment in enterprises?

2.2 Functions of assessment

According to Bush and Dunaway (2005), assessment performs four basic interrelated functions. These are; analysis, motivation, transformation and education. The author however noted that depending on the size of the firm and their assessment history, assessment usually result to varying experiences and

outcomes. For example, specific aspects of the assessment process facilitate “unfreezing” in an organization that is just beginning a process improvement effort and help to provide momentum to organizations that are well underway with a process improvement program as is often the case with less mature organizations. For experienced organizations, assessments are often opportunities for concentration and careful self-analysis. In the paragraphs that follow, a detailed examination of these functions will be done.



Figure 2. Functions of Assessment

2.3 Assessment - A tool for analysis

Through in-depth and cross-referencing interviews, assessment provides insight into how a company server infrastructure is designed to work, how they are connected, how they perform their function, how they communicated with each other also with other devices connected to it, and how secured they can be. According to the interviewee’s opinion security aspect of servers is the most important part of because information can be hacked from any possible loop hole.

Through its reliance on reference models, assessment goes beyond mere description of how a firm works to analyze its organizational functionalities, based on a sophisticated understanding of how the software development cycle works in the most successful companies around the world.

2.4 Assessment as a Pivot for Change

An assessment is often a vehicle for positive change, it reduces complications and enable stakeholders take fresh look of how their infrastructure can be improved. By carrying out assessments: a company is able to prioritize improvement activities in accordance to an elaborately thought out and structured process improvement methodology such as SEI's CMM and CMMI. This makes it easier to organize the plans that follow an assessment in a logical and highly structured way.

2.5 Assessment as transformation tool

If assessments is carried out properly, it is expected that it will result in a situation where by the firm gravitates to levels where it operates at an optimum capacity and dynamic enough to respond to the exigencies of server management. These transformative effects are also felt in the firm's stock of up-to-date equipments and the staff members being trained in the latest techniques of server management and administration. Assessment integrates into a companies own process of self-analysis or understands of what software process improvement level often refred to as maturity levels—that is, an awareness that unless management practices are made more predictable and sophisticated organization's technical practices often will not work, an assessment is also able to improve the IT management culture of the firm.

2.6 Assessment as an educating tool

When a firm's technical staff members are required to compare their own practices to the ideals of an assessment model, which often happens during assessment process, they begin what may be a transformative education in the field of their expertise, this process make them to think hard the pros and cons of what they do for example what kind of infrastructure practice they have. It is in the midst of this re-think they encounter other ways of doing the same thing at a moment when they are uniquely receptive to alternative procdure.

3 Literature Review

3.1 IT Infrastructure and Assessment Hypothesis

Assessment

Assessment, as the name implies, is the appraisal/estimation of worth. It is a documented process often measured in knowledge, skills, attitudes, competences, quality, values etc. The term also applies to the other fields such as business enterprises, educational Institutions, finance sector etc. (Babylon, 2011).

A denotation of competence in either of the above mentioned fields is the ability to generate essential results. In order to evaluate an essential result, the results are measured against a predefined set of standards. These standards are commonly known as learning objectives, which are based on what the prospective assessor should actually need to know to be able to do. The standard also sets the channel for which a decisive conclusion will be made. It is, therefore, recommended that an assessment designer or evaluator possesses an intensive knowledge of the field at which the assessment is made as well as the general assessment process; these measures helps to produce a significantly fair and accurate judgment based on the results (Shank 2009, 2). Useful assessment standards address three main questions, namely:

1. What is the purpose of the assessment? What specifically is gained by doing it?
2. How do we know the purpose of the activity is being met? What types of information demonstrate the outcome of the activity, and where are they located?
3. After gathering the information, what is done with the findings? (Stewart, 2002).

An assessment design is a fundamental part of the entire process. The assessor requires a systematic approach in order to achieve a proposed result and if not done appropriately, might compromise the entire assessment process. A sufficiently valuable assessment should basically:

- Measure expectations (for example. results, performance, skills etc.).
- Provide valuable information to participants or stakeholders.
- Create a potential avenue to advance to the next process level.

Process of Assessment Creation

Hypothetically, the underlying core perspectives that precipitate assessment implementation are:

Validity

Validity is based on how well an assessment evaluates the knowledge and skills that learners are expected to gain from the instruction and also a matter of degree rather than an absolute (Shank 2009, 3). Valid assessments match both the content covered and the level of skill required. Many assessors attempt to match the assessment items to the covered content, but too often do not make sure that the assessment items also match the level of skill required. In addition, assessments are often erroneously developed to be easier than the actual skills required and, as a result, are less likely to be valid. Some ways to improve the validity of learning assessments include:

- Making sure there is congruence between objective type and assessment method
- Having real-world content expertise involved in developing the assessment
- Making sure that a larger percentage of assessment items address the more critical learning objectives
- Making assessment items as hard (or easy) as the real task.

Congruence between what the assessment evaluates and the learning objectives is widely accepted to be the most important evidence of validity (Shank 2009, 3).

As a result, a given assessment may be *more* valid for some purposes and *less* valid for others.

Reliability

If an assessment is not reliable, it cannot be valid. Reliability means the assessment works consistently. An unreliable assessment provides inconsistent scores on the same assessment (Shank 2009, 3). For example, if the same assessment is applied across different environment with different resource, the expected result must be similar, otherwise it will be perceived as unreliable.

Here are some commonly accepted ways to design more reliable assessments:

- Making sure that assessment items are unambiguous and written at the right level.
- Reviewing process documentation with potential learners to fix problematic writing before using the assessment.
- Having enough items to cover all skills adequately. Ideally, each objective should be assessed by multiple items.
- Providing checklists for evaluating realistic performances and training evaluators to use the checklists to reduce scoring subjectivity. (Anderson and David, 2001)

Stakes

Stakes are the consequences that occur from assessment results. For example, if within an assessment, there are no negative consequences in between, the assessment does not have any stakes. On the contrary, if there are consequences at different stages of the assessment, the assessment has stakes.

Congruence between needed job results and what is being assessed grows increasingly important as stakes get higher - the greater the consequences, the higher the stakes of the assessment (Shank 2009, 4). Moreover, as stakes heighten, taking steps to produce a valid assessment becomes more important, as well.

Feasibility

Feasibility could simply be described as trade-offs between ensuring validity and the time and resources at hand. When these trade-offs are made, it is realized that the assessment may not be optimally valid; due to unavailability of ideal number of items and test of complete range of skills (Anderson and David, 2001).

However problematic, it is depends on the stakes of the assessment and the decisions made as a result. With the above in place, the process of assessment creation then follows as listed below;

- Documenting learning objectives for the entire assessment process – identification of learning objectives
- Designing and building assessment
- Designing and building content and activities
- Managing formative evaluation
- Revising assessment, content and activities
- Conducting final development
- Managing summative evaluation

Maintaining/sustaining the course (Shank, 2009).

IT Infrastructure

Evaluating an enterprise technology infrastructure starts by understanding the current technology in place and communicating with members of the IT management team. This exchange of information does not only present an in-depth overview of the incumbent technology, but also reveals the enterprises' plan for future changes in technology as well as integration with its core business values (Lientz and Larssen, 2004). Even though it is assumed that a majority of large enterprises have IT departments, it will contradict with the fact that there is either no IT management team, or a small number of inexperienced administrators are entrusted with daily technological task within the local IT Infrastructures. In both scenarios, the extracted information based on the current technology provides a general/extensive insight of the previously chosen Infrastructure in comparison with the business model. This understanding creates a balance between the technologies as support for the enterprise and helps in the design/plan of an anticipated infrastructure.

The old wood work rule "Measure twice, cut once" is mandatory (Abram 1996) while conducting an assessment and plan process of the technology infrastructure of an enterprise. The important information to betide with is:

- Current network topology & General IT environment setup
- Security architecture of the infrastructure
- Security related procedures such as enterprises SLA's
- Location of critical data
- Data security and access control
- High level roles and responsibility within the IT department
- Important vendor relationships
- Ongoing plan for IT Initiatives
- IT inter-relationship model with the business process

In order to make the most of the Plan/design concept for technology infrastructure, a distinctive number of technologies – related documents should reveal:

- Network topology diagram of respective IT infrastructure
- Configurations and other operational documents
- Most recent audit reports

The Structure of IT Infrastructure

Before dissecting the context of the topic, a good understanding of IT infrastructure could lighten the scope of the main perspective. Let us consider a modern day business enterprise that aims to expand in sales, operations, maximize profits or advance in growth. The enterprise tends to achieve its goals by launching new products and services, consolidate with other businesses, exploits new opportunities, employ competent service professionals, raise standards to contend with potential competitors, and several other reasons. These factors are due to the spontaneous changes that occur over time in technology, its effect on businesses and likewise the infrastructure needed to support regular operations. For example an awesome business system and strategy that worked 2 years ago can be perceived as highly incompatible with today's customer driven business solution.

There have been so many reviews and definitions in the past about IT Infrastructure. The subject has become a key issue for researchers, scientists, business/technology developers and a wide range of organizational planners/decision makers. A majority of enterprises has/will continue to incorporate IT Infrastructure to assist their overall business model. However, the definition of IT infrastructure could be perceived as being complicated as it spans through a diversity of elements such as policies, processes, people, information, resources, assets, communication etc.

Brockway and McKay (1989, p1-11) depict IT infrastructure as the enabling foundation of shared information technology capabilities upon which businesses

operate within an enterprise. They view the components of IT Infrastructure in a 3 layer model:

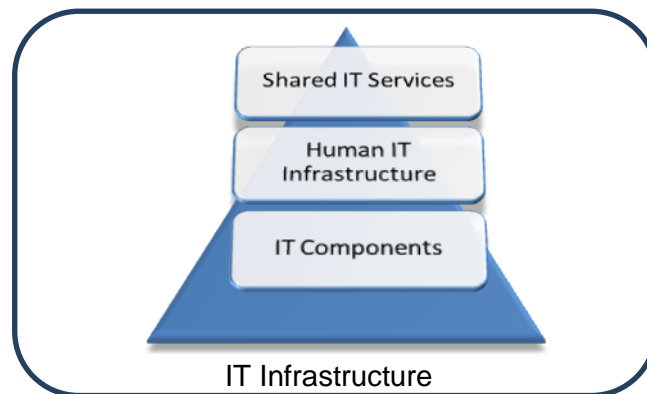


Figure 3. Brockway and McKay (1989) 3-layer Model.

IT Components

These are off the shelf components such as computers, printers, routers, communication gadgets, application software, operating systems etc.

Human IT Infrastructure

This refers to the competences, skills, policies, standards needed to facilitate the utilization of IT components streamlined to an appropriate service ascribed in the 3 layer model.

Shared Information Technology Services

These are referred to as services which are relatively stable over time such as management of large scale computing (server maintenance), management of shared customer databases.

A more pragmatic definition amongst others is that of Duncan (1995), Byrd and Turner (2000) that defines IT infrastructure as a “group of shared IT resources which consists of technically physical hardware, core-data processing applications, networks, communication technologies, software’s and human components of expertise, skills, competencies, commitments, policies, values,

and knowledge that are cohered in order to create a typical unique service delivery within an enterprise.”

The most recent (Broadbent, 2004) overview of the structure of an IT Infrastructure is retrieved from the MIT Centre for Information Research depicted below (Figure 4), where Weill and Broadbent illustrated IT Infrastructure as the bedrock of IT from a business/management perspective. Based on basic principles of financial management, they re-evaluated IT Investments as **IT Portfolio**, where they divided IT into four management layers and further illustrated IT Infrastructure.

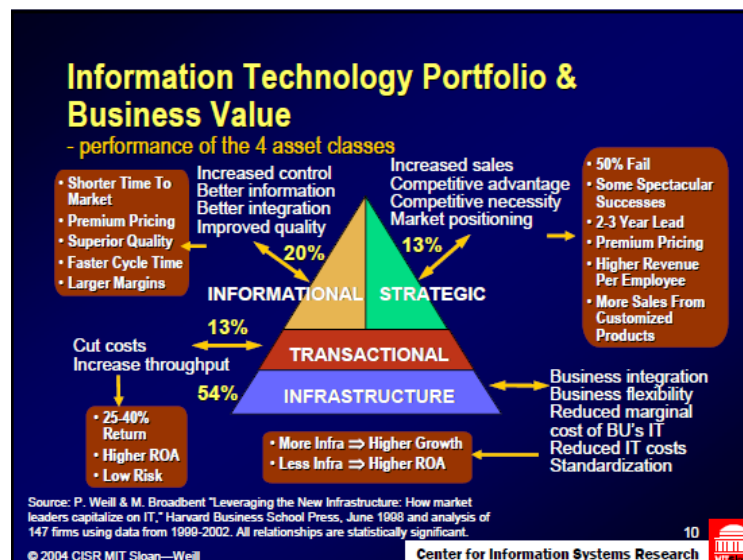


Figure 4. IT Portfolio – Weill and Broadbent (Microsoft Solutions Forum, 2004)

Informational IT provides invaluable information for uses which are needed.

Strategic IT gains competitive advantage and increases sales via major innovations.

Transactional IT is applications used specifically for transaction cost reduction in business.

IT Infrastructure provides shared IT based resources, such as capability, flexibility, effectiveness within the enterprise (Microsoft Solutions Forum, 2004).

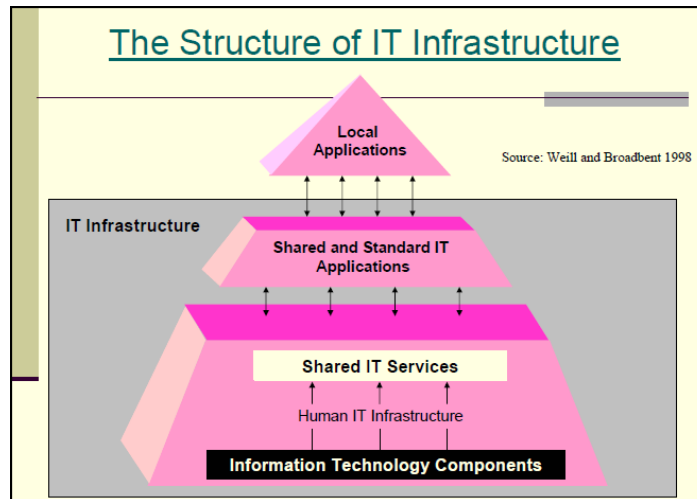


Figure 5. Structure of IT Infrastructure –Weill and Broadbent (1998)

Weill and Broadbent opined the underlying cores of IT infrastructure as the technically physical infrastructure, Human IT Infrastructure, and Shared IT services.

As retrieved from these definitions, we draw a conclusion that *“IT infrastructure is an underlying framework that accommodates policies, processes, people, hardware, software, vendors, networks, customer services, information and communication that is required for a business to be successful.”*

IT Infrastructure is sizably a huge investment for business enterprises and so many disciplines have to be considered before implementing a design or plan that will adapt or optimize current infrastructure scaled to evolving business needs (Broadbent, 2004).

4 Forms of Assessment

4.1 Virtualization Assessment

One of the most innovative improvements in technology is the incorporation of virtualization technology into the computer processor, this idea has made computing more powerful and smaller, whereby increasing the features and enhancing the speed of data transfer across networks, in recent time the data speed has increase from 100MBps to 300MBps. With newer focal areas, IT manager are now finding ways to employ virtualization technology throughout their organization (Click IT, 2012).

Achieving effective virtualization starts with a comprehensive IT infrastructure assessment. This assessment should examine the cost and power advantages of migrating to a virtualized infrastructure and identify relevant network configuration and security issues. By taking a proactive approach to virtualization that includes network and storage infrastructure optimization, you can maintain the high level of application performance, security, availability, and manageability that your business requires (Cisco.com, 2012).

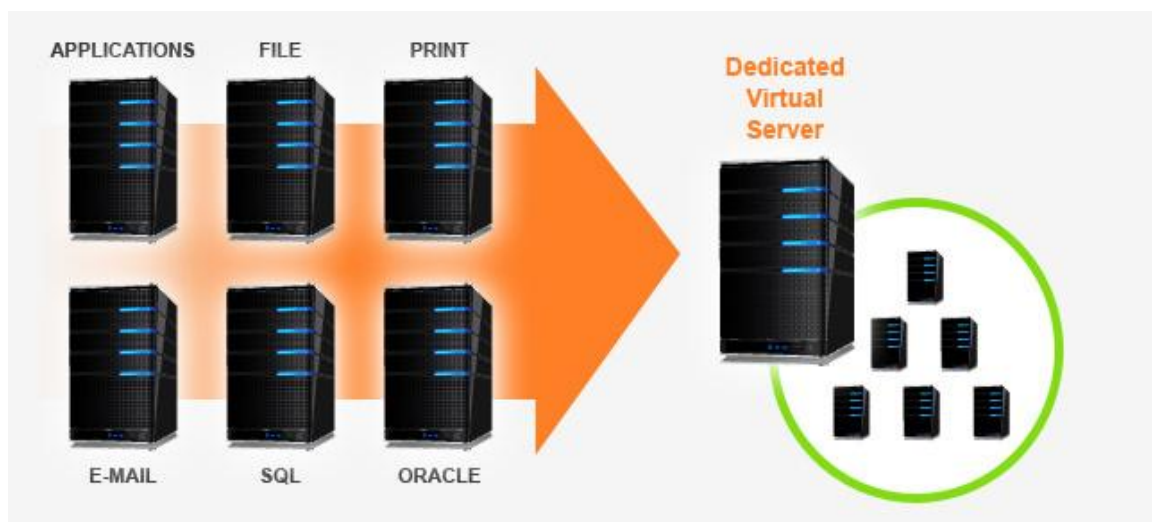


Figure 6. Atum vps Hosting (Atum.2012)

Virtualization is a method of dividing a computer's resources into multiple environments to create flexibility, easy-to-manage, secure computing systems. While server virtualization as mentioned in the diagram above, remains the most common type of virtual systems, this applications has applications across many other areas of IT. Two areas where virtualization can have important effect are server and client. Another value of virtualization is that it allows for separation of resources (or independencies). This enables greater control and movement to different situations in other to enhance the versatility and performance of the overall system.

4.2 Server consolidation Assessment

Many organisations have lost track of the numbers of servers and its application running on each server installed. Creating a situation called "Server Sprawl" in which multiple underutilized servers' take-up more space and consume more resources than can be justified by workload (Tech target, 2012). But with the help of server consolidation assessment, which helps determine how best servers can be utilized to reduce the risk of sprawl as earlier mentioned above and create benefit to the customer by evaluating and selected the best practice consolidation scenarios. The assessment of server development helps to establish and define both the technical and the financial baseline workload that exist for the identified server for transformation. These helps to create a generic report or inventory and performance data for the servers. There are different levels of consolidation of server namely Physical, Logical and Rationalized type of consolidation and companies go for them depending on their requirement.

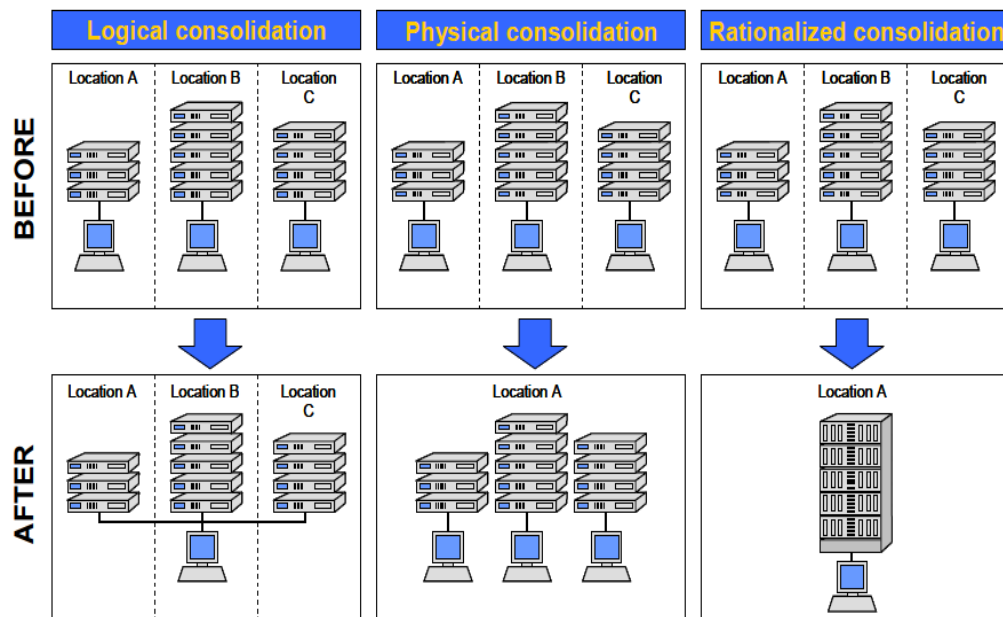


Figure 7. Three type of Consolidation (blu.org)

- Logical Consolidation:** This involves the Non-movement of server, while local operators are reduced or eliminated and management functions are such as restore, recovery, maintenance, and user's supports are performed remotely. The benefits of logical consolidation are as follows, Simplified administration, Reduced Operation, More effective and efficient of administrative resources. The major benefit of this system is that it reduces the use of human IT infrastructure to save cost for the company.
- Physical Consolidation:** This type consolidation involves consolidating servers with same application or platform in one physical location. This process is called collocation which leads to greater efficiency by eliminating the replication of skill sets across different locations. When systems are in a central location, networking becomes much easier and more efficient, power costs are reduced, backup can be performed more efficiently, and security can be increased. The usefulness of this process

to this thesis and its advantage to large enterprises is that, companies with many departments can have all of it controlled with few departments. The benefits are stated below.

- ✓ Reduces skill dilution
- ✓ Lower overhead cost: Power, Space, etc
- ✓ Improve network and application performance
- ✓ Greater security
- ✓ More efficient network and storage
- ✓ Reduce failure (biltading.com 2012).

Rationalized Consolidation: Initially a single server is assigned to use a single application; however, recent innovation in server hardware gave room for the support of servers with mixed workloads. This means that you can run multiple heterogeneous applications on single servers, or multiple applications on fewer, more powerful platforms, usually through workload management and partitioning.

The major benefits of the type of consolidation are.

- ✓ It reduces server operation cost
- ✓ It improves service level
- ✓ It reduces space required for equipments
- ✓ It improves security
- ✓ Better utilization of computer resources
- ✓ Increase standardization
- ✓ Reliability and Availability (tcs.com 2012).

The above explained system has some common characteristics. They are often highly adapted to the local IT environment, play a critical role for large enterprises and often require special knowledge regarding setup and configuration. It

essential that all local systems are covered in details during the course of assessment. That is why an assessment remains the basic necessity for transformation of any kind.

4.3 Risk Assessment

Risk management is very vital or important in today's information technology growing world. And risk management is necessary for enterprises and will be beneficial on the long-run. But one important thing to note is that not all risk can be eliminated.

The process of risk assessment can be described as a frame-work based on a set of guiding principles for the purpose of management (isaca.org 2011). It helps in examining what can cause damage to IT facilities in a workplace. Also a risk assessment can be said to be a process whereby an assessor can determine what information exist that requires protection, and to understand and document potential risk that might arise from security failures which might lead to loss of information confidentiality, integrity, or availability. The appropriate and strategic control of stewardship of information is the bases of risk assessment.

Risk management process which includes both the assessment of information security risks to the institution as well as the determination of appropriate management action and setting priorities for managing and implementing controls to protect against those risks. This process can be broadly divided into three components:

- Risk Assessment
- Risk Identification
- Risk treatment

Risk assessment

This process Identifies, quantifies, and prioritizes risks against both criteria for risk acceptance and objectives relevant to the organization. The assessment results guide the determination of appropriate management action and priorities

for managing information security risks and for implementing controls selected to protect against these risks. The assessment should include both a systematic approach to estimating the magnitude of risks and a process for comparing estimated risks against risk criteria to determine the significance of the risks.

The scope of a risk assessment can be either the whole organization, parts of the organization, an individual information system, or even specific system components, or services. The process of assessing risks and selecting controls will need to be performed a number of times to cover different parts of the organization or individual information systems, and to address the constantly evolving changes in security requirements or after a significant change is introduced, for example, a new asset or service is introduced or a vulnerability is exploited or discovered.

Components of a Risk Assessment

Administrative Safeguards

These include, but are not limited to, those control measures that ensure

- Classification of data handled by the unit and determination of controls to protect those assets;
- Documentation of procedures, standards, and recommended practices to ensure that applicable policies and controls are implemented appropriately for a given business process;
- Identification of personnel who are authorized to access systems;
- Assurance that appropriate authorization controls are implemented;
- Security awareness training and education for all personnel; and
- Background checks prior to the selection and hiring of new personnel into critical positions.

Logical Safeguards

These encompass the range of technical controls that

- Ensure access by only authorized users and session termination when finished;
- Enforce secure password management
- Manage tracking of development, maintenance, and changes to application software and information systems
- Manage access to the network; and
- Ensure event logging

Physical Safeguards

These protect physical resources through controls that

- allow access by only authorized individuals, through the use of physical means, such as locks, badge readers, or access cards;
- ensure the prevention, detection, early warning of and recovery from emergency disruptions, such as flooding, power failures, or earthquakes; and govern the receipt and removal of hardware and electronic media, including equipment reassignment, and final disposition of equipment (Ucop.edu 2012).

Risk identification

During the course of assessment of IT infrastructure it is important that risk identification is one of the major components of an assessment process; which includes identifying possible risk that might have significant impact negatively on the entire assessment process. Furthermore the risk identification exercise helps an assessor confirm risk in accordance to its mandate and responsibilities and development or prepare a plan needed to curb or avoid it.

The aim of this step is to generate a list of ICT security risks to be managed and the appropriate approach to their treatment. Five aspect of risk identification frame-work are

1. Strategic risk

2. Operational risk (including those related to service delivery, technology, people)
3. Financial risk
4. Reputation risk
5. Legal/regulatory/compliance.

Risk identification considers what is at risk, and the associated threats and vulnerabilities.

Sources of ICT security threats can include:

- Human behavior (human error, negligence, dishonesty, malice)
- Disasters (natural, fire or equipment failure)
- Changing political and financial circumstances
- Lack of training and/or experience
- Geographic circumstances with sites spread throughout the state (Asis.org, 2003).

Vulnerabilities are characteristics that may be exploited by a threat. Examples include:

- Physical and environmental controls around infrastructure
- Hardware (e.g. Insufficient maintenance, incorrect installation)
- Software (e.g. Application and operating system flaws, poor design and testing)
- Communications (e.g. Use of public Internet, plain text communications)
- Documents (e.g. inappropriate storage and disposal, lack of control over copying)

- Personnel (e.g. lack of training and security awareness, not adhering to policy and procedures)
- Procedural (e.g. lack of change control or user maintenance procedures). (Decd 2010).

Risk treatment can be explored. For each of the risks identified following the risk assessment a risk treatment decision needs to be made. Possible options for risk treatment include:

- Knowingly and objectively accepting risks, providing they clearly satisfy the organization's policy and criteria for risk acceptance
- Applying appropriate controls to reduce the risks
- Avoiding risks by not allowing actions that would cause the risks to occur
- Transferring the associated risks to other parties, e.g. insurers or suppliers

For each of the risks where the treatment decision is to apply some level of mitigation, the appropriate level of controls may be selected from other sections of this Security Guide or elsewhere. Controls should be selected to ensure that risks are reduced to an acceptable level, taking into account applicable federal, state, and local statute as well as other binding regulation; the institutions objectives; operational requirements and constraints; and the cost of implementation and operation relative to potential harm and cost likely to result from a security failure.

4.4 Security Assessment

Information is the most valuable asset and resource to an organization. Securing your organization's system is an essential responsibility of a security professional. One must implement confidentiality, integrity and availability at all times. Confidentiality is making sure that only the authorized person or group can access particular information.

Integrity is ensuring that sensitive information has not been changed or modified.

Availability is having information accessible to authorized parties at reasonable times. The three principles are fundamental when offering services over the Internet. Failure to implement all three would result in loss of resources, a loss

in revenue and a tainted reputation for an organization. A security assessment aids in checking for confidentiality, integrity and availability.

- **Confidentiality** - being secure from unauthorized access. Example: Vulnerabilities in telnet (user names and passwords sent unencrypted from a remote connection) can allow an attack against Confidentiality.
- **Integrity** - accuracy and completeness of data. Example: Vulnerabilities in send mail (mail can be forged from any address) can allow an attack against integrity.
- **Availability** - data and systems ready for use at all times by authorized users. Example: Variations in ping (request for information, can cause a denial of service attack -like, floods, ping of death) can be an attack against availability (sans.org, 2011).

It is a set of procedures performed on a server that detects whether or not any possible vulnerability exists.

Purpose of Security Assessment

The aim of this type of assessment is to guarantee necessary security control is integrated in the design and implementation of a security project. And if a security assessment is done properly and correctly it should provide documentation outlining any security gaps between a project designs and approved corporate security policies. Management can address security gaps in three ways: Management can decide to cancel the project, allocate the necessary resources to correct the security gaps, or accept the risk based on an informed risk / reward analysis (sans.org, 2011).

An assessment process can enhance other security awareness, project managers and management will realize that designing an appropriate security control into a project at the beginning can prevent huge expenses from fixing security hole after implementation.

- **Vulnerabilities**

Vulnerabilities are weaknesses in system that enable an attacker to compromise the integrity, availability, or confidentiality of the system or the data that it processes. Some of the worst vulnerabilities allow attackers to exploit the compromised system by causing it to run malicious code without the user's knowledge.

Security Assessment Categories

Any checklist questions (and subsequent follow-up discussions with the project team)

Should always be based on approved policy. This helps prevent senseless arguments on what is considered "good or adequate security". The following general topics and sample questions are probably relevant for most assessments. However, many more detailed questions and conversations will likely surface from each one:

- **Network Security** – If a new device is being added to the network, are the appropriate controls and protections in place (Firewalls, Intrusion Detection Systems, etc.)? Who owns and manages access to the network device? Are procedures in place for monitoring and maintaining the network device? Are production and development environments appropriately separated?
- **System Security** – Who owns and has access to the system? How can the system be accessed (network, modem, wireless, etc.)? How IDs and passwords are are managed and controlled? Are root and admin passwords changed and managed appropriately? Are system logging and audit functions active? What are the procedures for monitoring system logs? Does the OS configuration conform to corporate policy and requirements? What are the procedures for applying security patches, virus updates, etc

- **Application Security** – Who owns and is responsible for the application? What application security mechanisms (access controls) are in place? What data does the application use? What information does the application create? Is this information appropriately classified and protected? How is the application integrated into other security components (such as using NT authorization, external access controls, and centralized logging/monitoring)?
- **Data Security and Classification** – What data is being incorporated into the project? What is the sensitivity (classification) of the data? Are data protection mechanisms set commensurate with the sensitivity of the data? Who will have access to the data? What access controls are in place? According to policy, what are the encryption requirements for the data (in storage, in transit, etc.)
- **Business Resumption** – What are the procedures for system and file back-ups? What are the procedures for managing system outages and system recovery? (san.org, 2010)

Examples of Protective Security Measures

- **Access controls** – An access control is created so that an administrator determines allowed activities of a legitimated user by creating user IDs and passwords, appropriate password and security policies, this process helps to mediate every attempt by the user to access a resource in the system
- **Separation of duties**- Separation of duties is a classic security method to manage conflict of interest, the appearance of conflict of interest, and fraud. It restricts the amount of power held by any one individual. To be certain that you have identified all separation of duties issues, you will first need to create an information flow diagram for every function within each area of the organization

- **User authentication** -To be certain that you have identified all separation of duties issues, you will first need to create an information flow diagram for every function within each area of the organization with appropriate use of controls, where possible, e.g. smart cards, biometrics, etc.
- **Workstation lock screens** - When you leave your workstation unlocked, anyone can use it and assume your network identity, gaining access to any applications or files to which you have access. As every person is responsible for keeping his or her workstation secure, you should lock your workstation whenever you leave it, even if you will only be gone for a few minutes. Your workstation screensaver should also have its password protection configured to begin after a short period of inactivity (10 minutes at most is recommended). It is very easy to get sidetracked and stay away from your desk longer than you anticipate, so it is best just to secure your workstation whenever you leave it.
- **Encryption** - Encryption is the conversion of data into a form, called a cipher-text that cannot be easily understood by unauthorized people. Decryption is the process of converting encrypted data back into its original form, so it can be understood. In order to easily recover the contents of an encrypted signal, the correct decryption key is required. The key is an algorithm that undoes the work of the encryption algorithm. Alternatively, a computer can be used in an attempt to break the cipher. The more complex the encryption algorithm, the more difficult it becomes to eavesdrop on the communications without access to the key.
- **Proper registry permissions**- This type of security in the registry involves the use of ACL what all users should have access or should be denied with their appropriate permission in the network domain.

- **Proper directory and file permissions-** File permissions are the system's way of telling you what you can and cannot do with a file or folder. In Linux and Unix it has the (R,W,X) type of permission and are explained as follows;
 - ✓ READ – Can read the file – Can list file in a directory.
 - ✓ WRITE – can edit the file – Can create and delete file in a directory.
 - ✓ AND EXECUTE – Can run the file as a program – Can change to the directory (cybercity.biz).
- **Social engineering prevention** - The social engineering attacks attempt to trick stakeholders into disclosing sensitive information such as login credentials s. Low-tech methods are used to exploit your people, rather than your technology. This may be perpetrated through a spoofed email or telephone call, or could even occur on-site as the attacker drops USB pen drives on your facilities. Regardless of the method, social engineering can be used to gain unfettered access into the most secure IT environments (security pursuit, 2012).
- **Applying patches/updates** - A security patch is a change applied to an asset to correct the weakness described by a vulnerability. This corrective action will prevent successful exploitation and remove or mitigate a threat's capability to exploit a specific vulnerability in an asset. Security patches are the primary method of fixing security vulnerabilities in software. Currently Microsoft releases its security patches once a month, and other operating systems and software projects have security teams dedicated to releasing the most reliable software patches as soon after a vulnerability announcement as quickly as possible to make updates (patch computing.org)
- **Firewalls** – Firewalls are a key part of keeping a network system safe and secure. All servers deserve the protection of a firewall, whether it's

the thousand of server and desktop that comprises to make a large network of a company. There are two types of firewall

- ✓ **Network firewall** – Network firewalls, such as the software-based Microsoft's ISA Server or the hardware-based firewall System, protect the perimeter of a network by watching traffic that enters and leaves.
- ✓ **Hosted Base firewall** - Host-based firewalls, such as Internet ICF—included with Windows XP and Windows Server 2003), protect an individual computer regardless of the network it's connected to. You might need one or the other—but most businesses require a combination of both to meet their security requirements (TechNet 2012).
- **VPN tunneling**-(Virtual Private Network) as the name implies VPN use the tunnelling capability of IPSec to transparently move private data across the public Internet. Tunnelling treats entire packets from a private internetwork as payload data that must be transported across a public transport network (Cisco VPN, 2009).
- **Screening routers**- screening router performs packet filtering and is used as a firewall. In some cases a screening router may be used as perimeter protection for the internal network or as the entire firewall solution (Screening router, 2012).
- **Anti-virus software** – Antivirus software is a computer program that detects, prevent and take action to clean disarm or remove the malicious software program such as virus and worms.

- Prompt removal of terminated/transferred employee accounts, default passwords and unnecessary services running on the system,
- implementing and enforcing change control policy to limit activity to authorized users only,
- review and management signoffs of user authorizations
- use of checksums with attendant software to report file modifications
- enable audit logging and perform log reviews
- review of open ports and services
- properly configured routers
- searching for and disconnecting unauthorized or poorly configured modem services
- properly defined user rights

5. Research Methodology

Study Design

The study adopts a constructive research approach whereby qualitative data were gathered through semi-structured/expert interviews. The choice of research approach/methodology is to gain vivid and in-depth understanding of circumstances and contexts that surround the research findings. Being part of a wider study, this part of the thesis is meant to supplement the other part of the thesis that was carried out using action research methodology.

During the course of the research I was seeking to find the best practical ways and new ways of carrying out assessment and to see if there exists any standard method for doing this. With this in mind, I decided to use a semi-structured/expert type of interview whereby a few lead questions were asked in order to get the interviewee's unrestrained opinion about the topic under investigation. For example, "What is an assessment all about?", "Why do enterprises need to carry out assessment?", "what does it take to carry out a successful assessment?" "How do I know my assessment is successful?" These questions created room for more questions. The interview methodology was supplemented with the analysis of relevant literature, internet blogs that deal on the topic.

These few lead questions formed part of the questionnaire found in "Appendix A" These questions serve as a template.

The constructive method is the most commonly used in computer science research method (Wikipedia, 2010). This approach demands a form of validation that does not need to be quite as empirically-based as in other types of research in the other part of the thesis.

Hair and Money (2007) also state that "Constructive methods depict how problems can be solved and if there exist previous solutions; how are the newer solutions better than the previous ones".

According to Hair and Money (2007), the phases of constructive research are:

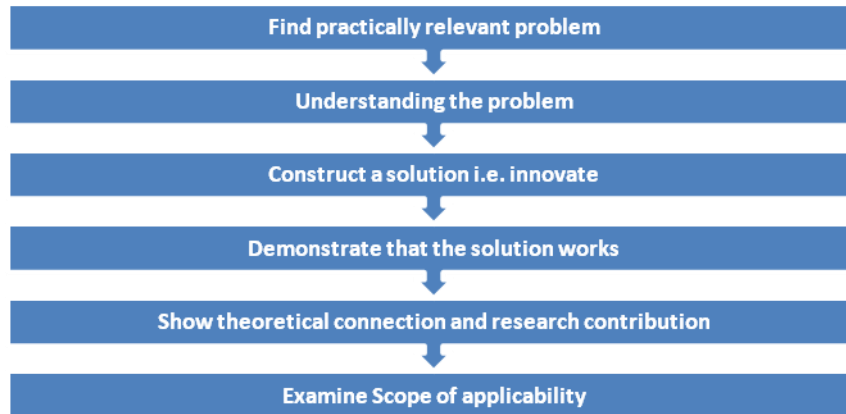


Figure 7. Constructive Research (Hair and Money) (2007).

The phases listed above (Hair & Money, 2007), will be examined/discussed with more clarity when a practical application of the developed method/solution is evaluated.

This is why we took a step further to conduct an action research. Although action research may be perceived to associate with educational research, it may also be based on a wider context which involves reporting findings as a case study or carrying out a case study as part of a situational analysis (China-Doll Custom Journal, 2012).

The China-Doll Custom Journal (2012) simply summarizes the action research cycle in the following manner: Plan, Do and Review.

Plan

- Identify the initial idea, for instance, what aspects of the practice we want to improve
- Reflection and initial planning initially i.e., finding out what is already known in relation to the initial idea, which includes “analyzing what the literature says”.
- Plan action steps, i.e., decide what we are going to do and how we are going to investigate out initial ideas in the light of what we have learnt from the initial research (constructive research) and review the literature.

Do

- Implement action steps
- Monitor implementation & effects, i.e., monitor and analyze what happens when the action steps are implemented.

Review

- Revise the general idea, i.e., review, refine and focus on the investigation.

Based on the methods and corresponding steps stated above, the research investigation was divided into two parts and handled by each author of this thesis. The second author focused on the constructive research, i.e., identifying specific problems that enterprises face while accessing their local IT infrastructure, analyzing the theoretical aspects of assessments and its connection to our practical approach in solving the problem. The first author focused on the action research in a real-world project and practically applied the assessment methods, processes studied during the earlier research by developing guidelines that could be implemented within an IT transformation project, such as this consolidation projects (Yin, 1994).

5.1 Study Population/Participants

The population for the study were server administrators and engineers. However, one server administrator was interviewed. The interviewee is currently the Transition Manager, Information and Capability Management Unit at Nokia Oyj. Role – Responsible for the “Transition Planning and Support” is ensuring the quality of handover to use phases.

5.2 Sampling Technique

A purposive sampling technique was used in selecting the study participant. The choice of the participant was informed by his vast experience in server

administration and his expert knowledge in the field. And he was the only person willing to assist this much; though there two others at the beginning but after some point they were unreachable. That was why this method was adopted.

5.3 Assessment Strategy

This relates to the strategy in which; we (research participants) retrieved data during the entire process of the research

5.4 Data Collection

Data collection was done via research related literature, blogs, articles, bulletins, text books resources (library) and the World Wide Web (Internet). Materials were gathered from relative subjects, white papers and best practices (used as references) while developing the content of the constructive research work. This aided in the learning benefits and created a basis in which the thesis topic was approached and written.

A detailed questionnaire was developed during the constructive work and respondent were allowed to answer the questions under investigation in order to build a useable structured draft. The questionnaire was designed to allow for high flexibility, for instance, respondents were allowed unrestrained opinion to every question related to their responsibilities. In addition, follow-up calls and meetings were scheduled frequently to further clarify misunderstood questions or answers.

During the process of constructive research all interviews were done through face-to-face, conversation with IT personnel, video conference call using Skype, and using phone if I need urgent clarification on some issues that never needed me traveling while interviewing note or minutes were taken and clarification questions were asked to ensure clear understanding on the researcher's behalf. These answers were then analyzed and used to develop this work. IT personnel that assisted in this were from Nokia in Salo.

6 Analysis

The analysis below; comprises of reviewing of the interviewees /expert opinion. The diagram below was created by an interviewee who has been a server manager conducting assessment for years and more of his integrity can found under sampling techniques.

“About the percentage of enterprises that sees assessment as an important, in evaluating their IT Infrastructure” when comparing (Large, Medium and Small scale Enterprise)? It was revealed that due to the complexity of IT infrastructure in large organisation they tend to do assessment more. Assessment is cost effective in the long run and it will help larg scale enterpriese understand their system better, it also ensures that the business between front-end services to clients is stable.

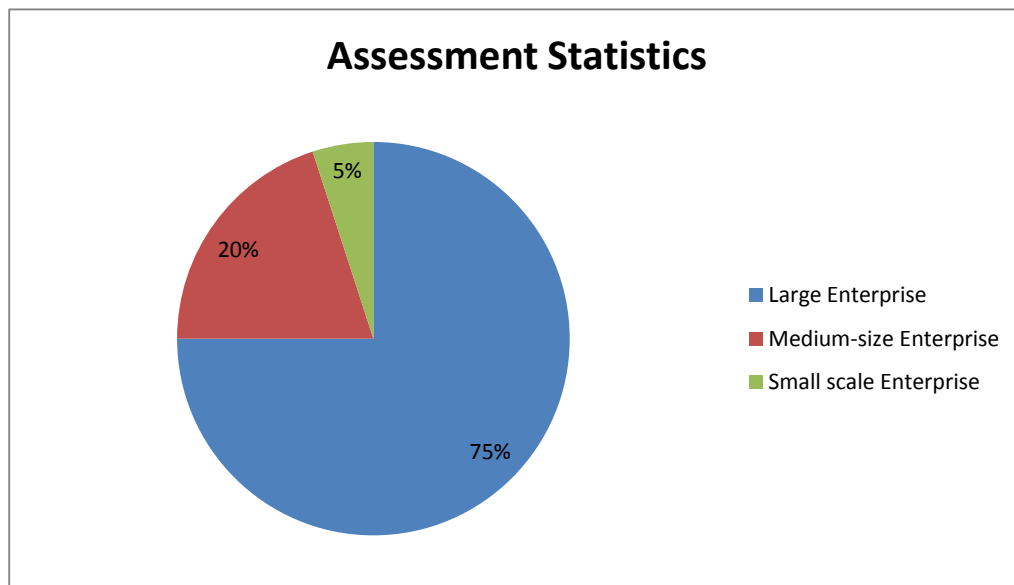


Figure 8. Enterprise Assessment Statistics

Comparatively, only a lower percentage of medium or small scale enterprises conduct assessment as compared to large enterprises, similarly, it was shown that it is much easier for small and medium scale enterprises, to identify their IT components that are faulty or due for decommissioning, refresh or “left as is” without the need of employing resources (with special skill) to take assessment of their infrastructure.

However, these manual assessment processes do not produce the best results, as the risk of human error is high. In large enterprises where there are several IT components across different branch offices, the automated process “becomes a must for effective operation for large enterprises”. Depending on the size of enterprise, costs generated due to assessment are often viewed by IT personnel’ as additional expense.

Therefore, smaller enterprises tend not to conduct assessment regularly. Finally, due to the fact that many IT environments are heterogeneous, the processes and tools used within enterprises (for instance, large scale businesses) to conduct assessments are practically unstructured.

7 What Next? Migration

The primary scope of the Migration exercise is to consolidate the back-end part of candidate system/servers on to a new environment i.e. virtual or physical platform.

As mentioned before, Migration activities are out of the scope for this thesis but the detailed summaries of focus are:

- Collect required/available documentation for system.
- Develop migration plan and create first draft of “System Migration Plan/Report” for system.
- Review done by migration team.
- Agree with “system owner” on migration plans.
- Complete “System Refresh Plan/Report” for system.
- Create checklist about functionality of the system.
- Run test protocol to verify test protocol before migration starts.
- Create IC and IQ/OQ for adaption.
- Backup system if required for rollback.
- Migrate systems by using migration method(s).
- Document migration results in “System Migration Plan/Report”.
- Sign-off migration report.
- Decommission servers.
- Archive migration report.

8 Result and Conclusion

Is there a preferred method/approach used in assessing IT infrastructure components within enterprises?

In the course of this research it was found that there is no universally recognized model or standard for carrying out assessment of IT infrastructure (server) in large, medium or small scale enterprises. However, an assessment template can be generated based on best practices or processes (with the aid of third party tools and questions) to guide an assessor hence making it easier to do subsequent assessment; it is advisable for organisations to install the third party tool, after the first assessment process so that information can be easily retrieved.

The interview responses also indicate that the interview responses also indicate that assessment provides an organization with support for business process and operations, decision making, and competitive advantage through enabling management to meet local and global challenges, business process engineering, agile competition, capture opportunities, support cooperate strategy, link department whose functions may or may not be different; enhance worker productivity and increase the quality of goods and service. This provides the answer to the secondary research questions which seek to find out the rationale for conducting IT infrastructure assessment in enterprises.

Whenever an assessment of infrastructure is to be done, there is a number of related issues to ponder about such as decisions on the most efficient and cost effective way of doing an assessment.

An assessment does not only inform about the way one part of an organisation works, instead it explains the way part of an organisation works within an organisational structure. It analyzes the strengths and weaknesses of how an organisation system. Since an assessment involves stakeholders of the company and an external assessor, it is said to be participant based activities which helps and organisation buy into, or, own a plan out of it. An assessment methodology remains the best available means of facilitating more productive, reliable and more profitable means for growth. Wise companies will understand

when assessment for optimization should be their major agenda; these processes do not only cut cost but also position their IT infrastructure to meet future needs.

Contrast and Future Research Objectives

As was earlier noted, this study adopted a qualitative research approach in which in-dept expert interview was used. However, only one expert was interviewed. This thus puts a limitation on the general study results.

A future research within IT infrastructure assessment scope should be focused on analyzing other aspects of the structure of the IT Infrastructure i.e. human IT Infrastructure, shared IT services, or shared/standard IT application, thus examining their distinct impact on enterprise IT transformation. Also network assessment to secure how data packets are trasfrered across network and how it can be secured is one of the limitations as well in this thesis.

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Appendix A – Assessment Questionnaire (Template)

	Assessment Questions	Companies	Response from IT Stakeholders	Additional Comments
1	Do you have other sites integrated with this IT infrastructure? How many are they?	A	Yes, 4 Sites	
		B	Yes, 2 other sites	
		C	no	
2	How many local offices does your IT infrastructure support?	A	3 local offices	
		B	1 local office	
		C	Non	
3	How often do you take assessment of your infrastructure?	A	Only when an IT transformation project is initiated	
		B	When there is a problem	
		C	Not often	
4	Why do you assess your IT Infrastructure?	A	To get an overview of the current IT managed components before making any changes to the Infrastructure.	
		B	To identify and upgrade certain outdated components within the infrastructure,	

		C	Never, or whenever there is a problem	
5	What specific projects trigger the assessment of your IT Infrastructure?	A	Server Virtualization projects	
		B	Client Server Application upgrades	
		C	Legacy systems decommissioning projects	
6	How do you conduct the assessment of your IT Infrastructure?	A	Manually conducted by 3 IT Staffs	
		B	Manually conducted by internal Project lead and third party IT consultants	
		C	Manually conducted by 1 IT Administrator	
7	What are the effects of this assessment to the business?	A	Improved business productivity	
		B	Business applications runs	

			efficiently	
		C	Saves cost of running IT expenditures	
8	What issues do you encounter while carrying out an assessment of your IT Infrastructure?	A	Takes too much time due to manual process	
		B	Time consuming task.	
		C	The process is not structured; sometimes IT components are missed during the process	
9	What types of IT environments are assessed? Virtual, physical or both?	A	Physical IT components	
		B	Physical IT components	
		C	Both Virtual and Physical IT components	
10	Do you use any tools for the assessment of your IT Infrastructure? If yes, what are the names of these tools?	A	No	
		B	No	
		C	Yes, Microsoft Excel Spread	

			sheets	
11	Do you know of any standard approach of conducting an IT infrastructure assessment?	A	None	
		B	None	
		C	None	
12	What methods or approach do you use for assessment?	A	None	
		B	None	
		C	None	
13	How many participants (i.e. assessment evaluators) are involved in taking the assessment? What are their competency levels?	A	3, computer system administrative competence	
		B	1, IT management competence	
		C	4, Project management and computer analyst competence	
14	How long does it take to complete an IT infrastructure assessment?	A	6 weeks	
		B	2 weeks	
		C	Few days sometimes week depending how big the problem is	
15	What time in the day is the assessment conducted?	A	After office hours (18.00 – 22.00)	

		B	After office hours (18.00 – 23.00)	
		C	After office hours (17.00 – 23.00)	
16	Were there any external dependencies while taking the assessment?	A	Yes, dependencies on external system owners	
		B	None	
		C	Yes, dependencies on external system owners	
17	What is the outcome of a successful IT Infrastructure assessment?	A	Complete list of IT components	
		B	Extensive overview of managed IT components	
		C	If done correctly; a in-depth insight of all hosted systems, applications, hardware and software	
18	Who are the key beneficiaries of the assessment outcome?	A	The business users and customers	
		B	The business users and	

			customers	
		C	The business users and customers	
19	Have your enterprise been involved in any IT transformation projects?	A	Yes	
		B	Yes	
		C	Yes	
20	Did the project require an assessment of the infrastructure?	A	Yes	
		B	Yes	
		C	Yes	

Q&A Analysis

(1) Do you have other sites integrated with this IT infrastructure? How many are they?

“With this question we know how many department are connected and controlled from that department” secondly we can also apply or the same process in other department if assessment will be done there.

(2) How many local offices does your IT infrastructure support?

If the answer is yes, then we’ll be careful not to hamper/disrupt information, and also we know that if assessment will be done in other branches of same company similar procedure might be applied.

(3) How often do you take assessment of your infrastructure?

With this we like to know if it is the first, so that we can educate local IT manger hear their own opinion during the process.

- (4) Why do you assess your IT Infrastructure?

With this we like to know why they are embarking on the project.

- (5) What specific projects trigger the assessment of your IT Infrastructure?

This helps us know what type of assessment they want (Optimization, Virtualization, Consolidation, Risk, Security, or there is problem with their system) this will be confirmed with the third part tool.

- (6) How do you conduct the assessment of your IT Infrastructure?

With this question if it has been done before we like to know the system used, and how the process worked.

- (7) What are the effects of this assessment to the business?

With this we know how it has affected the business may be positively, if not we can tell where the problem lies and recommend better solution.

- (8) What issues to you encounter while carrying out an assessment of your IT Infrastructure?

This question we can ascertain if the local IT manager have been conducting assessment locally, manually or even with other third party tool, and the problems they encountered during the process.

- (9) What types of IT environments are assessed? Virtual, physical or both?

For Physical environment it helps us (Identify all servers in the environment, Gather statistics of all server, Analyze the statistics to determine the ideal consolidation candidate. And all these process can be achieved with the third party tool.

Virtual environment it helps us (Identify all virtualized servers in the environment, Identify "stale" virtual servers that can be retired, Identify inefficiencies in virtual client configurations to streamline existing clients, Analyze the operational readiness and the entire data centre

environment, Review your upgrade and patch status, Optimize and tune virtual servers, Review and enhance your backup policies and your disaster recovery plan. And more.

- (10) Do you use any tools for the assessment of your IT Infrastructure?
If yes, what are the names of these tools? With this we know what type of tool that has been used before.
- (11) Do you know of any standard approach of conducting an IT infrastructure assessment?
With this we like to know if they are familiar with any system of assessment
- (12) What methods or approach do you use for assessment?
With this we know approach was used, if assessment has been done before
- (13) How many participants (i.e. assessment evaluators) are involved in taking the assessment? What are their competency levels?
With this we know there external assessor or internal and their level of competence.
- (14) How long does it take to complete an IT infrastructure assessment?
With this we know how long it took the team of assessors,
- (15) What time in the day is the assessment conducted?
With this we can know if the assessment was done peak time or off peak.
- (16) Were there any external dependencies while taking the assessment?
With this question we can know if the process depends on any one contribution or not.
- (17) What is the outcome of a successful IT Infrastructure assessment?
With this we know at the end if the assessment was successful or not.
- (18) Who are the key beneficiaries of the assessment outcome?
With this we like to know who beneficiaries from the process
- (19) Have your enterprise been involved in any IT transformation projects?
With this we like to know they have done assessment before or not.

(20) Did the project require an assessment of the infrastructure?

With this we like to know what kind of IT project they have been.