INTERNET PROTOCOL (IP) NEUROMETRICS

A Comparative Analysis of Cool Media Networks' "iMotive™" and Traditional Network Enterprise Resource Management (ERP) Systems

by

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A thesis submitted in partial fulfillment of the requirements for the degree of

Masters of Business Administration

Athabasca University

March 1st 2003

Abstract

Cool Media Network's iMotive™ system describes a radical change in network management practices and methodology via the "IP Neurometric" system - the qualitative interpolation of quantitative network statistics data.

The "IP Neurometric" based system will give rise to fundamental changes in Business-to-Customer (B2C) and "Business-to-Business" (B2B) network supply chain management via the monitoring of the "human network" as opposed to the current device based hardware network metrics. iMotive™will introduce a paradigm shift in network Enterprise Resource Planning (ERP) via " triggered management" services. In turn, the iMotive™- system will be able to reduce bandwidth costs by introducing Just-in-Time network bandwidth provisioning and Continuous Customer Quality Input (CCQI) in conjunction to network ERP methodology.

Applying Orlikowski's Structurational model of technology, to analyze the iMotive™ ERP application, the research project will primarily endeavour to educate Information Technology (IT) executives and network infrastructure Managers/Planners with information on state-of-the-art next generation ERP (NG-ERP) methodology and practices in light of reducing enterprise bandwidth costs, increase scalability, decrease down-time, add system portability, reduce redundancy, and increase user productivity while strengthening industry commitment to Total Quality Management (TQM).

Executive Summary

This research paper endeavors to explore Orlikowski's theory article on "*The Duality of Technology*", the *structuration* model, as it serves to analyze the iMotive™ Network ERP application at Cool Media Networks. The research finds that the iMotive™ Network ERP model encourages the structuration model and promotes the flow and creativity of user participation. Utilizing non-proprietary client software users are encouraged to participate in the Network ERP system using their own preferred technologies. The iMotive™ system promotes a common network ERP infrastructure.

Furthermore, the paper makes recommendations to management regarding the adaptation of the iMotive™ Network ERP system including, an awareness for ample network resources, promoting user initiated client technologies to participate in the Network ERP system, establishing a distributed support system for the iMotive™ Network ERP system, allowing technological dualism to flow and not resist the deterministic aspect of technology nor the social influence, create policies and procedures to ensure the continuity of Network ERP

practices, and develop methodology for measuring the effeteness of the Network ERP system.

Cool Media Network's iMotive™ system describes a radical change in network management practices and methodology via the "IP Neurometric" system – the qualitative interpolation of quantitative network statistics data. The "IP Neurometric" based ERP system will give rise to fundamental changes in B2C and B2B network supply chain management via the monitoring of the "human network" as opposed to the current device based hardware network metrics. Business will be able to proactively plan and provision for customer bandwidth and supplier network services via iMotive's™ triggered management services. In turn the iMotive™ system will be able to reduce bandwidth costs by introducing Just-in-Time network bandwidth provisioning.

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Introduction

Business-to-Business (B2B) statistics show that online profitability is estimated to be 34% in the first year. As such, Business-to-Consumer (B2C) e-commerce predictions estimate an increase in the total household online shopping from 17m in 1999 to 49m in 2004, increasing networking on sales from $20.2M in 1999 to $184M in 2004. More than 10 million households will have some form of home networking installed by 2003, according to the Yankee Group, and more than 4 million will have home networking of the phone line-based variety.

A U.S. government report finds that progress is being made toward the Administration's goal of making certain every American has access to the information-age tools necessary to take part in the digital economy (Rickard).

Online personal digital assistants (PDA) market will increase with the penetration of wireless e-business infrastructure and services such as wireless banking, shopping and related information services (David, 30)

The sustained demand for Internet Protocol based (IP) business and consumer networking and related services will certainly requires a solid understanding of network enterprise resource planning (ERP) in order to accurately and effectively assess scalability and provision for supply and demand of IP based services. Traditionally, network infrastructure planners base IP network ERP modeling and provisioning on quantitative data models - based on quantitative data traffic statistics collected via the Simple Network Monitoring Protocol (SNMP).

Quantitative data analysis simply offers variations of bandwidth throughput statistics. From the perspective of the "human network", users of IP networks consisting of connected office workers or spanning across physical borders (Otto), current ERP methodologies offer no indication of network productivity or usability. In the expanding structural networking complexities and critical interrelationships between B2B and B2C "human-networks", current IP network ERP methodologies must look beyond tradition in order to manage network infrastructure change.

Background – Cool Media Networks

“Cool Media” is a term coined by the late Marshall Mcluhan in his ground breaking work Understanding Media (1964): a momentous

endeavor to define the most basic constituents of human communication: the interface between the medium and the human being.

In 'Media Hot and Cold", Mcluhan describes that one of the fundamental characteristics of a cool medium, like television (TV), is that it allows for increased interplay among the senses.

At Cool Media Networks we strongly believe that electronic networks, much like TV, are representative of “cool media”. The foundation of our premise is grounded in the vast amount of sensory information that lies at the heart of every electronic packet of information that is transferred from one computer host to the next.

Cool Media Networks extends Mcluhan's phenomenological work in "connected behavior" to real-world applicability in development of neuorometric content monitoring tool set dubbed iMotive™.

Founded in 1998, Cool Media Networks is in the business of Internet (IP) Network Research and Development - developing network tools that enable network managers and users to adapt to changes in network behavior. Our neuorometric networking product line - "iMotive™" - interpolates quantitative IP statistics and generates a qualitative synopsis of the state of the network and its users.

Internetworking takes on an "organic integration" OI™ as the state of a networks becomes analogous to the stat of its human operators.

Cool Media Networks is focused on building loyalty and value with its target customers through a commitment to our vision of “OI ™ for the Planet” – providing our customers, employees, and shareholders access to a world-class e-business research and development Corporation.

Background - Enterprise Resource Planning (ERP)

Enterprise resource planning is the practice of consolidating an enterprise’s planning, manufacturing, sales and marketing efforts into one management system. ERP systems are complimentary to managements arsenal as they create a single “truth” of the companies overall performance ERP software attempts to integrate all departments and functions across a company onto a single computer system that can serve all those different departments' particular needs. ERP automates the tasks involved in performing a business process -

such as order fulfillment, which involves taking an order from a customer, shipping it and billing for it.

Background – iMotive™ - Network Neurometric Research

Contemporary computing and communications design is primarily focused on assisting the user with a "friendly" user interface. One aspect of modern communication metrics that is commonly overlooked is how the user feels about such interfaces - monitoring and adjusting the computer interface to a users' emotional state (as a reaction to such an interface) is a relatively new field.

The iMotive™ toolset extends the metaphor to networked computing devices - or the emotional state of users communicating with other devices.

Let us consider, for example, a workgroup of 10 users. There is an individual emotional state between a user and their computer interface (at any given time t), and a completely different emotional state between such a user and the 9 other possible connections they may have with users within that group. The iMotive™ toolset monitors the state of the entire network to produce metrics that can interpolate the efficiency of design and productivity of use for such a network. In this

regard is could be said that a "happy" network is a network of happy and productive people.

As such, iMotive™ statistics give computer analysts and engineers, as well as individual users, the ability to adjust and fine-tune their network environments.

Background – The EPR Paradigm shift

A paradigm shift is a change in the way we think about the very nature of a topic – so much so, that we need to rethink the way we frame our questions, not just how we respond to them. Cool Media Networks has identified a radical shift in ERP practice and methodology - an ERP paradigm shift.

Five years ago, it would have been hard for anyone to believe that any company would be replacing all their major business systems; customers, work, materials, financial, and human resources, at the same time in favor of a single product to meet these systems critical needs. Yet today, the sales figures from providers like People Soft, and Oracle (2001 Annual Reports) tell us that industry leaders worldwide have started down that path. The willingness to embrace ERP methodologies and practices has radically changed the business landscape and permeated the very communications infrastructure of every business – regardless of industry.

At the centre of the change is an awakening and growing acceptance of ERP concepts and products and their symbiotic relationships with

computer networks. At the core of every modern ERP system is a fast, efficient, and co-coordinated transport network; this may be a local network or an enterprise wide Internet Protocol (IP) Network.

Cool Media Networks has identified the core services provided by core Network Service Providers (such as Bell, AT&T, Sprint) is in fact a metaphor for a network ERP. This ERP metaphor extends to include the supply chains, as well as customers within the model of the enterprise. As such Cool Media Networks has dubbed the new paradigm shift as **"*Network ERP***".

Background - Network ERP and the iMotive™ System

The key to understanding Cool Media Networks' unique concept of Network ERP manifests itself in the realization of the varying degrees of network infrastructure and control systems required to manage the assorted components of the enterprise.

That is, current industry models and systems focus on building an integrated collection of software components to manage various aspects of the business. Seldom is there any consideration for the "fitting" of various network components that ultimately bind the ERP

system. Furthermore, from the scope of network service providers, modern ERP methodology gives very little consideration for the state of the individual customers that are integrally linked to the business and the of the networked ERP system.

In an attempt to address the shift in understanding and view of ERP systems, Cool Media Networks has investigated the possibility of adopting the iMotive™ suite of network tools to enable a more effective design, and implementation of “Next Generation ERP” (NG-ERP).

Research Objective

The objective of this research project is to conduct a comparative analysis between traditional, quantitative, statistically based, network ERP systems and Cool Media Networks’ qualitative network ERP system dubbed *iMotive*™ - the neurometric interpolation of Internet network data statistics.

Cool Media Networks wishes to investigate the notion of modeling an operational efficiency process by integrating existing electronic capabilities of the iMotive™ product infrastructure in order to generate

internal and external commitment to process efficiency, quality, and continuous improvement (CI).

Applying Orlikowski's *Structurational* model of technology (409), to analyze the iMotive™ ERP application, the research project will primarily endeavor to educate Information Technology (IT) executives and network infrastructure Managers/Planners with information on state-of-the-art next generation ERP (NG-ERP) methodology and practices in light of reducing enterprise bandwidth costs, increase scalability, decrease down-time, add system portability, reduce redundancy, and increase user productivity while strengthening industry commitment to Total Quality Management (TQM).

Research Methods

An extensive literature review was conducted to first determine industry definitions and practices for such items as ERP, JIT systems, Internet protocols, iMotive™, and Neurometrics research.

From this information, current policies and practices were identified.
An assessment matrix and methodology scorecard (Appendix III) was

established in an effort to compare traditional network ERP systems with the iMotive™ system - revealing the current status of the ERP software systems. Based on the results of the methodology scorecard, the relative strengths and weaknesses of iMotive™ and traditional ERP system was assessed and were compared and contrasted.

Key Assumptions

Assumptions provide context to our *analysis.* Any factors outside our analysis that could impact its applicability and resulting recommendations are listed below:

- The "Just in Time" (JIT) model excludes external processes
- Kanban demand signaling systems can exist in non-physical forms
- The iMotive™ network infrastructure continuously connects Cool Media Networks to supply chains and customers.
- The "Customer" is a distinct business unit
- Customers are willing to adhere and participate in a hybrid JIT model

Research Questions

1. **What is Enterprise Resource Planning (ERP)?**

A Brief History of ERP

The focus of manufacturing systems in the 1960's was on Inventory control. Most of the software packages then (usually customized) were designed to handle inventory based on traditional inventory concepts. In the 1970's the focus shifted to MRP (Material Requirement Planning) systems that translated the "*Master Schedule*" built for the end items into time-phased net requirements for the sub-assemblies, components and raw materials planning and procurement (David, 395).

In the 1980's the concept of Manufacturing Resources Planning (MRP II), an extension of MRP to shop floor and Distribution management activities, evolved in the early 1990's, MRP-II was further extended to cover areas like Engineering, Finance, Human Resources, Projects Management etc i.e. the complete gamut of activities within any business enterprise. As such, the term ERP (Enterprise Resource Planning) was coined (AMR Research)

.

Applications to eBusiness

ERP systems also provide the core enterprise back-end, which enables companies to partake in the Internet economy, through deployment of e-commerce, customer care, and supply-chain applications. The network is key to ensure that these applications run successfully. In order to deliver these mission-critical applications, you need a highly available, scalable, and application aware network. Today, ERP systems today use client/server architectures, commonly using a 3-tier or N-tier model (Coomber).

ERP in the Service Industry

Enterprise Resource Planning or ERP is an industry term for integrated, muti-module application software packages that are designed to serve and support multiple business functions. An ERP system can include software for manufacturing, order entry, accounts receivable and payable, general ledger, purchasing, warehousing, transportation and human resources. Evolving out of the manufacturing industry, ERP implies the use of packaged software rather than proprietary software written by or for one customer. ERP modules may be able to interface with an organization's own software with varying

degrees of effort, and, depending on the software, ERP modules may be alterable via the vendor's proprietary tools as well as proprietary or standard programming

Applications in today's enterprise networking environments require different levels of service based upon business requirements. These requirements can be translated into network policies. The careful planning of resources plays a key role in assisting network services providers in optimizing their resources and maximizing their practices.

Why is it Necessary?

By becoming the integrated information solution across the entire organization, ERP systems allow companies to better understand their business. With ERP software, companies can standardize business processes and more easily enact best practices. By creating more efficient processes, companies can concentrate their efforts on serving their customers and maximizing profit.

Market Leaders

The top five ERP vendors, SAP, Oracle Corporation, Peoplesoft, Inc., JD Edwards & Company, and Baan International, account for 64

percent of total ERP market revenue. These vendors continue to play a major role in shaping the landscape of new target markets, with expanded product functionality, and higher penetration rates (AMR Research).

What is a Customer Assisted Just-in- Time (JIT) and lean system?

The goal of lean systems, which is known as "just in time" (or JIT) delivery, is to deliver exactly what the customer wants, exactly when the customer wants it (Aimtech). JIT, created by Taiichi Ohno of Toyota, helps businesses avoid such profit-killers as stockpiling inventory or parts that do not move, or performing services and intermediate steps that the client neither wants nor needs.

Lean systems require an overall, as well as a minute, step-by-step analysis of how a company produces and delivers its goods or services to customers. This analysis reveals where there is waste. A Continuous Improvement (CI) approach to every step then eliminates that waste. Lean systems employ several key techniques to accomplish goals such as: setups, reduction, pull systems with Kanban (He, Qi Ming) controls, and preventive maintenance.

The bottom line of lean systems is eliminating the waste of materials, time, human resources, and capital. In short, waste is anything that does not add value to what a company produces. Although started with Henry Ford at the Ford Motor Company in the early 20th century, lean systems can be applied today to any business (Acta).

As mentioned above, the textual representation of JIT is focused primarily on the manufacturing industry. JIT considers high volume production using minimal inventories and of raw material. Moreover, producing more than is necessary is considered wasteful under JIT production systems. In a service operations model, JIT implementations must be modified to meet industry needs.

Service industries can adapt the JIT service operation by organizing problem solving groups into functional units that report to each other, organizing work areas and online user profiles and resources, maintain process standards by using specialized document revision software, simplifying process flows by working in a parallel manner, constantly assessing and revising technology as it translates to ones' environment, avoiding customer service delays by synchronizing demand with supply, streamlining activities and avoid process duplication by integrating our customer service and inventory systems database , introducing new demand-pull scheduling systems in the

form of software in order to predict the customer demand – establishing strong associations to our supplier networks

The combining of internal and external JIT systems gives rise to the notion of "Continuous Customer Quality Input (CCQI)" - the customer acts as an integral part of the operations process system. As a result, further to a company being committed to quality and Continuous Improvement (CI) of customer service processes and procedure, the customer becomes an integral part of service quality. In this manner, customer service can be delegated (in part) to the customer - adding a self-serving dimension as direct a result of hybrid JIT processes.

What is Continuous Customer Quality Input (CCQI).

Often JIT is associated with internal efficiency process models and lean systems models that have effectively made a clear division between company and customer - the customer is considered a base to support the model (Aquilano, Chase, and Jacobs, 403). There is reason to argue, however, that in the service industry, particularly companies that directly connect the customer to the company via

electronics networks, as is the case with Cool Media, the customer becomes an extension of the operations processes.

The internal JIT model assumes that the ambition of each production unit is to maximize profits while minimizing waste, and to develop efficient mechanisms to handle the improvement of ideas. Given the close relationship that customers now shares with service industries - it makes good business sense to treat the customer as a distinct business unit - one that must also be considered to operate in an efficient manner.

Combining Internal and External JIT

Let us assume that internal JIT processes extend to the customer. The customer has a direct influence on demand. Given such a scenario, the customer plays an important role in the signaling process; the customer is the catalyst from which internal process systems act - customer demand levels signal internal regulation systems.

Now, let us assume that the customer is not only an extension of the JIT system – but acts as a signaling device. In this manner, the customer becomes a functional part of the JIT system. What remains

to be solved is – how, and in what capacity, can the customer act as a signaling device?

Virtual Kanban and Demand Pulling

In the manufacturing industry, a *Kanban* (Aquilano, Chase, and Jacobs, 399) is a card containing all the information required to be performed on a product at each stage along its path to completion and which parts are needed at subsequent processes. These cards are used to control work-in-progress (WIP), production, and inventory flow. A Kanban System will allow for the 'pulling' or required resources when there is demand. The Kanban methodology, in turn, allows a company to utilize JIT production and ordering systems – such practices allow them to minimize their inventories while still satisfying customer demands (Duffy).

When dealing with the production of data, as opposed to physical products, we must rework our Kanban system to take into account the ephemeral components of our production environment. In the place of cards, computer logic triggers implemented at various stages of the service process can be implemented to control the supply and demand

of intellectual property, programming, design and products required to fulfill the service product or contract in question.

The Structuration Model of Technology

The structuration model of technology proposed by Orlikowski (1992) discusses what compels researchers to propose determinism and social construction as mutually exclusive alternatives – as she assumes there exists no dichotomy. Orllikowski then uses structuration theory as Giddens (1984) developed it to show that it is possible for deterministic influences and social constructionist influences to work together over time to create uses of a technology in the organization that are not static, but dynamic. This leads to a more dialectical understanding of the resulting construction because it recognizes the presence of alternately competing and complementary influences, which can vary over time. As a result, the two primary requirements of this model are: 1) technology exhibits a dual nature, and 2) the interpretation (symbolic definition) of technology is flexible.

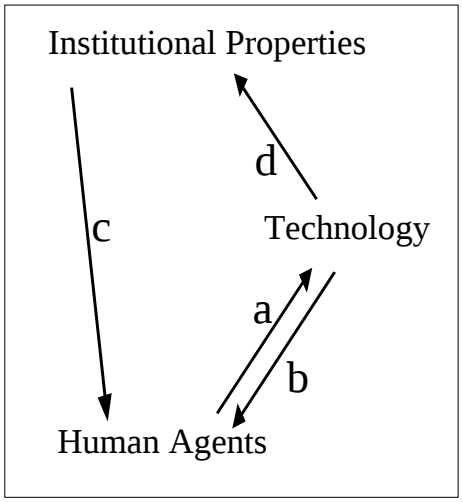
To highlight the differences between models, Orlikowski briefly reviews three prior models of technology (Figure 1):

- The technological imperative considers technology as objective and external with deterministic impacts on organizations.

- The strategic choice model has three variations. This model emphasizes technology as a product of ongoing human action that is driven by different design intentions, shared interpretation, or the political and economic interests of the powerful.

- Technology is considered to act as a *trigger* of structural change, but its influence is determined by the organizational history and context in which the technology is rooted.

As it pertains to this research paper, the structuration model of technology will assist us in developing an objective understanding of technology in terms of a purpose and social construct at Cool Media Networks. In terms of adopting the iMotive™ system as an integral part of the companies Network ERP system, the structurational model will guide our decision process, via an unbiased view of technology and its influences.



Arrow	Type of Influence
a	Technology as a product of human action
b	Technology facilitates and constrains human action through norms
c	Institutional properties influence humans in their interaction with technology
d	Interaction with technology influences the institutional properties of an organization

Figure 1 – Structuration Model (Orlikowski)

What is Internetworking?

A Brief History of the Internet

Transmission Control Protocol (TCP) and Internet Protocol (IP), or TCP/IP, traces its origins to a research project funded by the United States Defense Advanced Research Projects Agency (DARPA), which was created by researchers in the early 1970s. After it had proven to be a success, the ARPANET was an experimental network that was converted into an operational one in 1975.

In 1983, the new protocol suite TCP/IP was adopted as a standard, and all hosts on the network were required to use it – thus the Internet was born. The Internet community consist of a group of individuals and organizations that developed the Internet, create and maintain Internet protocols.

When the ARPANET finally grew into the Internet (with ARPANET having been phased out in 1990), the use of TCP/IP had spread to networks beyond the Internet itself. Many companies have now built corporate TCP/IP networks, and the Internet has grown to a point at which it is considered a mainstream consumer technology.

How Internet Information is generated and propagated

The most common type of network hardware used to generate and carry information is known as *Ethernet* – commonly referred to as a network interface cards (or NICs*)*. In its simplest form, it consists of a single cable with hosts attached to it through connectors, taps, or transceivers. Simple Ethernets are relatively inexpensive to install, which together with a net transfer rate of 10, 100, or even 1,000 Megabits per second, accounts for much of its popularity.

Ethernet NIC come in three flavors: *thick*, *thin*, and *twisted pair*. Thin and thick Ethernet each use a coaxial cable, differing in diameter and the way you may attach a host to this cable. Thin Ethernet uses a T-shaped “BNC” connector, which you insert into the cable and twist onto a plug on the back of your computer. Thick Ethernet requires that you drill a small hole into the cable, and attach a transceiver using a “vampire tap.” One or more hosts can then be connected to the transceiver. Thin and thick Ethernet cable can run for a maximum of 200 and 500 meters respectively, and are also called 10base-2 and 10base-5. The “base” refers to “base-band modulation” and simply means that the data is directly fed onto the cable without any modem. The number at the start refers to the speed in Megabits per second, and the number at the end is the maximum length of the cable in hundreds of meters. Twisted pair uses a cable made of two pairs of copper wires and usually requires additional hardware known as *active hubs*. Twisted pair is also known as 10base-T, the “T” meaning twisted pair. The 100 Megabits per second version is known as 100base-T.

The Internet's Building Blocks: The IP Datagram

Ethernet NICS are used to carry Internet packet information. The IP protocol utilizes a structure known as a an "IP datagram". The function or purpose of the IP protocol is to move datagrams through an interconnected set of networks. Passing the datagram from one Internet module to another until the destination is reached. The Internet modules reside in hosts and gateways in the Internet system. The datagrams are routed from one Internet module to another through individual networks based on the interpretation of an Internet address

IP Datagram Network Information Flow

The Internet sends a datagram along-with Ethernet network address to the local network interface. local network interface for that network to send the datagram.

At the destination host (computer) the local net header is stripped and handed to the Internet module. The Internet module determines that the datagram is for an application program in this host. It passes

the data to the application program in response to a system call, passing the source address and other parameters as results of the call (Figure 2).

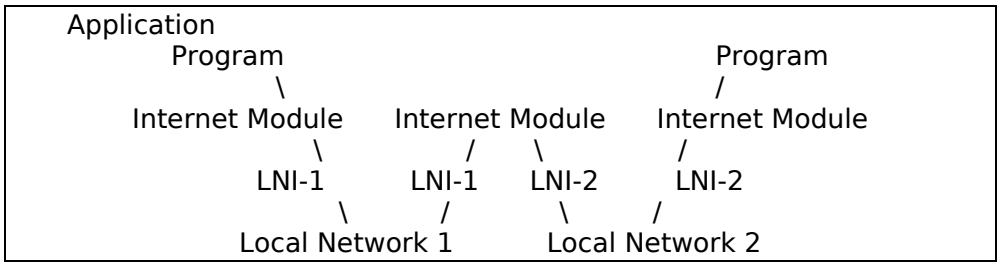


Figure 2 - IP Datagram Application Path (Cisco)

What is Simple Network Management Protocol (SNMP)?

As with Transmission Control Protocol (TCP), SNMP is an *Internet* protocol developed in the early 1970s. The *Simple Network Management Protocol* (SNMP) is a protocol designed to facilitate the exchange of management information between network devices (ie. Ethernet NICs). By using SNMP data network administrators can more easily manage network performance, find and solve network problems, and plan for network growth.

SNMP is the most popular protocol for managing diverse commercial Internetworks as well as those used in universities and research organizations. SNMP-related standardization activity continues even as vendors develop and release state-of-the-art, SNMP-based management applications. SNMP is a powerful protocol presented in trying to manage today's heterogeneous networks.

What are SNMP network object statistics?

An SNMP-managed network consists of three key components: managed devices, agents, and network-management systems (NMSs) (Figure 3).

A managed device is a networked computer that contains an SNMP agent and that resides on a managed network. Managed devices collect and store management information and make this information available to NMSs using SNMP. Managed devices, sometimes called network elements, can be routers and access servers, switches and bridges, hubs, computer hosts, or printers.

An *agent* is a network-management software module that resides in a managed device. An agent has local knowledge of management information and translates that information into a form compatible with SNMP.

An *NMS* executes applications that monitor and control managed devices. NMSs provide the bulk of the processing and memory resources required for network management. One or more NMSs must exist on any managed network.

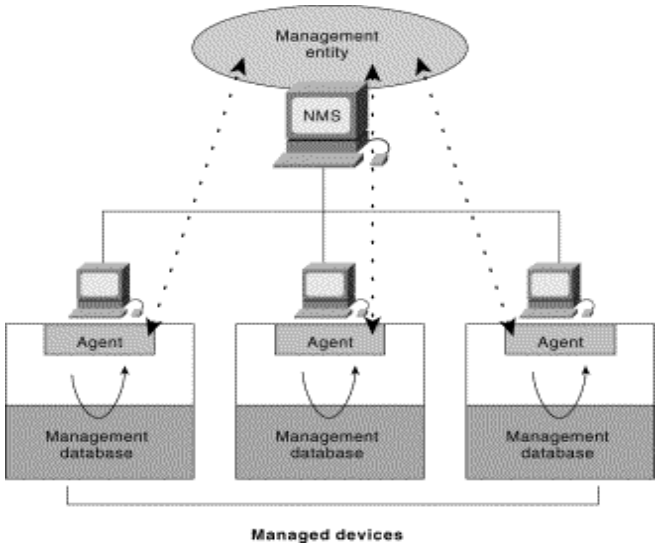


Figure 3 - SNMP Network Management System (Cisco)

As such, the SNMP Protocol is part of the Internet network management architecture, network architecture management and

metric collection is based on the interaction of many entities as described in Appendix II.

What are SNMP based Network Management tools?

As mentioned above, SNMP is an Internet standard for gathering statistics from and managing devices on the Internet such as CPU, disks, network, uptime, users, mail waiting to be read, queue lengths. Below follows a list of three of the most widely used industry SNMP based network management systems:

- **Multi-Router Traffic Grapher** (Oetiker) is a graphing tool that will create web pages showing hourly, daily, weekly and yearly in-bound and out-bound packet traffic on one or many routers/ports.

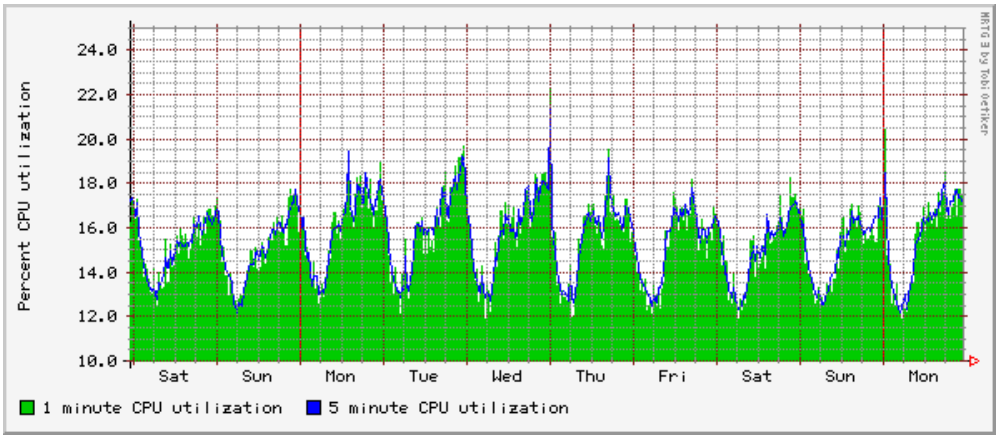


Figure 4 - MRTG Daily

- **SPECTRUM** (Aprisma) is an integrated systems and network management platform. It simplifies and distributes network operations throughout an organization. Its distributed management with true client/server architecture provides unique levels of scalability and flexibility, while Spectrum's Inductive Modeling Technology allows for in-built event correlation, and a true understanding of relationships among network and systems entities.

- **HP Openview** (Hewlett Packard) the information generated by HP OpenView provides network Managers with assurance to

the availability and top performance for networks including, diagnose performance problems using recent and historical data, identification of over- and under-utilized links, understanding how device resources are affecting network performance, document current network performance for internal use and customer service level agreements (SLAs), monitor metrics, and avoid bottlenecks with specific and customized reports

What is The Duality of Network ERP Systems?

Pertaining to our discussion above in our analysis of the structuration model of technology, human actions are enabled and constrained by structures, yet these same structures are the result of previous actions (Figure 1). Structural properties – rules, and resources mediate human action and, at the same time, are reaffirmed through human use. In other words, institutional properties are both the medium and the outcome of interaction.

There is a duality in the nature of Network ERP systems form the perspective of human interaction. The duality is expressed in fact that Network ERP systems are a product of human structuration and a vehicle to promote structure. As we have realized above, this *dualism* is also expressed in the structuration model of technology.

As such, the paradox, which clearly emerges, is that the duality therein is expressed in how technology shapes human action and human action shapes technology.

What is Symbiotics?

In Rajani we find that the *symbionic* mind may be defined as “any apparatus consisting of some useful device, interfaced with the human brain, capable of intelligent action”

Interfacing devices consist of electrodes that measure Evoked Response Potentials (EPs) achieved by measuring minute voltage changes that are produced in response to a specific stimulus like a light, a bell, or a shock but which are of such small amplitude as to not show up on a conventional electroencephalogram (EEG).

What is IP Neurometrics?

Cool Media Network's extends Rajani's theories of Symbionic Neurometrics towards a theory of neurometrics independent of a physical *apparatus-human* interface. Cool Media Networks research postulates that users of a discrete system, such as a network, encode EPs in the form of cognitive signaling as network control, routing, data, and error packets are generated. A one-one relationship exists between human user's action potential and the network - or to paraphrase the immortal words of Marshal McLuhan in the "Medium is the Massage" - the medium evokes the message. An individual emotional state between a user and their network interface exists (at any given time t) - and there is a completely different emotional state(s) between such a user and the other possible connections existing, and interacting, on the network.

How can IP Neurometrics measure qualitative Network Statistics

At the heart of the IP Neurometrics theory, Cool Media Networks postulates that any networked device, for which there is interaction between mind and machine, becomes an extension of the human nervous system (Porrovecchio). As such, IP Neurometrics assumes that the flow of information between mind and machine is captured in a user's typing rate, keystrokes, mouse-clicks, pauses, language, connection rate, source, destination, and many other personal computing environment parameters.

Furthermore, Cool Media Networks postulates that any human user interacting with his/her networked environment interacts with each and every other connected user and any given network – extending the metaphor of a connected mind-machine to the user community.

As such, IP Neurometrics employs a discrete set of transformational inferences, researched models of user computing and networking

behaviors, which translate collected statistics from IP datagram over various IP, based devices and networks. Quantitative IP network data is thus transformed into measurable units of behavior from which a state can be inferred between the user and the networked device or peripheral.

What is iMotive™?

Contemporary computing and communications design is primarily focused on assisting the user with a "friendly" user interface. One aspect of modern communication metrics that is commonly overlooked is how the user feels about such interfaces - monitoring and adjusting the computer interface to users emotional state (as a reaction to such an interface) is a relatively new field.

The iMotive™ toolset extends the metaphor to networked computing devices - or the emotional state of users communicating with other devices. For example let us that a workgroup of 10 users. There is an individual emotional state between a user and their computer interface (at any given time t) - and there is a completely different emotional

state(s) between such a user and the 9 other possible connections they may have with users with that work group.

The iMotive™ toolset monitors the state of the entire network to produce metrics that can interpolate the efficiency of design and productivity of use for such a network.

In turn, such information can give computer analysis and engineers, as well as individual users, the ability to adjust, and fine-tune their network environments.

What critical IP network information Does iMotive™ collect?

IMotive™ collects several pieces of critical IP datagram information in order to interpolate and correlate IP packet data to network behavior. Critical IP packet datagram information includes information from the IP datagram such as packet version number, Internet header length, total length, identification, flags, fragment offset, time-to-live, protocol, header checksum, source IP address, destination IP address, options, and data (Appendix I)

How does iMotive™ interpolate qualitative network measurements?

As mentioned above, IP Neurometrics employs a discrete set of transformational inferences, researched models of user computing and networking behaviors, which translate collected statistics from IP packet data over various IP based devices. Quantitative IP network data is thus transformed into measurable units of behavior from which a state can be inferred between the user and the networked device or peripheral.

Current Network ERP Management Tools vs. iMotive™

Analysis of The Methodology Scorecard

In the Harvard business review, Stewart suggests that the balanced scorecard is most successful when applied as a strategic management and planning tool. In order to quantitatively assess the iMotive ™ versus traditional Network ERP systems our study will employ the methodology of Stewards balanced scorecards, excluding the accounting references (Appendix III).

As we find in Appendix III, the iMotive™ Network ERP system received a weighted score of 90 points on our methodology scorecard - compared to a total weighted score of 67 for the MRTG system.

Attributing factors to iMotive's™ higher weighted score include a dominant riding in the "Visual Reporting" category – scoring a 30 over MRTG's score of 10.8. Although, the "Visual Reporting" category was ranked the 3rd of four categories, iMotive's™ leading score is a reflection of attributes that MRTG, and Network ERP systems like it, does not currently own. As a result attributes within the category have no previous industry precedence. Such a measurement leads to the observation that "Visual Reporting" with attributes that measure network and user "state" is absent in today's Network EPR models and may be used as benchmarks to measure the validity of future Network ERP systems.

iMotive™ is also dominant in the "Data Reporting" category – scoring a 10.8 over MRTG's score of 8.8. "Data Reporting" is the second highest-ranking category, which includes attributes that measure the level of detail in the data collected. We clearly find that the iMotive™ system is reflective of reporting the minutia of Internet traffic details, such as IP latency, and IP source, and destination.

In the highest-ranking category, "Operational Quality" – the scorecard attempts to measure system efficiency, adaptation, and portability. The attributed within this category will collectively measure the inherent

quality of system design – the speed, and efficiency at the core of the system. In this category we find that the iMotive™ system leads by 1.6 points scoring 39.2 over MRTG's score of 37.6. Although a small margin, iMotive's™ lead in the "Operational Quality" category is reflective of its ability to operate on several hardware environments via a web interface, and the customization of user interface.

One category in which the iMotive™ system did not dominate is the "Interfaces Monitored" – which considers the types of devices that each system can communicate with and collect data from. MRTG leads this category scoring a 10.0 over iMotive's™ score of 9.6. MRTG's resultant lead in this category is a direct reflection of its global programming community and the contributions that have been made over time to expand its library of network devices that can be monitored to collect data (Oetiker).

What are we really measuring?

Traditional SNMP based network management tools such as *MRTG* are limited to measuring the state of a networked user interface. The state of the network using such traditional methodology is represented by the collection of quantified interface (i.e. Ethernet) and IP packet

information. Collected data is then circulated through a variety of calculations such as daily averages, mean, high and low bandwidth and Central Processing Unit (CPU) utilization. Visuals are generated in order to graphically present the data in a human-readable format.

Comparatively speaking, the iMotive™ system takes SNMP based network management tools one leap further and enables a network manager to understand the quantitative and qualitative state of the network.

Current SNMP based management tools' measurements and methodology are insufficient to provide a network manager the appropriate arsenal of applications necessary to understand and interpret the fusion of "mind-machine" state of a network infrastructure

How will iMotive™ affect network ERP methodologies and CCQI practices

Effects on Virtual Kanban and Demand Pulling

The iMotive™ IP neuorometric product features and infrastructure consisting of a network linked to inventory data, software programs archive, intellectual knowledge databases, and metrics pertaining the customer's use of iMotive™ product such as network addressing, source, destination, duration of packet life (Appendix I).

As per the operation of the iMotive™ product, the customer will pull data from servers that generate a qualitative analysis, and then push the results back to our server to be processed by interactive web applications. Being able to 'see' the customer using the product (while requesting resources) virtually integrates the 'back-office' and the 'customer interface'

In turn, this gives rise to a new virtual signaling method - the external demand for iMotive™ related data signals internal systems to regulate the amount of bandwidth the company subscribes to serve the product,

adjusts internal database structures, and adjusts the levels of contractual staff needed to support the product

The iMotive™ system promotes the hybridization of technology. The amalgamation of several distinct information systems used for various information gathering and distributing purposes, is utilized to establish communication between subscribers. As such, the iMotive™ system enables and promotes the conditioning of social practices. The iMotive™ system facilitates technology, human action, and social practice as the interpolation of Neurometric behavior drives the metaphor for a connected social “body” in a working technological world.

The complexity of the iMotive™ system is such that the modular software design is capable of adapting to changes in infrastructure. The iMotive™ system delivers interchangeable frameworks of technology that are adaptable and framed to specific human structures. As such the maintenance of the system becomes a simple mapping and translation of the appropriate models.

Effects of Combining Internal and External JIT

Given that the IMotive™ production and JIT systems infrastructure are one in the same no further equipment will have to be purchased to accommodate the implementation and operation of JIT systems. Furthermore, as we find in the Strategic Marketing Plan, Cool Media Networks estimates a 12% annual profit loss, an average annual cost of $1000 per client, due to deficiencies in operations processes a well-defined internal process JIT system will save the company an estimated $10,000 or in operations costs (Cool Media).

The implementation of Virtual Kanban systems will have a direct impact on operations process savings. The introduction of external (customer) JIT will reclaim for Cool Media an added 2% in profit loss or an additional saving of 2% of annual profits.

From an operations improvement perspective, in concept or physical change, the company should consider the effects of disruption to existing services or processes. Typically, a change in technology is the main factor to disruption in employee relations and process disruption. Employee dislocation may reveal itself in initial loss of productivity due to leaning curves, a reduction in employee satisfaction, and diminished communication between management and employees - resulting in resentment and disregard for the value of change. Although it is

imperative that management endorses a common vision, philosophy, and objectives, the top-down communication theory does not scale to the continuous improvement (CI) model - an order to promote continuity within the framework of an organization, commitment to improvement must follow a 'top-down' and a 'bottom-up' communication path - communication must function in parallel.

How will iMotive™ affect B2B and B2C ERP?

IMotive™ strengthens interaction with technology and influences the institutional properties of our organization. The influence is more likely to be a reinforcing rather than a transforming one. Human interaction with technology via iMotive™ at Cool Media reinforces practices and overall company operational vision.

Application of the iMotive™ Network ERP Model

The uniqueness that accompanies Network ERP applications, in comparison to other forms of productivity tools, is the focus on the enterprise as an entity. Many office productivity tools either support one specific function and/or fail to recognize the need to integrate processes.

Furthermore, employing Network ERP methodology and practices encourages businesses to adapt to business standards when interacting with other business entities in their supply chain.

There is a duality in the nature of Network ERP systems form the human interaction perspective. The duality is expressed in fact that Network ERP systems are a product of human structuration and a vehicle to promote structure. As we have realized above, this *dualism* is also expressed in the structuration model of technology.

As such, the paradox, which clearly emerges, is that the duality therein is expressed in how technology shapes human action and human action shapes technology**.**

The iMotive™ system has been transparent to users. As iMotive™ utilizes network infrastructure to enable the Network ERP system, there are no specific applications that the user must spend time on retraining. The iMotive™ Network ERP system utilized existing client interface technologies such as web browsers, and is stable usable technology across computing platforms.

Cool Media Network's organizational culture gave the iMotive™ Network ERP system a clear advantage in terms of its application and success. The promotion of non-proprietary client applications and the acceptance of user-initiated technology learning, complements the horizontal organizational structure. The horizontal organizational structure enables technology flow more smoothly than a vertical one, as Network ERP systems must cross functions.

The iMotive™ system changed our organization by establishing a unified technology infrastructure. It is the opinion of the author that the unified infrastructure is essential to the enabling of across-the-board technologies that assist in establishing an ERP system.

Secondly, a clear and distinct shift in employee attitudes was observed with respect to the organization itself. The iMotive™ Network ERP

system infrastructure promoted a comradery amongst the employees – the Network ERP system spoke via, metaphorically speaking, and employee participation.

Reduced Bandwidth Costs

The iMotive™ Network ERP system enables JIT methodology and practices by enabling a user to subscribe to only that bandwidth which is needed - as requested by the user's network application(s) usage. In this manner the enterprise network bandwidth subscription is transformed into a dynamic process rather than static one. Of note, participating Internet Service Providers (ISPs) will require to adopt similar bandwidth reservation and billing systems to accommodate the iMotive™ infrastructure.

Increased Network Scalability

As the iMotive™ system is not of a static nature, network upgrades, or downgrades, are more efficiently planned and executed. The iMotive™ system offers can be run regardless of underlying network hardware changes as the iMotive™ network ERP system operates independently of the proprietary network hardware technologies.

Decreased Network Down-Time

In a business environment in which loss of connectivity and access to networking resources can translate to loss or revenue, the issue of network unavailability or “down-time” is mission critical. The iMotive™ system reduced the probability of downtime by offering visual reports of user and network states in an effort to empower network administrators with network “forecasting” tools. As such, administrators are capable of planning ahead and avoiding operational roadblocks.

Increased Network Portability

As was mentioned above the iMotive™ system is not bound to any particular network hardware technology. Rather, there exists independence between the hardware and the System. Conversely, the iMotive™ system allows for network migration. In the event of a company relocation, or network hardware upgrade, the network is independent of the iMotive™ system and, as such, inherits a “portable” quality.

Increased User Productivity

As we have discovered, the iMotive™ network ERP system enables the user to monitor the state of network activity as it pertains to hi or her qualitative state – the neurometric translation of evoked user response messages onto the network. As such, iMotive™ provides feedback which can be useful to monitor and adjust bandwidth levels, behavior, and productivity.

Strengthen Commitment to TQM and CCQI

The iMotive™ Network ERP system methodology and practice is based on the principles of JIT and lean systems – the use of signaling to continuously produce enough product to meet demand. As such, the iMotive™ system extends traditional ERP methodology, as discussed above, to include the customer of network services into the supply chains model – thus an active participation and commitment to service quality in the form of CCQI.

Recommendations

Based on our analysis of the iMotive™ ERP system at Cool Media Networks the following recommendations are suggested for consideration of senior management:

- Cool Media should adapt the JIT model for efficiency and lean systems operation by organizing problem solving groups into functional units that report to each other, organize our work areas and online user profiles and resources, maintain process standards by using specialized document revision software, simplifying process flows by working in a parallel manner, constantly assess and revise technology as it translates to our environment,

- Avoid service delays caused by inefficient processes by synchronizing demand with supply, streamline activities and avoid process duplication by integrating our customer service and inventory systems database,

- Implement a hybrid JIT concept: combine external JIT and Continuous Customer Quality Input (CCQI) utilizing existing

iMotive™ product delivery infrastructure. - Thus creating a customer process network that aids the internal JIT process. In order to ensure the efficient operations of the JIT model Cool Media will cycle JIT and CCQI between the internal company system and the external customer operations processes. The hybrid system will produce what the customer wants, exactly when the customer wants it.

- Introduce Virtual Kanban (demand-pull scheduling) in the form of a data signaling systems embedded into the iMotive™ network infrastructure. This may also require Simulator software in order to predict the customer demand, as well as the establishment of strong associations to our customer network

- Implement employee Cross Training and Total Quality Management as a prime company campaign. Introduce each step of the hybrid JIT system in small incremental changes as to not overwhelm employees and excising operations processes.

- Utilize the iMotive™ system infrastructure to generate process reports for internal operations efficiency auditing.

- The *iMo*tive™ system of Network-ERP requires ample network resources. It is recommended that Cool Media secure network bandwidth to increase network infrastructure.

- Promote user initiated client technologies to participate in the ERP system.

- Establish a distributed support system for the *iMo*tive™ ERP system.

- Allow the dualism to flow - do not resist the deterministic aspect of technology nor the social influence.

- Create policies and procedures to ensure ERP practices

- Develop methodology for measuring the effeteness of the ERP system

- Build Network-ERP systems to suite a framed technology model

- A properly implemented ERP system promotes solidarity as participation in the business

- Introduce Network-ERP systems into the workforce as technology infrastructure changes

- Promote the Network-ERP system adaptation to companies associated with Cool Media Networks

Conclusions

Given our analysis of the ERP applications at Cool Media Networks, from within a theoretical framework, we have identified key aspects of the implementation of the structuration model of technology. We have discovered that Cool Media Networks endeavors to develop a meaningful application of the dualistic theory of the objectivity and technology and the internal organizational culture that shapes technology. As such, we have identified the distinct features of the iMotive™ Network-ERP system as a system that fits the structuration model of technology and promotes ERP practices. Using Orlikowski's Duality *of Technology* we gain a vital understanding of the *structuration* model of technology as it relates to Network-ERP.

Integrating existing electronic capabilities of the iMotive™ product infrastructure will enable Cool Media to generate a product/customer driven operations efficiency process system. Given the technological complexity and cost structure of the iMotive product, it is imperative that production processes and cost are kept streamlined.

Adopting a hybrid JIT model consisting of internal and external process efficiency modeling, utilizing virtual Kanban systems, virtual signaling

methodology - the external demand for iMotive™ related data signals internal systems to regulate the amount of bandwidth the company subscribes to serve the product, adjusts internal database structures, and adjusts the levels of contractual staff needed to support the product - will reduce operation costs.

Furthermore, internal JIT Processes will consist of developing problem solving groups into functional units that report to each other, organize work areas and online user profiles and resources, maintain process standards by using specialized document revision software, simplifying process flows by working in a parallel manner, constantly assess and revise technology as it translates to our environment.

The combining of internal and external JIT systems gives rise to the notion of "Continuous Customer Quality Input (CCQI)" - the customer acts an integral part of the operations process system. As a result, further to a company being committed the quality and Continuous Improvement (CI) of customer service processes and procedures - the customer (by default) becomes committed to customer service quality. In this manner, customer service can be delegated (in part) to the customer - adding a self-serving dimension as direct a result of hybrid JIT processes.

The Future of Network ERP: Managerial Implications of the iMotive™ Model

Industry analysts expect that every major service company will purchase ERP software, which ranges in cost -with maintenance and training - from hundreds of thousands of dollars for a small company to millions for a large company. AMR Research of Boston says consolidation among the major players will continue and intensify. ERP vendors are expected to put more effort into e-commerce, CRM and SCM initiatives, with leaders redirecting between 50% and 75% of their R&D budget to these projects (AMR Research).

According to Gartner research group, the rapid evolution of ERP has already lead to a new corporate must-have, ERP II, which is supposed to help businesses gain more competitive edge in the future. The major difference is that ERP II involves collaborative commerce, which enables business partners from multiple companies to exchange information posted on eCommerce exchanges (Leung).

As such, Cool Media Network-ERP is positioned to provide a competitive solution to eCommerce infrastructure.

The managerial implications of the uniqueness of Network-ERP system is one of diligent planning in adapting the development, and implementation of ERP systems in a direction that best suits the given work-environment.

Management is encouraged to increase the network infrastructure to accommodate Network-ERP systems. The future of Network-ERP will require and network planners to increase their understanding of technology infrastructure and process management.

Furthermore, managers must frame technology accurately to their business environment. As such, Network-ERP implentation will enhance the current state of ERP.

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Appendix I: IP Datagram Structure

The following tablet outlines basic Internet Protocol (IP) datagram structure.

Version (4 bits)Internet Header Length (4)Type-of-Service (8)Total Length (16)Identification (16)Flags (3)Fragment Offset (13)Time-to-Live (8)Protocol (8)Header Checksum (16)Source IP Address (32)Destination IP Address (32)OptionsData

Appendix II – SNMP: Internet Management Model

As specified in Internet RFCs, an SNMP network management system comprises:

- ***Network elements*** - are hardware devices such as computers, routers, and terminal servers that are connected to networks.

- ***Agents*** - are software modules that reside in network elements. They collect and store management information such as the number of error packets received by a network element.

- ***Managed object*** - is a characteristic of something that can be managed. For example, a list of currently active TCP connections in a particular host computer is a managed object. Managed objects differ from variables, which are particular object instances. An object instance is a single active TCP connection in a particular host computer. Managed objects can be defined a single object or multiple, related instances.

- **Management Information Base (MIB)** - is a collection of managed objects residing in a virtual information store. Collections of related managed objects are defined in specific MIB modules.

- **Syntax notation** - is a language used to describe a MIB's managed objects in a machine-independent format. Internet management systems use a subset of the International Organization for Standardization's (ISO's) Open System Interconnection (OSI) Abstract Syntax Notation 1 (ASN.1) to define both the packets exchanged by the management protocol and the objects that are to be managed.

- ***Structure of Management Information*** **(SMI)** - defines the rules for describing management information. The SMI is defined using ASN.1.

- ***Network management stations*** **(NMSs)** - execute management applications that monitor and control network elements. NMSs are usually engineering workstation-caliber computers with fast CPUs, mega pixel color displays, substantial memory, and abundant disk space. At

least one NMS must be present in each managed environment.

- ***Parties*** - is a logical SNMPv2 entity that can initiate or receive SNMPv2 communication. Each SNMPv2 party comprises a single, unique party identity, a logical network location, a single authentication protocol, and a single privacy protocol. SNMPv2 messages are communicated between two parties. An SNMPv2 entity can define multiple parties, each with different parameters. For example, different parties can use different authentication and/or privacy protocols.

- ***Management protocol*** - is used to convey management information between agents and NMSs. SNMP is the Internet community's de facto standard management protocol.

Appendix III – Methodology Assessment Matrix

Methodology Scorecard							iMotive		MRTG	
Themes	**Attributes**	**Theme Wt. %**	**Attribute Wt.%**	**Overall Att. Wt.%**	**Definition of Attributes**	**Questions** Legend for Raw Score : 0=non-compliant 1=non-compliant, has some elements 2=compliant, with most elements 3=compliant 100%	**Raw Score**	**Wt. Scores**	**Raw Score**	**Wt. Scores**
						TOTAL Score		**90**		**67**
Data Reporting		25					*0-3*		*0-3*	
A measure of bandwidth rarte in bits	Rate in Bps		1	0.4		Rate in Bps	2	0.8	3	1.2
A measure of bandwidth rarte in packets	Rate in Pps		1	0.4		Rate in Pps	2	0.8	3	1.2
Enables users to a snapshot view	5 minute average		1	0.4		5 minute average	1	0.4	3	1.2
Enables users to a snapshot view	1 hour average		1	0.4		1 hour average	2	0.8	3	1.2
Enables users to a snapshot view	Daily average		1	0.4		Daily average	3	1.2	3	1.2
Access to archived data	Yealy average		1	0.3		Yealy average	3	0.8	3	0.8
The time for packets to arrive at dest.	IP Packet Latency		1	0.4		IP Packet Latency	3	1.2	1	0.4
Where network traffic originates	IP Packet source		2	0.8		IP Packet source	3	2.4	1	0.8
Where network traffic end-up	IP Packet destination		2	0.8		IP Packet destination	3	2.4	1	0.8
						Subtotal - Data Reporting Score	**22.0**	**10.8**	**9.0**	**8.8**
Interfaces Monitored		15								
Measure local network activity	Ethernet		1	0.4		Ethernet	3	1.2	3	1.2
Measure interface of large networks	ATM		2	0.8		ATM	3	2.4	3	2.4
Measure keyboard or mouse activity	Serial		2	0.8		Serial	2	1.6	3	2.4
Common to all computers	USB		1	0.4		USB	2	0.8	3	1.2
Measure network printer activity	Printer		3	1.2		Printer	2	2.4	2	2.4
Measure wireless internet connections	Wireless		1	0.4		Wireless	3	1.2	1	0.4
						Subtotal - Interfaces Monitored	**9.0**	**9.6**	**15.0**	**10.0**
Visual Reportig		20								
Qualitative state of all network traffic	Network State Meter		4	1.6		Network State Meter	3	4.8	0	0.0
Qualitiative state of user groups	User Group State meter		5	2.0		User Group State meter	3	6.0	0	0.0
Qualitative state of user	User State Meter		5	2.0		User State Meter	3	6.0	0	0.0
Quantitative measutes of daily traffic	Daily averages		4	1.6		Daily averages	3	4.8	3	4.8
Quantitative measutes of in/out traffic	incoming/outgoing traffic		4	1.6		incoming/outgoing traffic	3	4.8	3	4.8
Visual representation of network	Network Topology		3	1.2		Network Topology	3	3.6	1	1.2
						Subtotal -Visual Reporting	**16.8**	**30.0**	**0.0**	**10.8**
Operational Quality		40								
Programming System efficenty	System Design		6.0	2.4		System Design	2	4.8	2	4.8
Speed at which data is interpolated by systen	Data Processing Speed		6	2.4		Data Processing Speed	2	4.8	2	4.8
Speed at which visuals are generated	Graphics Processing Speed		6	2.4		Graphics Processing Speed	2	4.8	3	7.2
Can the System operate on any hardware?	Computing Platform Independenc		7	2.8		Computing Platform Independence	3	8.4	2	5.6
Can the System be accessed over the web?	Web enabled		7	2.8		Web enabled	3	8.4	3	8.4
Are System visuals customizable?	Reporting Style Sheets		3	1.2		Reporting Style Sheets	2	2.4	1	1.2
Is the system easy to build-upon?	ERP Scalibility		7	2.8		ERP Scalibility	2	5.6	2	5.6
						Subtotal - Operational Quality	**22.8**	**39.2**	**22.4**	**37.6**
		100								

