INVESTIGATING EFFECTIVE INFORMATION INTERCHANGE WITHIN VIRTUAL ORGANIZATIONS: INTRODUCING THE MERiSII MODEL

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ABSTRACT

The innovative advancements of information communication technology (ICT) combined with a globalized economy have given rise to organizational forms that manipulate time and distance. Today, competitive advantages are more elusive than tangible as a result of dynamically complex environments motivating organizations to adjust in structure and functional capacity. New emergent forms of organizational structures have resulted in the virtual organization (VO), which employs a network structure and allows organizations the flexibility to perform core processes amongst distributed teams, units, departments, and/or organizations. In essence the virtual organization may be viewed as a strategic response to dynamic environmental forces that have encouraged organizations to rethink the concept of competitiveness. Virtual organizations have gained popularity throughout the last decade as a more effective way of managing and communicating information within and across organizations. Information communication technology (ICT) has aided in the globalizing effect of informationalism. The informational flows within a virtual organization have direct bearing on individual and group efforts to obtain and employ information essential to organizational objectives. This thesis investigates the information interchange within virtual organizations through a theoretical study, which converges identified relevant subject areas and introduces the Media Rich Social Information Interchange (MERiSii) model. The empirical study is designed to further investigate the validity of theoretical concepts employed in the MERiSii model and to expand its development to facilitate the function of information interchange. VGR-IT is an IT infrastructure provider, for hospitals and healthcare facilities in the Västra Götaland region of Sweden. Interviews conducted with an account manager for VGR-IT and an IT strategist for Borås Hospital give insight into the communicative tasks of information interchange that must be effective to support the core processes within VGR-IT and the service VGR-IT provides to Borås hospital. The results of a comparative analysis between the theoretical and empirical studies support a revised MERiSii model that may be implicated in future research to further verify its effectiveness.

Keywords: Virtual organization, Information interchange, Media richness, Socio-technical systems, Computer-mediated communication (CMC).
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INTRODUCTION

1.1 Background

The innovative advancements of information communication technology (ICT) combined with a globalized economy have given rise to organizational forms that manipulate time and distance. Today, competitive advantages are more elusive than tangible as a result of dynamically complex environments motivating organizations to adapt in structure and functional capacity. New emergent forms of organizational structure have resulted in the virtual organization (VO), which allows organizations the functionality to perform core processes amongst distributed teams, units, departments, and/or organizations. Thus the virtual organization may be viewed as a strategic response to dynamic environmental forces that have encouraged organizations to rethink the concept of competitiveness. Virtual organizations have gained popularity throughout the last decade as a more efficient way of managing and communicating information within and across organizations. Ernest, (1994), as cited in, (Castells, 1996) identifies that organizational needs coupled with technological advancement establishes virtual organizations as a competitive equalizer. Ahuja & Carley, (1998: 0) define a virtual organization as, “a geographically distributed organization whose members are bound by a long-term common interest or goal, and who communicate and coordinate their work through information technology.” Several alternative structural forms have been identified as virtual or network type organizational structures when in essence every form of organization maybe structurally defined as a network. The information flow within a virtual organization has direct bearing on individual and group efforts to obtain and employ information essential to organizational functions, under this logic networks are created and maintained for strategic purposes.

Virtual healthcare organizations are being implemented at a high rate due to the potential benefits to the stakeholders, healthcare staff, patients, and community, however many challenges have been encountered in their implementation. Pirnejad, Bal, Stoop & Berg (2007) conducted research on a Dutch ICT project that was initiated to develop a national communication healthcare network. A myriad of challenges were identified as hindering implementation of the Netherland virtual healthcare network (VMN). Pirnejad et al (2007) concluded that in an effort to achieve successful implementation a virtual healthcare network would have to utilize both a centralized and decentralized approach to cultural, financial, technical, political, ethical, and organizational dissimilarity issues.

Gibbons (2007) confirms that better comprehensions of healthcare networks are necessary, yet research efforts are hindered by the complexity of network expanse, data cost, and evaluating complete systems for comparative studies. Research pertaining to organizational networks has contributed to the formulation of healthcare networks but is deficient at establishing measurable standards and actionable guidelines for network evolution (ibid). The average propensities of affiliate organizations to participate in
alliance with other network members support information interchange. Here, Gibbons (2007) also identifies network structure as crucial to information flow where subgroups with fully connected network structures have shown to be more efficient.

Informatics is an academic field of study that combines many heterogenous disciplines that utilizes IT and information management tactics to enhance process effectiveness. These disciplines include information technology, computer science, information science, and social science, etc. Virtual organizations have evolved as a result of restructuring the way organizations communicate, manage information, and achieve primary processes. This evolution directly relates to advancements in information communication technology (ICT), which is a core concept in sustaining relationships and communication within an organization that is virtually structured. Research that has the potential to accelerate network effectiveness within organizations also holds the capacity to influence various strands of informatics research benefiting both academics and practitioners.

1.2 Statement of Problem

Today virtual organizations often function as information repositories for centrally located or globally distributed organizations. The information disseminated within these organizational networks directly impacts the effectiveness of organizations. Some organizations have proven to maintain effective virtual structures that support competitive advantages while others fail to acquire such effectiveness. A key factor to achieving success in business is communication. Aside from the physical constraints present in organizational infrastructure, technology, and environment a common denominator that remains consistent as well as a fluctuating variable is the social agent. By investigating the social and technical models of organizational communication the potential exist to rectify ambiguities and in doing so it will contribute to the body of knowledge used in the evolution of virtual organizations.

When individuals organize to address a communal goal they often form networks; networks that utilize communication for the interchange of information and knowledge. The survival of organizations today hinges on their flexibility to respond to threats and seize emergent opportunities. Virtual organizations are in large supported and sustained by innovations in ICT that enable organizations to exploit time and location barriers and better facilitate knowledge management. Many strides have been made towards transforming the traditional organization of yesterday into the virtual organization of today.

1.3 Purpose of study

Many virtual organizations have proven to foster environments that achieve effective information interchange (Christie & Levary, 1998). However, all organizations are not created equal, while some virtual organizations achieve effectiveness others are insufficient at reaching their optimal potential. Thus the aim of this study is twofold to create an understanding for essential characteristics that may encourage effective
information interchange in virtual organizations and to develop a theory based model that may be employed to facilitate the function of information interchange.

1.4 Research Questions

What factors encourage effective information interchange within virtual organizations?

Sub-questions:

a. How does the method of communication affect network effectiveness?

b. How does flexibility affect network effectiveness?

c. What socio-technical determinants affect communication within virtual organizations?

d. What aspects of network and organizational structure must be present to facilitate network effectiveness?

1.5 Target Group

Groups that may find research of virtual organizations beneficial are: Academic Researchers (where the results may inspire, support, or refute past and future academic research), Healthcare Professionals (where the results may improve the concept of virtual organizations in healthcare settings), System Developers (where the results may aid in more effective information systems), Network Designers (where the results may improve the physical and logical network structure within VOs), and Business Organizations (where the results may help transform organizational structure to achieve greater effectiveness).

1.6 Delimitations

Delimitations of this research arise from the fact that virtual healthcare organizations were the intended organizational type. However due to unforeseen circumstances an organization that provides IT infrastructure to healthcare organizations became the primary focus. Therefore issues such as network flexibility, methods of communication, network structure, and organizational structure will be representative of the virtual organization introduced in the empirical study. Information interchange examined in this research is limited to a textual analysis and is not statistically calculated, measured, or graphically mapped.

1.7 Expected Outcome

The expected outcome of the research is to:

• Identify determinants of effective information interchange within virtual organizations.
• Identify what aspects of organizational structure are needed to achieve organizational effectiveness.
• Identify consistent concepts in both theoretical and empirical studies.
• Develop a conceptual model of information interchange within virtual organizations based on the identified theoretical concepts.

1.8 Experience and Background of Author

The author comes from a Computer Information Systems (CIS) background. Like the study of Informatics CIS is a convergence of business and information system courses. In business studies the dominating perspective is an organizational perspective giving a clear understanding of organizational concepts. The author has also shown an interest for and has had a concentration of his studies directed towards network administration. A common concern that continues to reemerge is how to ameliorate healthcare organizations that deliver effective service within acceptable economical boundaries. In Sweden a universal public healthcare policy is in place that is regulated and facilitated by government funding. In the author’s native country of the United States, healthcare reform is a major issue. The proposed U.S. National Healthcare Act currently pending would more resemble universal healthcare policies found in many countries today. Understanding that healthcare contributes greatly to the U.S. national deficit it would be viable to look towards Sweden’s successful healthcare as inspiration. There appears to be a global consensus to lessen the economical burden of healthcare by managing financial provisions more efficiently and effectively.

1.9 Thesis Structure

The purpose of (Figure 1) a thesis structure model is to illustrate the structure, concepts, and chapters of the research thesis. Chapter 1 covers the background study of the research phenomenon and establishes a conceptual framework. The background study is employed to develop the main research question supported by four sub-questions. Together the background study and the research questions directly influence the research design presented in chapter 2. As depicted, the research design is a case study in which in-depth interviews and documents are used as data generation methods. The data returned is evaluated through a comparative analysis technique. In chapter 3 the theoretical study is presented, the presentation consists of key concepts, relevant research, previous research, sub-areas for relevant topics, and the results of the answered sub-questions. In chapter 4 the empirical study is presented, the presentation consists of the case background, data generated through interviews and documents, and the results of the answered sub-questions. In chapter 5 a comparative analysis is applied to the results of the theoretical and empirical studies followed by a summary. The last and final chapter holds the discussion, here the conclusion to the research is presented and the research as a whole is evaluated.
Figure 1: Thesis Structure Model (Hall, 2010)
2 RESEARCH DESIGN

2.1 Research Perspective

Theoretical paradigms are pivotal to comprehending the overall perspective from which research is designed and conducted (Krauss, 2005). Traditional scientific research has fundamentally been approached from a positivist perspective. The positivism paradigm, termed the scientific method, represents the traditional perspective to research (Oates, 2006). Positivism is a theoretical framework that examines the social world through the same lens as applied to the natural world where time and context-free generalizations are quantitatively measurable (Nagel, 1986). The positivist approach contends that all legitimate knowledge evolves from a process of deductive reasoning where theory leads credence to scientific observation. Positivist organizational theories have appeared the last few decades to address the complexities posed by organizations, however, the positivist perspective poorly addresses the social challenges pertaining to human agents encountered in organizational research (Lee, 1991).

Interpretivist and positivist paradigms contrast substantially because of differences in approach that are evident in research ontology, epistemology, and methodology. The theoretical framework underpinning this research is of the interpretivist paradigm. From an interpretivist perspective the knowledge of reality is viewed as being a social construction interpreted by human agents (Walsham, 2001), and Bogdan & Biklen (1998: 22) define paradigm as, “A loose connection of logically related assumptions, concepts, or propositions that orient thinking and research.” The research thesis argues for the use of an interpretivist perspective, which has shown considerable benefits for IS research when applied to the study of organizations. The social context of a research study holds value and is best interpreted when the results are subjectively reasoned (Bhattacharya, 2008). Subjective information is more closely associated with interpretivism and objective information to that of positivism. The use of subjective information here is construed as, “ideas, structures or pictures imputed to reality by people” (Dervin, 1977: 16-32). Considering the thesis aims to explore the social aspect of a phenomenon virtual organizations may be best understood when researched from an interpretivist perspective as suggested by (Orlikowski & Baroudi, 1991).

Interpretivist researchers attempt to comprehend phenomena based on an interpretation of meanings that result in subjective understanding (Orlikowski & Baroudi, 1991). Ontological beliefs respond to the philosophy of reality related to the phenomena under observation (Krauss, 2005). The ontological perspective of interpretivism assumes that the world as we understand it is inter-subjectively constructed from our subjective experiences and social reality (Bhattacharya, 2008). From an interpretivist perspective the phenomenon of virtual organizations is subjective and exists through human interaction; the intentionality ascribed to human activity is governed through dynamic social interconnections (ibid). Organizational studies are increasingly carried out from an interpretivist perspective through interpretivism (Orlikowski & Baroudi, 1991) this may be viewed as evidence reinforcing the assumption that organizations represent governed social systems defined by subjective human activity. Here the epistemological stance
applied to the investigation of virtual organizations is hermeneutic in essence with the understanding that we cannot detach ourselves from what it is that we know (Freeman, 2008). The theoretical lens a researcher uses to approach a phenomenon is deeply entwined with the ontological assumptions of the researcher and thus influences the methodology that will be employed (Dobson, 2002).

Research conducted under interpretivism may generate either qualitative or quantitative data. The argument posed here for the use of qualitative data is based on an understanding that interpretivism uses inductive methods to construct concepts and theories from detail. Qualitative data is descriptive where specific interest is shown in the process, meaning, and understanding obtained from words. In the case study conducted qualitative data will be generated through the triangulation of in-depth interviews and the literature review of second hand documentation. The character of knowledge created from this investigation is exploratory which proposes to understand the phenomenon and will potentially illuminate determinates that encourage network effectiveness within a virtual organization.

2.2 Research Strategy

2.2.1 Case Study

The proposed research strategy is a case study, which is a key method employed within qualitative research. At the inception of modern social science case studies were essentially the primary research strategy (Blatter, 2008). A research case is used to construct a comprehensive representation of the instance under investigation where the case is an empirical inquiry appropriate to investigate one or a few individuals, groups, or a phenomenon (Mayoux, 2001).

The case is an in depth study which employs several data generation methods that may be used individually or in triangulation. The most common data generation methods of studying cases are interviews, observations, documents, or questionnaires (Oates, 2006). Just as the relevance of interpretivist research often encounters opposition so have case studies as a research strategy. However, researchers that reject the validity of interpretivist cases often are advocates for positivist ideologies and traditional scientific methods of research. Such limited views lend stagnation to research that attempts to understand social phenomena; positivist research is traditionally carried out in experimental environments yielding static results that have limited bearing on social issues (ibid). Case studies, on the other hand, are generally conducted in everyday environments and yield interpretive results, which allows for subjectivity.

Although case studies have received some criticism for not being rigorous enough, they have shown to possess value outside of preconceived scientific bounds. Case studies have shown value in the realm of academics as an educational tool. It should be noted that case studies were transformed from being a positivist research tool to being a pedagogical strategy in social learning (Blatter, 2008). In organizational research case studies are commonly employed as a chosen research strategy. The investigative data generation methods of in-depth interviews and documents are both consistent with case studies. Like most qualitative methods case studies are holistic, interpretive, and recognize multiple
realities. They generally answer questions that investigate what is occurring, why it is happening, and how can it be improved. In case-centered research approaches case studies are often used in conjunction with comparative analysis (Blatter, 2008).

The theoretical study will be used to subsequently develop the conceptual model and establish answers for the research questions when the theoretical results are presented. The conceptual model developed in the theoretical study will be substantiated as a result of the empirical research, which will also answer the research questions. In chapter 5 a comparative analysis will be conducted on the results of both studies where (if any) inconsistencies may be illuminated. Here an expansion of the conceptual model will be presented based on the results of the comparative analysis.

2.3 Data Collection Procedures

Data generation techniques provide us with an opportunity to methodically gather information pertaining to a research phenomenon. The data generation techniques selected for this study exploring virtual organizations are interviews and documents. The data generation technique of interviewing employs a one-way dialogue, where interview questions are structured around a determined research topic. The technique of reviewing documents will comprise of prior empirical research addressing information interchange within virtual organizations and any organizational documents pertinent to information sought in this research. A triangulation data generation method of interviews consolidated with reviewing of documents establishes a greater degree of data validity (Oates, 2006) and is widely used in case studies.

2.3.1 Sampling

Sampling is the process in which data sources are selected from an array of possibilities. This process is comprised of two components: (1) defining the data source population, and (2) selecting the actual data sample from that population. Sampling is proposed for the purpose of efficiency where selecting a sample from a data source is more refined than selecting data from an entire population (Morgan, 2008). Interpreting the population means determining eligible criteria from which data can be studied where the total population for a given data source is recognized as defining sample frame (ibid).

Defining the overall population is achieved through purposive sampling, which is the process of identifying a set of appropriate conditions present in the considered research population. In applying purposive sampling the researcher relates an understanding of the magnitude of possible choices in relation to where, how, and with who research is conducted (Palys, 2008). This implies that the method employed for selecting a sample must be directly connected to the research objective. Purposive sampling characteristics embrace objectives such as small sample size, social perspectives, and subjective realities that are ever present components of qualitative research (ibid).

The strategy used here for implementing purposive sampling is typical case sampling. Typical case sampling is achieved by way of exploring cases that represent diverse
positions and perspectives of the research phenomenon this sampling strategy consist of selecting a case that it is not unusual and thus can be subject to generalization (ibid).

### 2.3.2 Interviews

An interview is an arranged meeting between an interviewer and informant; the interview has a specific structure and purpose defined by the interviewer prior to the interview. More often than not an interview is a data generation technique elicited for the purpose of extracting qualitative data (Ayres, 2008). Qualitative data generating techniques such as interviews attempt to expose knowledge based on the informant’s actual experiences and perspectives (Kvale, 1996).

Individual qualitative interviews allow for a greater sense of openness that may inspire informants to expose details and feelings, which may not be disclosed in a group interview. Individual in-depth interviews usually exposes details that upon analysis give rise to new or varying characteristics that may prompt new interviews based on more relevant questions (Johnson, 2002). Qualitative interviews are generally categorized in (3) structures unstructured, semi-structured, and structured (Bloom & Crabtree, 2006). With the focus of extracting qualitative data a semi-structure interview technique was chosen for this study. Semi-structured interviews generally consists of open-ended question they may elicit additional questioning depending on what is uncovered.

Research questions for semi-structured interviews are not random but identified as sharing a direct relation to the research topic, developed into an appropriate structure for open-ended questions, and selected by level of relevancy. The interview questions should remain consistent in relevancy and appropriateness for the targeted informant. The purpose of open-ended questions is to encourage informants to discuss what they feel is relevant. Open-ended question may lead to digression from the topic. The interview questions should therefore be structured in a way that allows for elaboration while retaining focus of research objectives. The arrangement of the open-ended questions form a funnel structure, which consist of both broad and focused questions where the interview is initialized with broad questions and move towards more focused ones as the interview progresses (Ryan, Coughlan & Cronin, 2009). The qualitative data compiled from the empirical study will be filed, processed, and categorized.

### 2.3.3 Documents

Documents often function as pivotal sources of social scientific data (Prior, 2008). As a data generation method documents may be divided into two categories: found documents (primary data) and research generated documents (secondary documents) (Oates, 2006). Such documents maybe produced by individuals, organizations, publications for a number of purposes. In addition to a textual data source documents may include other data source categories such as visual data, aural data, and electronic data. Documents have proven beneficial in regard to being economical and convenient, easily scrutinized for credibility, and providing researchers access to data that allow for longitudinal studies (ibid).
Documents used in this thesis fall within both categories of found and research generated documents. The found documents reviewed were produced by VGR and VGR-IT in conjunction with IBM and CA Technologies. These documents were produced for the purpose of highlighting successful implementation of various information and system technologies developed by specific vendors and concepts in practice at VGR-IT such as information technology infrastructure library (ITIL). In the empirical study data obtained through interviews was corroborated with found documents. Since VGR-IT is a subsidiary of a government agency most documentation developed for the organization exist within the public domain allowing such documents to be accessed via a web search. In the evaluation of found documents it is considered that documents have been created by individuals or organizations with vested interest that target a particular audience. Such documents have been utilized mainly for descriptive information relating to VGR-IT that can be validated.

Documents used in other areas of the thesis are research generated. Multiple relevant subject areas exist within the phenomenon of virtual organizations; documents analyzed in the theoretical study were selected for either the actuality aspect of the research or for cognitive authorities in specified fields of study. Relevant subject areas explored in the theoretical study influence identified themes conceptualized in study results.

2.4 Data Analysis Procedures

The data analysis procedure addresses the processing of generated data by method of analysis for the purpose of accentuating significant factors related to the specified research phenomena. In qualitative data generating techniques a structured method of qualitative data analysis is used. The collected data goes through a procedure of analysis phases such as data cleaning (relevant data is extracted), initial data analysis (assess data quality), main data analysis (apply data to original research question), and final data analysis (concludes data analysis process). All generated data should be backed-up and processed so that the existing data is consistent in format, this will enable the researcher to structure/arrange data so that it may be easily traversed. Preparations should be made so that data is formatted to compensate for the insertion of researcher notes for emerging themes and patterns.

Developing a filing system is also useful for establishing chronological order for generated data. For the research structure outline in this thesis data analysis procedures will pertain to mostly textual qualitative data where an inductive approach will be applied. Once generated data is processed for analysis (3) categories of relevant themes will be formed, data unrelated to research, data that has general value to research, and data that is relevant to research question. The data analysis procedures will identify patterns in generated data where results will either support the preexisting concepts attributed to the phenomenon or identify emergent concepts. In the results of the theoretical and empirical studies the research sub-questions will be answered and these results will undergo a comparative analysis where the data will be evaluated and results presented.
2.4.1 Comparative Analysis

Comparison is the key concept in the analysis of most social science research. It allows for distinctions to be established between individuals, groups, settings, themes, statements, cases, and interviews (Mills, 2008). Different instances bearing parallel characteristics can thus be analyzed to identify similarities and dissimilarities. In the comparative analysis, results from the theoretical study will be used as a lens through which to measure the empirical study.

Measuring the empirical study through the framework constructed from the theoretical study will provide a stable foundation to determine the relevancy of the data. In comparative analysis the frame of reference is a context in which two texts, themes, theories, processes, etc. are analyzed. An analysis that is significant has grounds for comparison, which is used to show that a chosen topic is intentional and meaningful. Here the research sub-questions will be used as a basis for comparison.

2.5 Strategies for Evaluating Findings

Strategies for evaluating collected data serve the purpose of ensuring that the quality of research remains vigorous. As qualitative data generating techniques becomes more pervasive research method suggestions continue to surface pertaining to expanding rigor. Several verification techniques exist that may strengthen the validity of case studies. One such technique used in this thesis research is triangulation where the data generation method is a combination of data retrieved from interviews and documents pertaining to the research topic.

Triangulation is an acceptable method of demonstrating rigor, because case studies yield interpretive results it is highly likely that differing forms of data will allow the research question to be approached from different angles. In essence no method of data generation can fully encapsulate a targeted research issue, however triangulation combines partial perspectives, which aims to give analyzed data validity. The quality of interpretive research has often been questioned for not meeting the criteria set for positivist research (Oates, 2006). Lincoln & Guda, (1985) have suggested a criteria set for interpretivist research that addresses trustworthiness:

*Confirmability* – aims to reassure that research findings are grounded in research participant’s viewpoint of the phenomenon and that the results of such findings can be verified.

*Dependability* - Since a significant challenge for qualitative research is the constantly changing environment dependability aims to show how well the research is recorded so that an audit trail can trace the steps taken to arrive at the presented results.

*Credibility* – aims to establish a high degree of uniformity between research design components. Uniformity must be visible relation to data sources, data generation
technique, confirming data accuracy with informants, and the trustworthiness of informants.

Transferability – Aims to establish the possibility that results derived from research may be applied across other environments associated the research phenomenon.

2.6 Results Presentation Method

The research results from the theoretical and empirical studies will be presented in textual form that will answer the research sub-questions. Throughout the theoretical study data will be presented in tables and diagrams. A conceptual model of information interchange will be introduced in the theoretical study and a revised version of this model will be developed based on the results of the comparative analysis of both studies. Theoretical text cited is referenced under The Harvard System. The results of the comparative analysis will be presented in textual form as answers for the research sub-questions. Displaying data in similar formats is beneficial for making comparisons during analysis.
3 THEORETICAL STUDY

In this Chapter the theoretical study is presented, it is comprised of a sample of relevant literature review, core concepts, and relevant subject areas. Due to the chapter's complexity a summary is presented: (3.1 Key concepts), (3.2 Relevant research areas: organizational theory, organizational communication, organizational structure, organizational flexibility, socio-technical systems, and information interchange), (3.3 Previous research: description of research previously done in research area), (3.4 Relevant literature sources: presentation of selected material), Subject area sub-chapters: (3.5 organizational theory), (3.6 organizational communication), (3.7 organizational structure), (3.8 organizational flexibility), (3.9 Network effectiveness), (3.10 Socio–technical systems), (3.11 Information interchange), (3.12 Summary of theoretical findings), and (3.13 Arguments for empirical study).

3.1 Key Concepts

**Virtual Organization:** A virtual organization is a collection of individuals or organizations that are sharing resources from geographically disbarred locations. Although the term virtual is usually employed to describe computer-generated environments, in which individuals that share general goals are assembled here it references an organizational structure where organizational task may be conducted in different places at different times (Miller, 2006). This form of organization has become more common over the past 10 years and has grown purposefully effective in cost reduction and increased efficiency.

**Media Richness:** attends to a framework proposed by Daft & Lengel, (1984,1986) which rates the effectiveness of various communication mediums from rich to lean. The more effective methods are deemed as richer and the less effective methods are deemed as leaner.

**Computer-Mediated Communication (CMC):** is a communicative interaction that employs computer technology to facilitate information interchange between individuals, organizations, or entities.

**Information and Communication Technology (ICT):** encompasses all technical means employed to manipulate information and assist communication, including but not limited to: computer/network hardware and software and communication middleware.

**Informationalism:** The information age identified by the capacity to transfer information and knowledge freely at ever increasing speeds has been denoted as informationalism which Castells (2004) describes as “the technological paradigm based on augmentation of the human capacity of information processing and communication made possible by the revolutions in microelectronic.”

**Healthcare Network:** a system of hospitals, medical practices, clinics, institutions, and affiliate agencies that are directly connected and share resources and information for the purpose of providing effective healthcare.

**Network Effectiveness:** a system of intersecting people, computers, machines, or operations that produce a desired effect or outcome, which can be qualitatively measured.
3.2 Relevant Subject Areas

Many different sub-fields exist within the vast interdisciplinary field of informatics. The phenomenon of information interchange within virtual organizations is one of complexity that encompasses several relevant subject areas. Depicted in the figure above are the interrelationships that exist within the study of virtual organizations. The relationships shown are between the function of information interchange within virtual organizations, relevant subject areas, and the (4) sub-questions that underpin the main research question of this thesis. The Media Rich Social Information Interchange (MERiSii) model is a concept developed from the relevant subject areas and is used as a link between the
function of information interchange and the concept of virtual organizations. Reviewing literature from cognitive authorities and other relevant authors have aided in formulating a conceptual overview of the targeted sub-fields.

The management of information within organizations is one of the leading forces that determine whether an organization will function effectively or not (Orlikowski, 1992). Rapid technological advancements have presented organizations with an opportunity to acquire cutting edge technology at reduced cost in a phase when universal standards, compatibility, and reliability in technology are at an all time high. In the past possessing such information technology afforded an organization to differentiate themselves from others, but as Nicholas Carr highlighted in his 2003 HBR article “IT Doesn’t Matter” the ability of information technology as a core function to acquire competitive advantage has deteriorated. A technological advantage no longer constitutes a competitive advantage. Organizations should strive for alternative efficiencies throughout the system where information technology is utilized. With this in mind we turn our sights on organizational informational flows and the human agents that facilitate its competitiveness.

3.2.1 Organizational Theory

Shifting theories of differentiating organizational models began to manifest after the advent of the industrial revolution. Theorists most noteworthy in establishing classical organizational theories are Henri Fayol, Max Weber, and Frederick Taylor (Borgatti, 1996). Aside from developing independent organizational theories the common denominator proposed by these classical theorist was the defining of a single best organizational structure that responds appropriately to robotic functionality, coined the machine metaphor. Where a metaphor can be considered an incomplete perception of an organization it may prove beneficial in exposing important aspects while concealing others (Miller, 2006).

3.2.2 Organizational Communication

Communication is a common activity so interlaced in human existence that its complexity and pervasiveness in society is often ignored (Littlejohn & Fost, 2008). In an attempt to better clarify the communication phenomenon we explore the theory of communication. The definitions for communication are broad, because of its vastness many theorist propose a “family of concepts” that address different functions of communication enabling its multidimensionality (ibid).

3.2.3 Organizational Structure

The organization is viewed as a system of methods constructed around the objective of obtaining a specified goal (Castells, 1996), yet its structure refers to the hierarchal positioning of administrators, managers, and employees in relation to coordinated actions for attaining that specified goal. Mintzberg (1979) distinguishes an organizational structure as a team of employees that differentiate the chain of command employed in policy formulation, responsibility allocation and conflict resolution. Yet within the
context of virtual organizations structure formation often denotes a network of organizations.

### 3.2.4 Organizational Flexibility

The ability of organizations to adapt to economic uncertainty is detrimental in determining the level at which an organization will succeed. Virtual networks have emerged as effective organizational structures due to their flexibility, scalability, and survivability in a diverse technological environment. Organizations are dependent upon human activity systems that are predisposed to continual change. The same degree of change that affects individuals and society assimilates organizations requiring the ability to reconfigure and contract/expand in reciprocation resulting in network evolution (Carley, 1999). The technological paradigm of informationalism utilizes the capacity of information processing and communication through emergent technologies that are highly flexible and self-expanding (Castells, 2004). In fact, workplace flexibility as it relates to where and how work is arranged is an issue receiving significant attention as contributing to organization effectiveness. Sanctioning for work processes which are carried out from home or remotely, circumvents time constraints and certain physical resources where information can be accessed, processed, and interchanged from virtually anywhere benefiting both employer and employee. Organizational flexibility also pertains to communication where established information flow pathways may be superseded in the event that pathways become closed or ineffective (ibid).

### 3.2.5 Network Effectiveness

A virtual organization is often comprised of a network of organizations that are assembled by some form of structural interdependence for a common purpose (Turrini et al., 2010). Independently the sub-organizations hold minimal value but under the umbrella of a virtual organization stand to gain the advantages of resource dependence and transaction cost reduction. Interdependence is established by a network structure and maintained through a network of information and communication systems. The coordination of joint activities allow organizations to strategically enhance competiveness, effectiveness and survival capacity (ibid). Traditional organizational literature generally places emphasis on inter-organizational relations while limited attention has been given to the nonstructural outcomes of organizational networks. Since a virtual organization is basically a network of organizations effectiveness must not only be measured at the organizational level but at the network level as well, which better represents the network a whole (Provan & Milward, 1995).

### 3.2.6 Socio-Technical System

In the exploration of virtual organizations inspiration is derived from organizational paradigms that approach the social characteristics of people and the technical features of organizational structure as interactive dynamic systems. Eric Twist and Fred Emery introduced the theory of socio-technical systems in the 1960’s during their consultancy of labor studies with for the Tavistock Institute in London (Aldridge, 2004). The socio-technical system (STS) theory was established as a result of combining general systems
theory, socio-technical theory, and joint optimization. The theory of socio-technical systems has allowed organizations to approach work designs in ways that have exceeded the performance of Frederick Taylor’s *scientifical management* (ibid). Organizations that function under STS strive to achieve effectiveness through balancing organizational relationships between technological and human agents.

### 3.2.7 Information Interchange

The interchange of Information is historically attributed to the information interchange model where digital bit patterns correspond to character symbols in the ASCII coding chart. The concept of information interchange here is ascribed to the correspondence of information exchanged within a network. Mark & Roussopoulos, (1990) attest that to attain information interchange the source and target of exchange must equate identical semantically rich renditions of the data in exchange. The continuous escalation of technology has reduced the need to establish binary patterns and character symbols for the correspondence of information, although these issues still exist the role of information interchange has shifted. The information interchange sought here will converge several relevant subject areas into a conceptual model that may be facilitated within virtual organizations.

### 3.3 Previous Research

Previous empirical studies in the area of information flows within virtual organizations specifically relate to communication, organizational, and network theories most measure data types, size, or patterns. Out of the empirical literature reviewed minimal focus has been directed to identifying influential factors that either retard or assist information interchange within virtual networks from a socio-technical perspective. Within the organizational paradigm a considerable amount of attention is given to communication, structure, networks, and culture mostly focused on various organizational types yet limited attention is direct to virtual healthcare organizations. Many researchers have focused on various network aspects where theories of virtual organizations have been proposed (Mowshowitz, 1997) and the need for a network effectiveness theory is suggested (3.6 Network Effectiveness) by (Turrini, Cristofoli, Frosini & Nasi, 2009).

Research targeting organizational networks has gained momentum over the past decade. One such study by Naydeck, Tyrrell, Burek & Sopko (1996) in a clinical trial, Bypass Angioplasty Revascularation Investigation (BARI) communication and administrative tasks were effectively facilitated. Key factors such as: organizational structure, communication, and control of protocol implementation were identified as being detrimental to sustaining successful healthcare organizations. In Fulk & Boyd (1991) “A Dynamic Simulation Comparing Classical and Emergent-Network Models: Organizational Design Implications” several theories ascribing to organizations were reviewed and evaluated. While media richness impacts information interchange in organizations a specified recurrent barrier in communication theories is uncertainty. The original model of media richness was revised to include computer-mediated communication where the focus shifted from viewing task ambiguity for an individual’s job as a whole to analyzing the communication involved in an individual’s task. It was
surnised that upper level management employed more media rich forms of communication as opposed to lower level management. Fulk & Boyd (1991) proposes that information interchange, organizations, and communication technology held the most potential of emergent theories that embody organizational communication.

Empirical research conducted by Hill, Weistroffer & Aiken (2005) explores classical and emergent network models in the concept of organizational design. In their research they propose that hierarchal organization structures do not fully compliment current organizations and thus call for emergent models that better facilitate rapid information flows. The characteristic commanding the most attention was access structures, which governs who will perform what task and pattern information exchange within the organizational chain of communication. The emergent network model that they present depicts a less hierarchal structured organization, which encourages interconnectedness as it relates to information interchange, establishing a more fully connected network as the communication design.

Research has established that the quality of information interchange within organizations has a direct correlation to organizational performance (Byrne & Lemay, 2006) and that a high level of quality information interchange in organizations influence the success of value added processes and reduce employee disgruntlement (Clampitt & Downs, 1993). In the research conducted by Byrne & Lemay (2006) concerning different media for organizational communication the core criteria for evaluating the quality of information interchange was an amalgamation of timeliness, usability, and correctness of information communication. In addition, communication satisfaction was also identified as a multidimensional factor where the general consensus of researchers gave adequate attention to communication climate, organizational integration, and organizational perspective. In the synopsis from Byrne & Lemay’s (2006) research it is concluded that both lean and rich media communication forms are employable in organizations; however, the perception of information quality is highest when received from upper management in a rich communication form. Trust emerged as an essential factor between the relationship of communication mediums and information interchange quality/communication satisfaction.

### 3.4 Relevant Literature Sources

Relevant literature was selected from a variety of books, journals, and conference papers. Online databases were searched at Gothenburg University, the University of Borås Libraries, and the Internet. Relevant literature sources reviewed were the result of browsing e-journals by subject and browsing the available list of e-journal suppliers. Database searches of e-journal suppliers were conducted on the premise of specifying a search criterion consisting of key words.

**Databases:** EBSCO-Business Premier, ACM Digital Library, Blackwell Synergy, SAGE Journals, ScienceDirect, SpringerLink, and Wiley Online Library.

**Key Words:** virtual networks, virtual organizations, organizational networks, information interchange, information flow, organizational information flow, organizational communication, network communication, organizational structure, network structure,
organizational flexibility, network flexibility, media richness, communication mediums, healthcare networks, virtual medical networks.

All the referenced articles that appear as relevant literature sources were published in peer-reviewed accredited journals that serve as research resources for both academic researchers and practitioners.

Abbe Mowshowitz, 1997 article: “Virtual Organizations” was published in - Communications of the ACM. He is one of the founding theorists of virtual organizations. Cited in 45 academically acceptable articles. This is ACM’s flagship scholarly magazine.

Alex Turrini, Daniela Cristofoli, Francesca Frosini & Greta Nasi, 2010 article: “Networking Literature About Determinants of Network Effectiveness” was published in - Public Administration Review. It is a peer-reviewed journal: academics & practitioners.

Bernard D. Hill, H Roland Weistroffer & Peter H Aiken, 2005 article: “A Dynamic Simulation Comparing Classical and Emergent-Network Models: Organizational Design Implications” was published in - Computational and Mathematical Organization Theory. It is a peer-reviewed scientific journal.

Deborah Gibbons, 2007 article: “Inter-organizational Network Structures and Diffusion of Information Through a Health system” was published in - American Journal of Public Health. It is a peer-reviewed scientific journal.

Habibollah Pirnejad, Roland Bal, Arjen P. Stoop & Marc Berg, 2007 article: “Inter – Organizational Communication Networks in Healthcare: Centralized Versus Decentralized Approaches” was published in - International Journal of Integrated Care. It is a peer-reviewed scientific journal.

Heath & Bryant, (2000) Human Communication Theory and Research: concepts, context, and challenges 2ed. Published by Lawrence Erlbaum Associates. Robert Heath holds seats at several universities has either authored or edited (12) books and over (100) published journal articles. He is a prominent scholar in both communication theory and organizational theory.

Janet Fulk & Brian Boyd, 1991 article: “Emerging Theories of Communication Organizations” cited (271) times was published in – Journal of Management. It is a peer-reviewed scientific journal.

Katherine Miller, (2006) Organizational Communication: Approaches and Processes 4ed. Published by Thomson & Wadsworth. Miller is a university professor has a long-standing history of accomplishments in communication research. She has either authored or co-authored (3) books, (33) published journal articles, (17) book chapters, (58) competitively selected conference papers, and has given somewhere in the range of (35) presentations at universities and conferences on organizational and communications research.
3.5 Organizational Theory

Classical organizational theories that ascribed to the machine metaphor accentuate that organizations are eminently specialized, standardized, and predictable. Henri Fayol’s theory of classical management is prescriptive in its approach by delineating that management’s organizational role includes planning, commanding, coordinating, controlling, and organizing. In the performance of these organizational roles Fayol presented a range of managerial principles that (ibid) divides into (4) categories: structure, power, reward, and attitude, which leads to organizational effectiveness. Although Max Weber’s theory of Bureaucracy was less descriptive than what Fayol purposed it was very similar in approach when examining the attributes for bureaucracy: clearly defined hierarchy, division of labor, and centralization.

Through Weber’s vision of bureaucracy he viewed organizations as closed-systems in addition he also emphasized the importance of rules for functioning and functioning authority where such authority is grounded in the power relationships of traditional authority, charismatic authority, and rational-legal authority (ibid). Frederick Taylor’s theory of scientific management distinguishes itself from the Fayol’s and Weber’s theories in that he did not delineate organizational structure yet placed greater emphasis on the organizational relationships and exerting jurisdiction over the functions of workers. The tenets prescribed in Taylor’s theory addressed the traditional method of learned job skills through time and motion studies, proper selection of workers, training of workers, and the divisional roles of managers and workers. It was Taylor’s theoretical belief that his form of scientific management could rectify the organizational dilemmas of uneven workloads and the practice of systematic soldering (ibid).

Although the classical era and its theorist are no longer with us remnants of their theoretical legacy are still prevalent in many manufacturing, service, and government organizational structures. The next wave of organizational theories that gained prominence was human relation approaches with the domineering theorist being Abraham Maslow, Douglas McGregor, and Frederick Herzberg. The human relation approaches converged on the assumptions that employees were individuals that necessitated attention, social interaction, and personal attainment. Maslow, McGregor, and Herzberg human relation approaches were grounded in human relations principles.
that bare resemblance to that of a family unit that display the (5) need levels: physiological, safety, affiliation, esteem, and self-actualization.

The prevailing theorist of the human resources approaches were Robert Blake and Jane Mouton, Rensis Likert, William Ouchi whose theoretical perspectives show traces of classical and human relations approaches to organizational management. However, where the approaches separate is the high criteria placed on both organizational productivity and employee need satisfaction. Just as the classical, human relations, and the human resources approaches are considered foundational approaches to organizational theories the systems, cultural, and critical approaches are seen as contemporary. The contemporary theories part ways from the foundational theories in that they exhibit dynamic structures and do not prescribe to any one organizational type. They do however describe conditions where they are more beneficial making them highly applicable to organizations operating in today’s business climate.

Many theorists have made contributions towards the management principles of organizations. Yet current paradigm shifts have allowed new organizational theories to emerge that are not grounded in the solitary organizational perspectives of the past. The research model of information interchange within virtual organizations incorporates characteristics of several interdisciplinary theoretical approaches such as: socio-technical systems theory, human resource approach, organizational behavior, informal organization, resource dependence, organizational ecology, and complex systems theory.

In viewing organizational research from the interpretivists perspective reality is constructed by virtue of words, symbols, and actions of organizational members (Heath & Bryant, 2000). Interpretivism seeks to illuminate the dynamics of organizations by revealing the social complexities that shape its behavior, culture, and effectiveness. The organizational theory that underpins an organization will dictate the structure and flexibility of all organizational functions.

### 3.6 Organizational Communication

Organizational communication has evolved into a field of study that encompasses an assortment of theoretical approaches. Information and communication technology advancements continue to dissolve the physical constructs of organizations encouraging many organizations to conform to communicative demands. Both traditional and contemporary forms of organizational communication have neglectful tendencies leading to the rationality that no universal theory of communication is forthcoming. In the sense that classical organizational theories rarely dictated structure of communication it can be inferred that the (3) theoretical concepts identified in organizational theory embodied communication that is task oriented, top-down, and often documented (Miller, 2006).

This approach is viewed as the classical approach to communication with the other (5) described as human relations, human resources, systems, cultural, and critical. From a perspective of effectiveness (4) highly relevant variables of organizational communication are content of communication, direction of communication flow, channel of communication, and style of communication. The contemporary approaches don’t
assign to a distinct communicative approach yet are more reflective of the communication complexities found in organizations today. As a result of technology organizations display more horizontal structures, virtual teams, flexibility, and distributed work, however, the most obvious impact is that of virtual organizations. The systems approach to organizational communication utilizes technology as the conduit to amalgamate the organization with its internal and external factors (Miller, 2006).

<table>
<thead>
<tr>
<th>Classical Approach</th>
<th>Human Relations Approach</th>
<th>Human Resources Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Task</td>
<td>Task, Social Innovation</td>
</tr>
<tr>
<td>Direction</td>
<td>Top-down</td>
<td>Bottom-up</td>
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<tr>
<td></td>
<td></td>
<td>All directions</td>
</tr>
<tr>
<td>Channel</td>
<td>Usually written</td>
<td>Often face-to-face</td>
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<tr>
<td>Style</td>
<td>Formal</td>
<td>Informal</td>
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<td></td>
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<td>Both, especially Informal</td>
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Table 1: Organizational Approaches to Communication

Technological innovation has transformed the workplace from manually propelled activities to advanced technology driven processes that profoundly influence the way organizations communicate (Miller, 2006). Such influences can be greatly attributed to the advent of the Internet and the World Wide Web (WWW), which have given organizations a platform to communication, handle business transactions, and promote a desired image.

New technological innovations fortify organizations in their primary processes through communication that allows faster transmissions, access to geographically dispersed participators, and asynchronous interchanges (ibid). In an effort to address the notions of task ambiguity and media richness in organizational communication theorists (Daft & Lengel, 1986) developed the Media Richness Model. Organizations employ a range of mediums to communicate with yet in relation to information carrying capacity certain mediums are supposedly richer than others. The criteria these mediums are measured by are: instant feedback, cues used, natural language, and personal focus. Mediums that possess most or all of these qualities are deemed richer where mediums with limited qualities are deemed leaner.

The social information processing model proposed by Janet Fulk and her colleagues expound on the media richness model by showing that mediums employed in an organizational setting are influenced by the conceptions of others (Miller, 2006). Communication is effective if the medium exhibits a suitable social presence necessary to stimulate the interpersonal complexity needed for the task.
The dual-capacity model proposed by Sitkin, Sutcliffe, & Barrios-Choplin, (1992) acknowledges that organizational communication has a data-carrying capacity yet add that the media employed by an organization also has a symbol-carrying capacity that projects an image of organizational culture (ibid). In assessing what effects technology has on organizational communication we employ the variables of content, pattern, and organizational structure.

The effects on communication content from technology are seen as possibly inhibiting social and emotional content of interchanges by reducing the available communication cues. The effects on communication patterns from technology has been noted as augmenting existing technology resulting in organizations experiencing communication surges and (Huber, 1984, as cited by Miller, 2006) establishes an increase in interchange diversity as a result of ICT.

Communication has greater implications than just a means of information interchange; it also serves as a knowledge creation process for individuals that engage in such communication (Barab, Squire, & Dueber, 2000). Organizational networks are altered by systems interactions within the organization and the systems are altered through human agency. The structure of a network is not continuous; it shifts in relation to emergent technology and processes in response to socio-technical systems interaction. A network approach to comprehending organizational systems stresses multidirectional communication where human interaction is boundless (Miller, 2006).

Figure 3: Knowledge Transfer Barriers in Computer-Mediated Communication
Above in (figure 3) depicts the knowledge transfer barriers in the computer-mediated communication model as proposed by David G. Schwartz (2007). These knowledge transfer barriers were identified from an empirical survey and input into a computer-mediated communication model. As it pertains to the research of information interchange in virtual organizations this model depicts plausible organizational communication barriers. Communication involves the mediation of messages between senders and receivers; it is the foundation of informational interchange between organizational agents. Merriam-Webster defines communication as a process in which information is interchanged between individuals through an established system of symbols, signs, or behaviors. This interchange and sentience of information traditionally exist between humans, animals, and nature but through man’s technological advancements now includes a myriad of technical agents. From an organizational perspective a large volume of individuals function in a communicational context through stipulated media, language, and interaction techniques.

**Ability:** The capacity to interchange information.

**Ease:** The act of transferring information from source to recipient without difficulty.

**Integration:** Capacity to merge information interchanged with prior knowledge.

**Willingness:** Willingness of information source to initiate interchange.

**Ambiguity Awareness:** Understanding the lack of decisiveness that may exist in the information interchanged from the source and recipient.

**Time:** Organizational availability to engage in the information interchange process.

**Motivation:** Organizational incentive for engaging in the information interchange process.

**Context:** Organizational circumstances that form the setting for information interchange.

**Design:** Organizational structure that encourages information interchange.

**Relationship:** The essence of the connectedness between source and recipient.

**Absorption:** The ability to assimilate the information being interchanged.

**Retention:** The activity of absorbing and holding on to the information interchanged.

**Reliability:** Belief that the information interchanged comes from a trusted source.

**Conjecture:** Degree of speculation relating to incomplete information.

### 3.7 Organizational Structure

Organizational structures have evolved largely as a result of cumulative actions such as technological advancements, environmental volatility, escalating operational cost, need for flexibility, and strategic priorities. Since many contemporary theories identify a systems perspective of organizations, cohesion between the social and technical sub-systems must be established and maintained. The organizational structure consistent with the illimitable information age of today supports this socio-technical perspective, which represents a holistic approach.

The formation of an organization’s structure, processes, and information technology is constituted in a manner that encourages information processing, interchange, and dissemination consistent with its business purpose (Ahuja & Carley, 2006). Several alternative structural forms have been identified as virtual or network type organizational
structures when in essence every form of organization maybe structurally defined as a network. Podolny & Page (1998: 57-76) define a network form of organization as any collection of actors \((N \geq 2)\) that pursue repeated, enduring exchange relation with one another and, at the same time, lack a legitimate organizational authority to arbitrate and resolve disputes that may arise between the exchanges.

These network forms include but are not limited to business groups, strategic alliances, research consortia, joint ventures, or a parent organization with subsidiaries (ibid). According to the networks and organizational form perspective network forms are viewed as network structures that reemerge in a multitude of environments (Ahuja & Carley, 2006). These emerging organizational forms manifest structures triggered by communication via information technologies that are more conducive to horizontal patterns of communication. An organizations design must support both vertical and horizontal information interaction flows to achieve organizational objectives. Organizational structures that are not suitable for the informational needs of the organization end up either restricting information or wasting resources by leave individuals misinformed (Daft, 2009).

When organizations are structured efficiently harmonious working relationships exist between individuals, organizational functions and units. Other factors also contribute to an organization ability to function such as the organizational size, age, geographic location, and field of expertise. Depending on where an organization stands in relation to such factors may have deep implications about an organizations success. Organizational stages of growth dictate that business processes may increase in scope by requiring individual skills to be highly flexible to foster creativity.

Organizational structures have evolved through many stages including: bureaucratic (pre – post), functional, divisional, matrix, organizational circle, team, and network before reaching the virtual structure. Organizational structures were traditionally vertical and maintained high authoritative command over organizational functions. These structures are still present in most complex large-scale organizations; however, many of these bureaucratically (vertical) structured organizations have adopted aspects of more contemporary (horizontal) structures. Contemporary structures tend to foster learning and adaptation, shared task, fewer rules, more teams and task forces, and decentralized decision-making (Daft, 2009). To a great extent this is attributed to the crisis reached by vertical organizations, where earning potential decreased due to rapid economical and technological change (Castells, 1996). Organizations that have shifted to network and virtual structures are the confluence to what is known as virtual networks where network structures outsource business processes and virtual structures globalize a specific organizational community.

A virtual organizational structure serves the same objective as traditional organization structures in that management is concerned with the division of labor requirements and the coordination of the capable elements of labor. The structure of a virtual organization must manage organizational sub-systems both internally and externally. Since the
inception of virtual organizations their structures have been denoted in several forms where structures necessitate the virtual organizations’ objectives.

The positioning of network hardware schematically represents the physical entities of a network. Such issues are of importance when exploring network technology, yet a network’s topology can be illustrated from either a physical or logical perspective. A network’s logical topology refers to its design of information interchange. Researchers have assessed that network structures are formed as the result of informal interaction of work processes (Ahuja & Carley, 2006). Structurally restrictive information flows within organizations encumbers information interchange between organizational members, which may potentially stagnate organizational growth.

3.8 Organizational Flexibility

In today’s fast pace highly volatile business world organizational flexibility is a competitive element necessary for survival and continued growth. Flexibility is defined as the ability of an organization to expeditiously and effectively respond to shifting external variables and adjust business objectives to respond to increasing demands. Hypercompetitive markets, globalization, more powerful technology, and decreasing resources compel organizational management to rapidly modify core functions in an effort to achieve business objectives. Not surprisingly emergent technologies make it plausible for new entrants to compete in business environments where barriers once stood. Theoretical discourse on achieving organizational flexibility targets constructing dynamic capabilities, maintaining multiple options, advocating horizontal communication, and encouraging employee camaraderie (Englehardt & Simmons, 2002).

The apparent concept of organizational flexibility has in some instances proven ambiguous. Fundamentally an organization is a systematized whole composed of interdependent components. In the past highly systematized organizations were able to adjust processes and structuring in a time frame that allowed continued operational effectiveness. However, rapidly shifting conditions have highly systematized organizations (complex systems) experiencing difficulty when attempting to implement flexibility measures. Most aspects of flexibility can be supported by an organization’s structure yet considering the average size of a complex system such organizations tend to implement change at a slower rate. The theory of complex adaptive systems (CAS) has shown potential when developing flexibility measures. In fact, complex systems that are exposed to high levels of emergent behavior have become more pervasive due to innovations in information communication technology (Bullock & Cliff, 2004).

Nature provides the perfect example of how entities organize through interconnection and interaction and adapt to environmental changes absent of hierarchal control. We draw examples of complex adaptive systems in such areas as biology, sociology, and economics. Natural examples of this phenomenon appear in insect colonies, ecology, animal nervous system, human immune system, developing embryos, and genetic evolution. Although there is not a clear definition for CAS several theorist have contributed principles and properties that may be drawn upon. Based on John Holland’s
(1992) original preliminary outline Levin, (2003) has proposed (3) principles of CAS: *diversity* (individuality of components), *local interactions* (between components), and *selection* (components of a sub-set for modification).

Complexities are not only found in CAS but exist in the environment of the system as well. Jost (2004) proposes an assessment of the external and internal complexities where external complexity is seen as the amount of input, information, and energy obtained from the environment and internal complexity as the internal representation of the information received as input (ibid). Understanding that the intensity and complexity of information will continue to place demands on organizational resources a rapid evolution in the quantity, variety, and complexity of network-structured organizations has begun to emerge. Network organizational structures appear to be more congruent to the internal social structure of an organization, which increase in effectiveness through augmented interactions and the diversity of individual roles (Englehardt & Simmons, 2002).

In hindsight the dilemma of flexibility will continue to plague organizations, as it stands a by-product of success is that when organizations are successful at adapting, flexibility dissipates and opposition to change increases (*inertia and change*) as organizations expand in size (ibid). Generally organizations incorporate structures that are able to meet specific objectives while adherence to flexibility dictates that less structure (self-organization) is more responsive to complex environments. A dual tiered structure could possibly be a viable solution where one tier would satisfy the order of hierarchal structures and the other tier would satisfy the chaos necessary to support strategic flexibility. These two tiers could possibly represent an operational level (*formal*) and a developmental level (*informal*) with the operational level fostering hierarchal stability/traditional functions and the developmental level fostering fully integrated communication, loose boundaries, innovative learning, locally emergent strategies, and self-organization (ibid).

Considering that information, in essence, underpins virtual organizations proactive flexibility measures must employ ICT and IS to sustain interconnectedness amongst all organizational components. Since virtual organizations are geographically disbursed their complex systems and activities are supported by ICT and IS that function within constantly shifting environments and are used by agents with high fluidity. Such a perspective places attention on the information interchange of an organization and thus enhances the need for flexibility. The concept of organizational flexibility introduced here has given a clear indication to the complexities that exist within the systems of an organization. Organizations in general have proven to be complex adaptive systems that must strive for balance between a standardized structure to handle *certainty* and a flexible structure that can handle *uncertainty*. Daft (2009: 151) proposes, “The best way for an organization to cope with a complex environment is to develop a complex structure.” The topic of flexibility within organizations is not one that is easily resolved flexible contingencies must address organizational theory, communication, structure, decision making policies, human resources, information systems, and processes.
3.9 Network Effectiveness

The network effectiveness framework proposed here is based on a literature review and classification of previous theoretical research (Turrini et al., 2010). The researchers of this study don’t declare this framework as an overall theory this model is presented as an amalgamation of identifiable items. The initial concept underpinning the framework model is based on a preliminary model of network effectiveness presented by Provan & Milward (1995). The elements framed in dashed lines represent Provan & Milward (1995) original theoretical concept and the solid lines represent the framework espoused by Turrini et al., (2010).

Network effectiveness is a multidimensional concept that has levels of complexity as illustrated in the above model, effectiveness types vary dependant on perception. Five
types of effectiveness are depicted here: client level effectiveness, ability to achieve goals, sustainability and viability, community level, and innovation/change. From Turrini et al. (2010) theoretical research three main characteristics are identified as determinants for network effectiveness: network structural, network functioning, and network context.

**Network Structure Characteristics**
*External Control:* applies to the network's reliance on support outside of the network.
*Integration Mechanisms & Tools:* applies to the ability to cohesively merge different individuals, concepts, or organizations into the network.
*Size and Consumption:* applies to the amount of members affiliated with the network and their heterogeneity.
*Formalization and Accountability:* applies to the rules governing a network and the responsibility to adhere to such regulations.
*Network Inner Stability:* applies to the competence and incumbency of management.

**Network Functioning Characteristics**
*Buffering Instability/Nurturing Stability:* applies to the ability of management to mediate intra and inter network strained relations various network entities and for establishing an environment that encourages participatory functions and information interchange.
*Steering Network Processes:* applies to the ability of management to oversee the network in relation headed for human/economic resources, decision making, and to reposition objects in response to internal/external changes.
*Traditional Managerial Work:* applies to the ability of management to display an effective degree of quality and competency to implement and coordinate administrative process that achieve strategic objectives.
*Generic Networking:* applies to managerial attitudes and behaviors that directly impacts network leadership and maintenance.

**Network Contextual Characteristics**
*System Stability:* applies to a network state that allows for environmental change and uncertainty that ensures the ability for the network to preserve.
*Resource Munificence:* applies to the resources allotted to which substantiates possibility of success to be permissible.
3.10 Socio-Technical Systems

In the theory of socio-technical systems it is theorized that every organization or work design is comprised of two subsystems, a social subsystem and a technical subsystem (Troxler & Lauche, 2003). The investigation of information interchange within virtual organizations places the theoretical assumptions within such a context where the study of organizations is viewed holistically to include social, technical, and environmental entities. A socio-technical system is a method of conceptualizing the reciprocal actions connecting humans, processes, and technology within an organizational work design. The socio-technical system strives to establish equitable conditions between effectiveness and humanity (Ropohl, 1979).

Primary Process: relates to the main goal of the organization, thus the main purpose of the organizational system.

Formal Organization: is based on arbitrary structure in which authority relationships define roles of individuals, organizational functions, and mediates intra-organizational communication.

Informal Organization: is the interconnectedness of an organizations social structure that ascribes to the informal roles individuals fulfill to accomplish primary processes.

Figure 5: Socio-Technical Systems (Troxler & Lauche, 2003)
Relationships formed within informal organizational roles often lead to social networks that may have implications beyond the systems boundaries.

Management Subsystem: is the managerial system that governs the formal organization by the implementation of formal/informal policies, strategies/procedures, and traditions/institutions.

Technical Subsystem: consist of an organization's physical structures, buildings, and technology which aids in the fulfillment of the primary process.

Social Subsystem: consist of members that have an organizational role but are socially governed by personal competencies, behaviors, attitudes, beliefs, values, and norms, which has direct barring on the completion of primary processes.

The socio-technical systems design activity is founded on three levels of analysis: the primary work system (primary process), the whole organizational system (formal/informal organization), and the macro social system (management subsystem) (Fox, 1995). The social subsystem of an organization is responsible for the functions of governing organizational objectives. It is at this level that relationships amongst management are established and decisions about organizational structure and values are developed (ibid). Solidarity between employees and management is crucial for organizational unity. Communication serves the purpose of disseminating organizational purpose, knowledge, request, and values, which have a role in developing shared objectives, norms, and feelings.

Homo sapiens as a species are very diverse and complex however within the organizational context individual diversities and complexities are intensified and often clash resulting in workplace conflict. For an organizational system to function efficiently and effectively its components and agents must maintain harmonious relationships. The socio-technical process targets social interrelationships and empowering autonomous internal-regulation.

Socio-technical systems theory has been incorporated with a range of humanistic approaches and processes within organizational theory. The most successful approach combines socio-technical tools and techniques with action research. The term action research was coined by social psychologist Kurt Lewin (1946, reproduced in Lewin, 1948: 202-3, 206) who describes action research as:

\[
\text{The research needed for social practice can best be characterized as research for social management or social engineering. A comparative research on the conditions and effects of various forms of social action and research leading to social action “that uses” a spiral of steps, each of which is comprised of a circle of planning, action, and fact finding about the result of the action.}
\]

The philosophy of socio-technical systems design and action research designate a set of humanistic principles related to technology and change perform in an inexhaustible iteration (Munford, 2006). This approach may be employed in problem solving situations
(such as ineffective information interaction) considering that all agents involved seek a democratic solution. Since information interchange is central to the core processes of a knowledge-based organization we look to the social subsystem for determinants of successful interdependence.

The literature study has produced three determinates of information interchange that ascribes to an organization’s social subsystem: Social influence, Individual differences, and organizational influence. Social influence: ones thoughts, actions and feelings are influenced by others. Individual differences: a dynamic and organized set of characteristics held by an individual. Organizational influence: roles and positions held by organizational members (Stephens, 2007).

The primary work systems of an organization are infused with an organization’s dominant culture while within the primary work systems organizational subcultures (groups) often emerge. Subcultures emerge in response to many different social, organizational, and individual characteristics. Generally members of a subculture belong to similar departments, workgroups, and teams yet more often than not formation surrounds conflicting authority positions (Boisner & Chatman, 2003). Most subcultures are formed as a result of organizational structure (organizational influences), group processes (social influences), and individual propensity (individual differences) (ibid).

Information interchange is not dictated by organizational subcultures, however subcultures have the potential to influence what information is interchanged and with whom. Despite being labeled as disruptive subcultures have proved to hold value to organizations with complex network structures (Boisner & Chatman, 2003). Organizations that are strong in culture experience limited change due to organizational members being locked into a particular set of values. Subcultures foster flexibility and innovative learning. Members of subcultures have the greatest propensity to interchange information.

McGrath (1990) offers the TIP theory (time, interaction, performance) that describes the relational links in groups as performing activities in regard to group support and well-being functions. Information interchange within subcultures and groups is associated with improved outcomes and is directly affected by a group’s internal dynamics (Warkentin & Beranek, 1999). Organizations looking to harness the benefits of a formal structure (standardized) with an informal structure (flexible) realize the potential of allowing subcultures to co-exist (Boisner & Chatman, 2003).

Virtual organizations that are structured and managed from a socio-technical systems perspective should employ IT systems that are designed and developed from a congruent perspective. Enid Mumford (1995) has developed just such an approach called Effective technical and human implementation of computer-based systems (ETHICS) that uses a systems development philosophy that is founded on the socio-technical philosophy.

In the 1970’s when the transition was being made from job design to organizational design socio-technical systems approaches gained popularity as the concept of
humanization was being heavily adapted into organizations. Thus times have changed and in between the divide of the 1970’s and the new millennium a change in culture and business has allowed organizational focus to become demoralized and scattered. In response to a global economy the necessity to reduce expenditure and computerized (lean productions and business process re-engineering) practices detoured the concept of social awareness in organizations to standardization of work processes (Munford, 2006).

The technical subsystem of a virtual organization is addressed through organizational structure, locality, information systems, and ICT. The social subsystem will be addressed by organizational leadership, communication structure, relationships, emotional intelligence, knowledge economy, decision-making polices, culture, diversity, and self-organization. Since technological advancements will continue to test human dynamics managerial leadership must posses the competence to handle the social complexities of an organization.

3.11 Information Interchange

![Figure 6: Media Rich Social Information Interchange Model (MERiSii Model)](image)

The MERiSii model amalgamates the theories of media richness and 2-way communication with implications of the knowledge process. The two theoretical frameworks represent the process of information interchange and its potential results, where the end result may vary depending on the effectiveness of the communication. The model may be viewed from a knowledge-based organizational perspective that may exist
on an intrapersonal or interpersonal level of a virtual organization. As noted by researchers and practitioners, when information is employed as a change agent, it has the potential to fall victim to uncertainty and ambiguity (Miller, 2006). This breakdown in communication may leave information seekers misinformed, thus reducing the effectiveness of the information interchange.

To necessitate information interchange effectiveness within organizations media rich communication methods must be matched with task ambiguity. An activity system at its most basic level is constructed and defined by communication between living and non-living entities, thus the human, business, and communication activities of an organization are entwined (Vygotsky, 1978). The complexity of an organization system may be replicated as a network defining the interconnectedness of subsystems within the boundary of an organization. The world we live in is founded on the interchange of information in both environmental and semantic states; where we define information as a data element with an established structure. For information to serve as meaningful a comprehensive understanding of its established structure must exist through a grounded necessity with global impact (Desouza & Hensgen 2002).

Within virtual organizations information is predominantly interchanged via CMC and ICT. In reviewing literature on information interchange Flanagan & Metzger’s (2001) explored motivations for using computer mediated ICT, the framework consisted of: uses and gratification, organizational issues, and symbolic uses of ICT. An analysis of the results yielded (10) clusters: information, learning, play leisure, persuasion, social bonding, relationship maintenance, status, and self-insight.

The research area of organizational communication is a multifaceted blend of approaches, theories, and methodologies. In reviewing literature targeting organizational communication it is evident that many challenges exist. Although traditional concepts of organizations and how they communicate still applies emergent organizational designs have introduced a range of concerns that require further exploration. In examining information interchange within organizations issues concerning the role of ethics, organizational change, diversity and intergroup facets of informational interchange, and relationship between new organizational structures and technology must be considered (Jones, Watson, Gardner & Gallois, 2004).

The earliest organizational concept was that of groups of individuals working in a coordinated effort to accomplished production related goals. Individuals perform such activities by utilizing communication as a core process. New organizational designs accomplish similar objectives in conjunction with environmental and social factors that are increasingly complex. Jones et al. (2004) have suggested that there is a need to develop theory that targets how the external environment and organizational structure impact information interchange. Considering that a range of theories may be applied to information interchange (media richness and social presence theory, a few newer theoretical contenders have been identified: social identity theory (SIT), communication accommodation theory (CAT), and critical discourse analysis (CDA) as being relevant.
Fundamentally, information interchange represents the process of communicating information. Information and communication, as (Ruben, 1992) proposed, share an intimate relationship where communication is viewed as a process and information as an artifact and concept. This shared relationship is both complex and based on necessity as their interdependence dictates. Information exist in (3) dimensions the biological level, intra-personal level, and inter-personal level. Interaction is a state that allows a system to reciprocate with another system and is represented on all levels of existence.

The communication process facilitates the interaction between living systems just as all other systems interact through information processing (Ruben, 1972). In semblance both information and communication perform an action that transforms, where information is the mediator between a living system and its environment and communication links systems to other systems by transforming the state of information. A systems complexity enhances the dependency of the communication process where information not only undergoes transmission but transformation to become more appropriate and significant (Miller, 1965). An organization represents a complex system comprised of sub-systems that are dependant on both communication and information.

Information interchanges within organizational networks represent patterns of interconnectedness where each identifiable pattern can be denoted as links within a network. As information symbolizes the essence of an organizations existence its structured patterns inspire researchers to investigate its itinerant (Monge, 1987). Clustered patterns of information interchange within an organizational unit may represent a micro-network, which can be grouped together to form an organization(s) macro-network. These information interchanges may take (1) of many forms: line (one-to-one), commune (open information interchange), hierarchy (layer of systems), dictator (systems gatekeeper), and liaison (system-to-many), (Krippendorff, 1977), as cited by (Heath & Bryant, 2000).

![Figure 7: Information Interchange Patterns](image)

Information can be interchanged between individuals, units, or organizations where the state of interchange can exist as a sub-system, system, or super system (health & Bryant, 2000). Information interchange generally corresponds to organizational structure; however, the logical structure of networks is not continuously consistent with organizational structure allowing for less restrictive information interchange. Virtual networks can represent the manner in which an organization utilizes its network capacity to improve organizational effectiveness.
3.12 Theoretical Study Results

The results of the theoretical study are displayed as they correlate to the sub-questions that underpin the main research question.

Research sub-questions

- **How does the method of communication affect network effectiveness?**

According to the theoretical study the communication method employed in a network has implications on its effectiveness. Organizational communication theorists have noted that objective characteristics of task ambiguity and media richness have direct correlation to communication effectiveness. Tasks that are unambiguous should be matched with leaner media and tasks that are ambiguous should be matched with richer media, this entails that the method of communication relates to the success of an interchange. In measuring media richness the focus is placed on the availability of feedback, available cues, natural language, and personal focus. The model for social information processing pays stricter attention to the social environment of an organization where the characteristics of media richness are expanded to include experience and knowledge of the user, users individuality, and the social information interchanged during communication. Here the communication interaction is viewed as an influencer to the medium employed even if that medium lacks richness. Another characteristic considered is the symbol-carrying capacity of a medium implying a specific image of an individual, group, or organization. The possibility of interchanged information permeating boundaries is more advantageous with technological processes, which is advantageous when we consider the global village we live in. Communication mediums that grant the probability of global access (computer-mediated communication) may affect network effectiveness. The retention of communicative information has a higher presence in some mediums than in others this attends to how interchanged information may be retained in an organization’s or network’s knowledge base. It appears that all methods of communication introduced into the communication arena are designed to take advantage of information communication networks. This necessitates the need for flexibility in communication methods where media richness can be equally matched to task ambiguity where social information processing, symbolism, information assimilation, retention, interdependence, and permeability are also considered as deciding factors for communication media choice.

- **How does flexibility affect network effectiveness?**

The flexibility attributed to information technology is the prime motivation for organizations to adopt virtual structures. It not only enables organizations to be effortlessly modified but to essentially be reinvented by repositioning resources (Castells, 1996). Organizational fluidity in a society grounded in constant change gives not only the ability to contend in an organizational field but possess the
The possibility of advancement (ibid). Networks flexibility is a dynamic concept that is deconstructive of the vertical organization because it allows for communicative relationships that are normally challenged by hierarchies. Giving way for organizational agents to acquire and utilize skills that are cross-functional reducing the need for prioritized resources. The flexibility of network systems allot for minimum down time where processes may be rearranged to meet emerging objectives. Specific network characteristics like the functioning and context have a direct bearing on network innovation and change. Although flexibility and scalability (Flexibility is the capacity of being effortlessly manipulated to respond to changed circumstances and conditions...Scalability the capacity of being appropriately scaled in volume to response to environmental volatility) are not prevalent to any one given area of a network the impact on network effectiveness is multidimensional. By employing strategic, reactive, cognitive, personnel, and structural flexibility organizational flexibility can be achieved. The socio-technical and managerial sub-systems must elastically foster relationships that will be erected and dismantled in support of primary processes as suggested by (Cravens, Piercy & Shipp, 1996).

- What socio-technical determinants affect communication within networks?

Communication within a network must attend to one-to-one, one-to-many, and many-to-many interchanges thus support both the social and technical sub-system. These forms of information interchange may be enacted within a local organizational unit or a geographically disbursed corporation. Computer-mediated communication is the enabling factor that allows intra/inter organizational network’s functionality. In computer-mediated communication specific barriers are identified as pertaining to both social and technical organizational subsystems: social (ability, willingness, motivation, relationship, absorption, ambiguity awareness, and conjecture) and technical (ease, integration, time, motivation, context, design, absorption, retention). Some characteristics like motivation and absorption are present in both sub-systems and present the ability to impact the human agents of a network and the information system. From a systems perspective some socio-technical issues are evident when examining properties of network links between members. Such links are examined on the criteria of strength (consisting of information flow, length of time link has been established, and relevance of importance to network success), symmetry (whether the link exist amongst peers), and multiplexity (refers to number of functional content levels the link employs). What network role an individual assumes in a network governs the interconnectivity of members. If a member holds a position within a line, commune, or hierarchy their reluctance to interchange information may negatively impact the network especially if the organizational member assumes the role of dictator or liaison. Several socio-technical determinants are identified in the communication process of networks and organizations supporting the notion a socio-technical systems perspective must place emphasis on network level properties and structure.
• What aspects of network and organizational structure must be present to facilitate network effectiveness?

Organizational theory attains to the managerial concepts behind different organizational structures. The traditional approach to organizations classical, human relations, and human resources establishes a theoretical framework of organizational approaches that are still evident today. The structure of an organization dictates its information interchange, which crucially impacts an organization’s effectiveness. Basic approaches to communication under these structures were task communication, social communication, and innovation communication. However, the influx of channels in communication and contemporary approaches to organizations identify communication as being more complex. Organizational structures of today must account for system components (hierarchically ordered, interdependent, and permeable), input-throughput-output processes (exchange and feedback), and system properties (holism, equifinality, negative entropy, and requisite variety). An all-conclusive structure does not exist but rather structures must attend to the nature of the organization and the context with which they function. Organizations have embraced the network and virtual structures adopting computer-mediated structures. The emergent network model presented depicts a less hierarchal structured organization that encourages interconnectedness as it relates to information interchange, establishing a more fully connected network as the communication design. A virtual organizations structure must account for subjective human participants, information globalization, organizational globalization, and globalized processes. Identifiable structural characteristics are external control, integration mechanisms and tools, size and consumption, formalization and accountability, and network inner stability. Although it is understood that centralized organizations of traditional structures restrict information interchange, an organization that assumes a network structure stands to benefit from centralization in relation to integration mechanisms. The structure adopted must account for system openness that encourages network entrants willing to collaborate on common objectives and free flowing communication. From the literature reviewed a hybrid approach to organizational structure will afford the best flexibility.

3.13 Arguments for Empirical Study

The study of information interchange within virtual organizations is comprised of multiple theories and frameworks targeting, amongst others: communication theories, organizational theories, network theories, media richness theory, computer-mediated theory, and socio-technical systems. In an effort to answer the research question: What factors encourage information interchange within virtual organizations? Four sub-questions are posed to help identify pertinent aspects. Results from the theoretical study are compiled to adequately answer the research sub-questions. In attention to the second purpose of the theoretical study the Media Rich Social Information Interchange (MERiSii) model was introduced. Although a certain level of success is achieved through
the exploration of relevant theoretical research categories this in itself does not constitute rigorous research.

Generally, in qualitative research the results of a theoretical study are verified through a subsequent (empirical) study. To give stronger persuasion to the results identified in the literature study an empirical study is performed. The verification of the identified themes found in the theoretical study will be substantiated by comparatively analyzing the results of both studies. The empirical case study prescribed here is tightly coupled with many relevant areas of the theoretical study in which identified determinants are espoused. The empirical case chosen is supported by a method triangulation consisting of in-depth interviews and documents.

Triangulation serves the dual purpose of highlighting the personal interpretations of the informants where credence is often verified through existing documentation. Within the process of interviewing and analyzing data interpretations are co-designed between informant and interviewer. Such interpretations are influenced by personal experiences and perceptions, however taking into account that existing documents may be biased depending on the specific purpose they were developed. In an effort to maintain impartiality documents used in the empirical study will either verify themes that emerged in the theoretical study, verify data generated in interviews, or to identify new aspects that have yet to be illuminated.

The MERiSii model developed in the theoretical study is a confluence of relevant subject areas that link information interchange to virtual organizations. To further investigate the validity of the developed model and to expand upon its conceptuality we seek to employ an empirical study in which a question-based interview guide targets relevant subject areas identified in the theoretical study.
4 EMPIRICAL CASE STUDY

4.1 Purpose

The empirical study will add to the existing body of knowledge ascribed to information interchange within virtual network and organizations and to investigate the relevancy of the MERiSii model. As the theoretical study has shown an abundance of information exist that shapes our conceptual knowledge about virtual networks. However, the information interchange within virtual organizations pertains to the interaction of people who differ in their perceptions and interpretations of every day life. At times the communication within and between organizations may suffer from a multitude of communicational barriers decreasing effectiveness. Thus the aim is to gain insight into the determinants that encourage effective information interchange within virtual organizations for the purpose of expanding upon the earlier introduced MERiSii model.

4.2 Sampling

The case sampling selected for the empirical study highlights VGR-IT an organization that provides IT infrastructure to all medical and healthcare facilities in the Västra Götaland region through virtual teams. Here a purposive sampling strategy is underpinned by a typical case sampling. In light of the fact that VGR-IT fits into the prescribed sample frame it also fits the desired research objective by matter of being a typical instance. VGR-IT is the chosen virtual organization through the process of purposive sampling because of its ability to represent the data source population needed to investigate virtual organizations with a relation to healthcare. The data source population was defined as a result of identifying virtual organization types. The sampling selection was made from the four types identified: organizational networks, network organizations, objective virtual organization, and subjective virtual organizations. The objective virtual organizational type was chosen for sampling because of its implications to informatics. An objective virtual organization is a formal organization that consists of human and virtual agents and has the primary focus of optimizing an organization’s back office and operational core. Virtual agents employed in an objective virtual organization are usually defined amongst others as ERP, CMS, MIS, DBMS, or GDSS. The actual data sample selection was made through a search of the Internet where several candidates were considered. The elimination process that ensued yielded several options but most were disregarded due to either locality or lack of response, making them impractical choices for investigation. An Internet search returned a total of (32) hospitals in Sweden and out of this small population size four counties were identified as having healthcare organizations virtually connected. As a result of a typical case sampling Västra Götaland County was selected. After being informed that the IT infrastructure of the county hospitals was outsourced to VGR-IT, VGR-IT became the typical case sampling. Searching VGR-IT’s web directory access was gained to the contact information of (35) organizational members that hold positions from lower management through upper management. Considering that the goal was to generate data from an informant that conducted tasks both internally and externally a customer relations manager and an IT strategist were chosen as research informants.
4.3 The Interviews

In preparations for the research interviews decisions were made based on the research strategy. These decisions entailed selecting a site or group to study, type of data generated, length of the study, arrangement of interviews, and documentation of interviews. A question-based interview guide was designed based on the interview technique. Relevant concepts were identified; question structure decided upon and research questions were formulated. Reflecting on the data generation technique it was imperative that informants were allowed to express all experiences and perspectives about the research phenomenon. The process of pre-arranging an interview is identified as criteria for a semi-structured interview; contact is established with informants pertaining to a specific date, time, and place for scheduling an interview.

A semi-structured interview is a data generation technique in which an interviewer and informant schedule a meeting for the purpose of sharing information concerning predetermined phenomena (Ayres, 2008). While conducting the theoretical study certain concepts were identified that directly related to the research sub-questions, these concepts were used as a basis for formulating the interview questions found in the interview guide. Initial interview questions totaled approximately (25) but after evaluating the questions based on relevancy (20) were selected. The level of relevancy was based on the effectiveness to collect pertinent data from informants targeting organizational communication, organizational structure, communication channels, communication barriers, organizational social systems, and organization flexibility. The questions in the interview guide were then tested on fellow classmates for possible misinterpretations due to irrelevancy or inappropriate sentence structure. The questions were constructed as open-ended to allow the informant freedom to elaborate whenever necessary.

In semi-structured open-ended questions are generally used to extract qualitative data. The open-ended questions were presented in a funnel structure where the interviews began with general questions and advancing to more focused ones. This structure was intended to reduce tension, placing the informant in a relaxed state more conducive to sharing experiences and perceptions about the phenomena of interest. An interviewer who employs a semi-structured research approach utilizes active listening skills to reflect on disclosed information that may require further inquiry. The possibility to extract rich and meaningful data from interviews rest on the interviewers aptitude to comprehend, interpret, and react to shared information (Ayres, 2008).

When interviewer and informants met for interviews an overview was given detailing the research purpose and the intention of the interviews. During this time rapport was established with the informants that allowed them an opportunity to assess the interviewer’s character. Generic conversation between interviewer and informant is necessary for the establishment of mutual respect and trust, which helps to create a comfortable interview environment (McGinn, 2008). The documentation of the interview was captured by audio recording, which allowed for rich detail. The audio recording of the interview was later transcribed into a text document where structure and categorizing permits a more effective evaluation method.
4.4 Interview 1

VGR-IT is an organization that provides IT infrastructure to healthcare and medical organizations in the Västra Götaland region of Sweden. Consolidating four smaller councils the Västra Götaland Regional Council (VGR) was formed in 1999. VGR has an annual budget of SEK 39 billion and employs (50,000) employees with the responsibility of providing quality healthcare services for (17) hospitals, (121) healthcare centers, and (170) dental care centers. At the time of its inception up until 2007 VGR retained seven separate organizations to deliver IT services for the regions hospitals and centers. Since healthcare accounts for such a substantial portion of VGR’s budget (90% in 2007) tremendous effort is place on budget reduction. In 2007 VGR-IT was formed as a solution towards reducing cost and complexity. VGR-IT employs approximately (550) employees that are geographically disbursed in six delivery process units launched from (Pv, Tv, Hkp-förv), (Nu, Kungälv), (SkaS), (SU, Frölunda), (SÄS, Alingsås), and (Röntgen, Läkemedel). The service center, infrastructure, and system integration provided by VGR-IT consists of engineering design, development, and operational solutions. In an effort to adhere to the financial obligations of agreed contracts each service center team has an account manager that oversees the service license agreement. Such contracts are detrimental considering the impact IT has on hospitals and healthcare centers where mistakes could possibly result in fatalities.

Although the scope of VGR-IT’s activities extend beyond Västra Götaland region healthcare the primary focus of this research target information interchange within VGR-IT and between VGR-IT and Borås hospital. Informant 1 (account manager for VGR-IT (Borås 1)) is part of a (27 member) virtual team located at Borås Hospital, which is part of Sweden’s Södra Älsborgs Läns Landsting Regional Health Authority. As a customer for VGR-IT SÄS (Borås Hospital) employs approximately (4,200) staff members that provide care for (210,000) consultations, (185,000) treatments, and (33,000) in-patients annually.

Informant 1 has worked with VGR-IT since it originated in January 2007 and previously was employed by VGR at Sahlgrenska University Hospital (Göteborg) for five years. As an account manager Informant 1 is responsible for the service level agreements of the IT delivery processes provided to SÄS and Alingsås Hospital. Informant 1 perceives the communication mediums used as computer-mediated communication (CMC), face-to-face, telephone (conference and mobile), and e-mail where the CMC interchange is perceived as a mixture of both formal and informal documents. Most stored documents for VGR-IT are in the form of performance metrics and operational data that in essence streamlines IT management solutions by reducing the need for manual intervention. Understanding that accurate information is paramount for the success of any organization VGR-IT has integrated management components founded on CA Technologies Enterprise Management solutions: CA Service Desk Manager, CA Service Catalog, CA CMDB, CA IT Client Manager, CA Asset Portfolio Management, CA Identity Manager, and CA Clarity Project & Portfolio Management (PPM).
Traditionally VGR-IT is a public organization with a hierarchal structure. The organization was created from within VGR also a hierarchal organization that still dictates the overall direction and the strategical planning of VGR-IT. Informant 1 perceives the structure of VGR-IT as evolving into a more horizontal structure that will be less restrictive in terms managerial levels and communication. The guidance of VGR shifts with every election leaving whichever political party to advance as the one that dictates strategy and occupy top managerial positions. The snowball effect is grounded on the fact that if the vision of VGR changes so does that of VGR-IT. With VGR-IT being in its infancy the opportunity for such changes have been minimal but the impression of organizational views shift with controlling political party does exist. Informant 1 appeared somewhat concerned with this issue because of the perception that the power structure VGR-IT was established on is shifting.

Organizations dealing with critical IT issues should be aware of the impact its business processes have. Here IT services provided to a hospital or a healthcare center means that faulty calculations in regard to implementations or configurations have more severe ramifications than economical or time losses. It may also be encouraging in relation to job satisfaction to be fully aware of the impact of your work so that integrity and thoroughness can be prioritized. Communication within VGR-IT and between VGR-IT and their customers is the key factor to understanding this aspect of task performance. Face-to-face communication in the form of weekly meetings between VGR-IT staff and between VGR-IT and hospital representatives helps to disseminate information and provide the opportunity for instant feedback on current and strategic planning.

The size of the VGR-IT team at Borås hospital allows for an unrestrictive communication structure that generally is performed face-to-face or by telephone without the need for prior scheduling. However, the communication between management and the VGR-IT team is more restrictive. When Informant 1 was asked about the team’s ability to clarify or get feedback from higher levels of management uneasiness was perceived causing the interviewer to reassert the question to avoid misinterpretation. Communication structure is superseded when demanding issues arise. Communication from upper management comes in the form of informal documentations delivered in the informative manner of posted meeting notes. From Informant 1 I gathered that this type of communication is sufficient and leaves few questions as for its interpretation.
4.5 Interview 2

Södra Älvsborgs Sjukhus (SÄS) located in Borås, Sweden is one of several regional hospitals with the primary responsibility of providing effective medical care to its patients. Södra Älvsborg Sjukhus (SÄS) is a (634)-bed facility that handles (50,000) emergency room patients annually. SÄS is a knowledge-based organization maintaining patient records from (15) area clinics in addition to their own generating approximately (4,000,000) records annually formatted in (300) different data types. Informant 2 is an IT strategist for SÄS (Borås Hospital) and has only occupied the position for four months, however Informant 2 is, in fact, a long time employee of Borås Hospital. In the role of IT strategist, Informant 2 directly communicates with Informant 1 and VGR-IT on IT related issues. Aside from the integrated approach to process management very little change took place in the first three years of transition from an internally managed IT department to an outsourced IT infrastructure provider (VGR-IT). The competency level of IT management has increased during the last (12) months [prior to this interview] mainly attributed to the changing structure of management and communication. VGR-IT controls somewhere between (35-40) servers in the Västra Götaland region but are currently seeking to transition this multitude of servers into two data centers and two sub-centers. Within the next (90) days [from the time of this interview] the VGR-IT team at Borås Hospital (Borås 1) will be relocated and merged with the VGR-IT team responsible for supporting public dentistry and clinics in the area (Borås 2). As an IT strategist, Informant 2 hopes that the change in structure will also give VGR-IT the opportunity to change its organization and allow for reduced spending on the services provided by them. Long-range projections see a reduction in power consumption and technical engineers needed hopefully resulting in a more effective service level agreement.

Communication between VGR-IT and hospital staff is for the most part maintained by telephone, e-mail, written documents, CMC, and face-to-face meetings. According to Informant 2 the weekly face-to-face meetings that transpire between VGR-IT and hospital representatives have increased in effectiveness over the past (24) months. The weekly meetings began with two hospital representatives who possessed limited knowledge of the day-to-day hospital operations but after (12) months they were replaced with better-informed representatives. IT strategist became involved in the communication process (24) months ago and implemented an additional meeting every third week for the purpose of strategic planning and increasing communication with VGR-IT. Although the communication maintained between the hospital and VGR-IT has positive effects future planning remains unproductive. This cannot be totally attributed to VGR-IT but rather VGR and bureaucratic red tape…the larger the organization the more complex the decision-making process.

Like most vertically structured organizations organizational levels may pose communication barriers. There may exist a range of reasons why communication issues go unattended yet for whatever reason if requested information is critical to task performance bypassing the communication chain can yield both pros and cons. Informant 2 “circumvents” the communication chain whenever necessary by contacting upper management for needed information. Obtaining such information allows Informant 2 to
be task effective, communication pathways that produce results should be encouraged yet such innovative objectives can intensify communication gaps. Relationships based on trust are seen as being essential for effective communication. As organizational structures evolve decision-making authority may become more lateral, nevertheless some organizational members finding themselves in such positions lack the confidence to actually make decisions. Such hesitant behavior negatively impacts managerial trust adding to communicational barriers. Informant 2 sees more evenly disseminated information as a way of strengthening existing communication gaps. Between the hospital and VGR-IT some feel a necessity for more effort to be place on establishing communication protocols for problem handling and request. Since physical distance may become an additional barrier between customer and provider prior history and personal friendships may not be relied upon. Effective communication protocols could address issues as they arise eliminating potential problems that require requested assistance.

Internally, Informant 2 has illuminated the imminent need of redesigning the hospital intranet attesting that the standing version is inefficient at communicating organizational information. Understanding communication as the most important aspect of an organization increasing the access to information in a knowledge-based organization should be paramount. Informant 2 sees undertaking such a task as redesigning the intranet as benefiting most from new insight. For Borås Hospital innovative change may emerge in the form of reversed ageism. Historically resistance to change has been attributed to fear of the unknown, with an IT staff over (40) years of age the technology creep at Borås Hospital is perceived as a fear of change. The deftly technological intranet designer sought is described as a smart-phone computing, cloud technology type change agent under (30) years of age that sees change as an opportunity instead of a risk, “we need these kind of people to challenge us.” The onslaught of technological innovation available today holds the potential to effectively stimulate information interchange at Borås Hospital. A currently running project aims to consolidate the multiple knowledge bases into a comprehensive knowledge base that can be consulted for all service issues and will eventually be linked to the intranet. As an IT strategist Informant 2 has professed a desire to construct a communication map of the interconnections within Borås Hospital and between Borås Hospital and affiliate organizations for the purpose of identifying core people and building support for needed changes. The more people informed about existing issues increase the potential to accelerate the implementation or remodeling of processes.

It is noted that a basic skill for anyone working with information technology is the capacity to adapt to change. Although VGR has been in existence since 1999 technical engineers working at VGR-IT represent a younger part of the organization this factor, according to Informant 2, poses VGR-IT as an organization capable of asserting flexible innovation.
4.6 Empirical Study Results

In preparation for data analysis three different segments of data generated from interviews and documents were identified: data with no relevancy to research study, general descriptive data of participants and the phenomenon, and data relevant to the research questions. These two different segments of data with relevancy are employed to answer the sub-questions that underpin the main research question.

• How does the method of communication affect network effectiveness?

The method of communication within a virtual organization impacts the effectiveness of interchanged information. Face-to-face communication within VGR-IT and Borås Hospital appear to be the most effective communication mode followed closely by CMC and telephones. The LOTUS domino e-mail system, audio/videoconference, chats, mobile phones, and a range of CA Technologies products represent computer-mediated communication, which allows for information interchange within the VGR-IT organization and with customers supported by VGR-IT. Formal and informal interpersonal documents are used to convey strategic planning and record task-oriented communication. The method of communication used in VGR-IT allows for the expression of different communicative clues. When face-to-face methods are employed organizational members are exposed to fewer ambiguities. The CMC methods used support task effectiveness in specific processes especially when the need exist to process and communicate information. Mobile phones provide a medium rich communication choice that increases accessibility while providing instant interpersonal feedback. The restructuring of the intranet has wide ranging implications for organization informative purposes. In bottom-up communication when upper management receives formal documentation of strategic IT planning an exact message is communicated where ambiguities or need of clarification must be achieved through extended iterations. Yet in top-down communication VGR-IT (Borås 1) is informed of decided changes by way of posted meeting minutes an exact message is communicated without the possibility of clarification or feedback for its intended purpose this method leads to ambiguities.

• How does flexibility affect network effectiveness?

In VGR-IT and Borås Hospital the lack of flexibility stands as a barrier to task effectiveness. VGR-IT is a virtual organization still in its infancy thus is open to innovative impressions in IT operations. Incorporating a set of Information Technology Infrastructure Library (ITIL) concepts allow for varying methods of managing the IT infrastructure at Borås Hospital. Both organizations show a degree of flexibility in relation to processes and most communication task but being a public organization expands the time frames in which change occurs. Flexibility dictates the capability to respond to external threats and internal weaknesses. From a technical aspect the IT innovations employed by VGR-IT and their changing structure allow for such flexibility yet on a communicative level
gaps have been indentified. Reduced organizational funding threatens to place limitations on services performed under the current SLA straining the relationship between VGR-IT and Borås Hospital. Communicative flexibility holds the potential to increase effectiveness by allowing organizational members to select method(s) that meet their intended purpose.

- **What socio-technical determinants affect communication within networks?**

Determinants that affect communication are the roles of individuals, attitudes, competencies, beliefs, organizational policies, traditions, and technological functions. Individuals posed the greatest potential to affect communication within organizations. Relationships may take many forms in organizations where personal relationships increase the interaction of individuals and instigate the communicative process. The status and attitude an individual holds toward the organization and other individuals have a profound effect on the motivation and volume of information interchanged. If such relationships are based on mutual respect and trust information may be disseminated more freely but when individuals lack managerial trust or are normally excluded from the decision-making process, as within VGR-IT, informational flows become deficient. The formal and informal policies an organization implements may creates an atmosphere where certain individuals are less informed than others, which could be a sign of information ownership and thus affect communication. Smaller organizational teams allow for interaction that is more personal and supply instant feedback. VGR-IT’s relocation plans have caused apprehension amongst some of the individuals that have found assurance in their locality. Communication mediums rich in social and emotional content are effectively utilized, however, both CMC and interpersonal documents inhibit socioemotional communication.

- **What aspects of network and organizational structure must be present to facilitate network effectiveness?**

Virtual organizations necessitate information and communication technology for the purpose of facilitating primary processes. VGR-IT is a young organization that was created as a subsidiary of a bureaucratically structured parent organization. Yet, VGR-IT has begun to shed the structure of VGR and is adopting a structure more congruent to what modern organizational theory dictate. Informational flows through hierarchical managerial levels often display unidirectional communication. While this is usually the case VGR-IT has exhibited signs of more than one organizational structure. This transitional manifestation may be perceived as flexibility yet it creates ambiguity amongst some organizational members. The logical structure of the communication network ascribes to the communication chain that is superseded whenever an informational need arises that fails to yield results through established chains. Managerial instability directly impacts structure in the form of integrative mechanisms.
5 ANALYSIS AND RESULTS

Frame of reference

The frame of reference proposed for the comparative analysis pertains to the sub-questions that underpin the main research question. The four sub-research questions have been addressed in the theoretical and empirical studies and themes have been identified in regard to the research phenomenon.

Grounds for Comparison

The grounds for comparison anticipate the comparative nature concerning the phenomenon of information interchange within virtual organizations. The theoretical study aims to construct a perception of virtual organizations from prior virtual organizational/networks research combined with related fields of study: organizational theory, organizational communication, organizational flexibility, and information interchange. The empirical study aims to investigate a case of information interchange within a virtual organization where data is generated through the triangulation of in-depth interviews and documents. In the comparative analysis the attempt is to identify both consistent and emergent themes through the comparison of both studies.

5.1 Comparative Analysis

• How does the method of communication affect network effectiveness?

Organization communication methods support varying communicative purposes where media effectiveness can be matched with task ambiguity. According to the theoretical study communication effectiveness may be achieved through the social information process and the symbol carrying capacity a medium represents. The empirical study enforces the media rich theory of face-to-face communication being effectively matched with ambiguous tasks. Within VGR-IT face-to-face communication serves the purpose of cross-referencing the projected activity schedule and could very much hold the symbol carrying capacity of dedication. In task communication individuals are identified as having varied levels of understanding so a medical physician can interpret instructions for system update from general terms whereas someone from human resources may need details, which are consistent with social information processing. When computer mediated communication is employed the potential exist to interchange information within the organization, between service provider and client, and between VGR-IT and the existing environment. CMC and ICT have the propensity to increase the volume of information interchanged, which often enriches the knowledge process. Using CMC and ICT successively could lead to information overload network effectiveness will be impacted if recipients stop responding or ignore transmission as a result of feeling pressured.
• How does flexibility affect network effectiveness?

Flexibility is the primary reasoning behind organizations adopting virtual structures. Theoretical results illustrate flexibility as impacting the effectiveness of organizational communication, processes, and expenditures. Organizations that are capable of utilizing information communication technology at a high rate are able to effectively disseminate information faster with increased fluidity through intra / inter organizational pathways. Taking advantage of CMC enables the automation of processes and the reduction of personnel needed, saving both time and money. The empirical study affirms that the use of CMC allows VGR-IT to provide IT infrastructure to Borås Hospital cheaper than what it cost to maintain an in-house IT department, although Borås Hospital maintains a few IT positions the size of VGR-IT’s (27) member virtual team services (2) hospitals and outperforms previous efforts. The strategic plan to reduce (40) regional servers down to (2) data centers and (2) sub-centers shows that process flexibility and scalability affords VGR-IT the ability to compete effectively in an ever-changing environment.

• What socio-technical determinants affect communication within networks?

The theoretical study identified socio-technical determinants that affect organizational communication. Although CMC assumes a critical role in virtual organization communication many social informational processing determinants exist. These determinants include organizational relationships where the roles individuals assume dictate the properties of interconnections between members. In essence the empirical data generated validates that the effectiveness of information interchange within VGR-IT is impacted by relationships. Such relationships are defined as collaborative, managerial, and process driven. VGR-IT and Borås Hospital share both collaborative (between organizations towards a common goal) and process driven (service provided from one organization to another) interconnectedness which represent inter-personal and organizational relationships. Managerial relationships in both organizations appear to be structural and formal with information flows through hierarchical and lateral pathways. Organizational subcultures are components of both the social and management subsystems, which hold the potential to influence communication amongst members as well as provide viable flexibility and innovative learning tactics in unstable environments. The increase in temporary employment opportunities such as consultancy and short-term business relationships are seen as factors that may limit communication, since tele-work and flexible work schedules may not allow individuals to establish a social presence and build trust amongst co-workers. Decisions that implement or design IS and ICT for an organization must be made in consideration to the people who use them and whom they affect.

• What aspects of network and organizational structure must be present to facilitate network effectiveness?

The theoretical study illuminates the fact that virtual organizations embrace structures that take advantage of computer-mediated communication. Areas targeted in the communication approach are task, social, and innovation. Organizational communication
is a complex process that attend to hierarchal, interdependent, and permeable components that must manage human participants, information globalization, organization globalization, and global processes. Most characteristics uncovered favor decentralization when information interchange is the primary objective yet in relation to integration organizations benefit from centralization. It has been assessed that a hybrid approach to organizational structure where the informal structure will afford flexibility while the formal structure will maintain standardization. Task analyzability and task variety are two components of task standardization, which has an effect on the communication structure. VGR-IT is an organization in its infancy that inherited a hierarchal structure from its parenting organization of VGR. Revealed in the empirical study VGR-IT is reaching a stage of development where structural transition is visible. In agreement with the theoretical study VGR-IT is gravitating towards a virtual structure yet remnants of its traditional structure remain and may continue to do so. The logical communication structure from upper management is unidirectional and broadens as it descends through organizational levels reaching full access at the process level.

5.2 Results Summary

In researching the phenomenon of virtual organizations a theoretical study of existing literature was conducted in addition to an empirical study entailing a case of VGR-IT a virtual organization. The results of the theoretical and empirical studies underwent a comparative analysis to identify either existent and/or emergent theories. The grounds for comparison are gauged on answers to research sub-questions that underpin the main research question.

- The analysis of sub-question 1 enforces the media rich theory and social information processing which dictates that methods of communication must match communication purpose and that social factors hold the potential to erect communication barriers.
- The analysis of sub-question 2 places flexibility in the context of structure, which dictates communication, processes and expenditure. The findings in the theoretical study are consistent with those of the empirical study where a small virtual team employing CMC has allowed VGR-IT to employ flexibility to improve process effectiveness.
- The analysis of sub-question 3 illuminates socio-technical determinants found in both theoretical and empirical studies. The congruency of the studies targets the roles individuals assume and the nature of relationships that exist between organizational members. The social subsystem factor that has the greatest impact on information interchange is trust. In addition the management sub-system directly influences both the social and the technical sub-systems.
- The analysis of sub-question 4 identifies structural characteristics that should be present for effective informational task, social, and innovative information interchange. Since a comprehensive organizational structure does not exist organizational size and purpose should be weighed to determine a hybridized structure.
5.3 Revised MERiSii Model

The revised MERiSii Model is a result of expanding upon themes present in both the theoretical and the empirical studies. As noted the socio-technical systems theory largely influences the revised MERiSii model. Sub-systems of an organization must establish interactive relationships based on trust to achieve effective information interchange. The socio and technical sub-systems are shown in the information interchange process where both systems interact to send and receive information. Due to the reliance upon ICT and CMC to complete organizational task the technical system may also represent a conductor that aids the information interchange process within the social sub-system. Consistent with the traditional role of management the management sub-system influences the relationships that exist within organizations. Considering the dynamic complexity of the environments that organizations function in, a high degree of flexibility is emphasized within the management system of virtual organizations. To facilitate effective information interchange the revised MERiSii model illustrates that organizational policies, strategies, structure, and culture must be flexible to positively support the social and technical sub-systems. A non-flexible management sub-system is perceived as a barrier to information interchange.
6 DISCUSSION

6.1 Conclusion

The virtual organization is a phenomenon that has gained momentum over the past decade. Its virtual structure is an adaptation evolving from organizations with network structures. This organizational type is a direct result of economical instability and advancements in ICT. But like any other form of organization information processing, management, and communication are essential to organizational operability. In this aspect virtual organizations are not only dependent on information and information systems for core functions but would be incapacitated without a network infrastructure and computer mediated technologies.

The thesis investigation aims to identify essential characteristics that may encourage effective information interchange within virtual organizations. It is composed of a theoretical and an empirical study that was used to generate answers to the research sub-questions. In the theoretical study a foundation is constructed for organizational theory in relation to management, structure, flexibility, and communication, which are all pertinent factors in the process of information interchange. The theoretical results render the complexity of determinant factors needed to strike a balance between human behavior and optimal information usage. Interpreting the virtual organization as a socio-technical system adheres to the roles enacted by the social system and functions performed by the technical system. The characteristics of the social system are significant as it governs the interactions of human agents who are heterogeneous in many aspects. Human agents participating in an organization share commonalities but are motivated by varying dispositions that often form communication barriers.

The use of media richness theory coupled with social information processing allows us to perceive the magnitude of matching communication mediums to the ambiguity of task. This also includes the underlying factors such mediums ascribe to create and sustain social characteristics linked to ICT. Consistent themes revealed throughout the theoretical study were issues of trust and uncertainty. Understanding that virtual organizations function within the variance of distance and time, relational barriers within the organizational system have been determined to retard information interchange process. Computer-mediated communication drastically increases the volume of information flow within an organization. Whereas the consumption, processing, and storage of information reflects an organization’s ability to compete in a given field, without the establishment and maintenance of trustful relationships amongst human agents necessary information becomes stagnant and consequentially becomes less effective. Structures consistent with virtual organizations are non-bureaucratic and encourage multidimensional relationships and multidirectional communication.

The development and maintenance of organizational polices, procedures, and traditions are skewed as oppose to bureaucratic management, yet standardized structure are needed to handle the certainty that exist in organizational behavior. In attending to the motivational needs of human agents non-bureaucratic structures are more compatible in
terms of physiological, moral, technical, and social aspects. Decision making authority is more lateral in virtual organizations promoting the efforts of agents toward organizational objectives. The empirical results are congruent with themes identified in the theoretical study. Identified as a virtual organization VGR-IT employs ICT and IS for intra/inter organizational purposes. Although the information interchanged appears to be effective it is suspected that better establishment of trust within the managerial level may increase effectiveness. Communication is most effective when a face-to-face method is used.

Communication channels rich in socioemotional cues are suggested for establishing trust after which ICT will be better utilized to carry out communication task. Employing a range of communication channels ascribes to the fluidity needed within an agile type of organization. Due to VGR-IT’s infancy it continues to struggle with the hierarchal parental structure of VGR, however efforts are being made to transition the organization into a more competitive organizational structure (standard/flexible). VGR is a prime example of an organization that has unbundled its core processes [IT infrastructure management] and created a subsidiary [VGR-IT] to provide service for the parent organization [VGR]. However with the growing demand for flexible IT infrastructure solutions it is perceivable that VGR-IT will evolve to provide cloud/grid computing type solutions for the Västra Götaland region of Sweden.

6.2 Implications for Information Interchange within Virtual Organizations

The research phenomenon of virtual organizations holds a connected interest to informatics. Generally, informatics consists of the study of the development and use of information systems. However, informatics is a broad academic field that is the convergence of human-computer interaction, information science, information technology, and social science. Further, the study of computer systems and informational techniques have been merged with a myriad of academic disciplines. Traditionally, the development and implementation of information systems consist of many methodologies, techniques and tools. The virtual organization is viewed as a socio-technical system, which is placed under the umbrella of systems theory. From a systems perspective the design, development, and implementation of a system must account for the interaction of all intra/inter organizational components. One such systems development philosophy devised by Enid Mumford that directly addresses organizations from a socio-technical perspective is ETHICS. Where some organizational components are predictable many, like the social system, are not, thus developing information systems from a socio-technical perspective is beneficial. Research studies that explore determinant factors of systems effectiveness are needed to guide development, implementation, and maintenance efforts of information systems.

The studies of virtual organizations further draws upon the interdisciplinary studies of business and social informatics. Although business informatics [organizational informatics] is more concerned with management concepts and social informatics with the social aspects of computerization, in similitude they support attainments sought by organizations. Rapid advancements in informational and communication technology have
given rise to the newly developed discipline of communication informatics. The initial focus of the thesis targeted a sample population of virtual healthcare organizations. However due to a shift in sample criterion VGR-IT was included in the sample population [identified as a virtual organization that provides IT infrastructure for a collection of hospitals and healthcare facilities]. The fact that VGR-IT is an organization devoted to the implementation and sustainment of information technology explicitly shows a correlation to informatics. VGR-IT maintains approximately 450 formalized information systems for Borås Hospital with (72) implemented in the last four years. Many of the systems implemented are obtained through government procurement where systems chosen best meet stipulated criteria. VGR-IT awards contracts to information systems vendors. Information systems vendors design and develop information systems according to methodologies, techniques, and tools established in disciplines such as: HCI, information science, and computer science, etc. If we take into account the IT infrastructure customer [Borås Hospital] the information systems implemented and sustained support: biomedical & health informatics, medical (clinical) informatics, public health informatics, bioinformatics, (clinical field) informatics, and consumer health informatics.

The MERiSii model introduced is a convergence of several theories relevant to information interchange within virtual organizations. The MERiSii model’s development and progression is inspired by results found in both theoretical and empirical studies. Incorporating a systems perspective into the phenomenon of virtual organizations lets us view the process of information interchange from that of a socio-technical system. This investigation has lead to the conclusion that several issues related to the social subsystem of a virtual organization impact the effectiveness of the information interchanged. The sustainment of trust-based relationships is needed to encourage open communication pathways between sub-systems. Organizational communication spans across a wide range of disciplines with direct implications to informatics with particular interest drawn to the discipline of organizational informatics and its sub-category of business informatics. The MERiSii model addresses the social concerns of communication (formal/informal) set forth by many qualitative methodology researchers. The MERiSii model could be of practical use in current areas of communication studies targeting the affect of organizational communication to individual identity and what role it plays in the interrelatedness of organizational experiences.

6.3 Method Evaluation

The theoretical study explores text relevant to the phenomenon of virtual organizations. Subject areas that underpin virtual organizations aid in the construction of a theoretical outline of texts that were used in analysis. The text used in the literature sampling encompasses published articles in academic and scientific journals and textbooks. The texts sampled adequately served the research purpose and allowed for the most relevant findings to be applied to the research sub-questions. In the analysis of texts it is understood that interpretations vary dependent upon the analysis perspective. Analysis of articles and textbooks conflicted at times due to different theoretical frameworks, time the work was published, interpretation of concept, etc. Most concepts and themes encountered in the literature held consistent elements linking them together while others
took unique stances that made an impression. As the theoretical study progressed the author gained insight into the phenomenon of virtual organizations. If a similar process were repeated relevant themes would be located more expeditiously.

Interviews are a good method of data generation and here the method was effective at giving insight to the inner working of an organization. The empirical study consisted of two interviews, more were anticipated but due to time constraints and cancellations they were not possible. The first interview provided a chance to test the time needed to answer questions in the interview guide. After the first (10) minutes it was realized that the scheduled (1½) hours would not be enough time to complete the amount of questions designed. Naturally there was an urge to engage in normal conversation as a way of building trust with the informants. Even though both Informants interviewed spoke English it is not their mother tongue. There were many times in the interview where the interviewer found himself wanting to provide missing word that were difficult to translate. When the informant appeared to freeze up from the awareness that he/she was unable to translate an appropriate term an intervention was for the sake of the interview.

The awareness of the fact that informant could easily influence prompted the interviewer to make it known that anything that couldn’t be translated should be spoken in Swedish. The first interview also provided a chance to critique my interview style and find different ways to prod the informant for more information when interesting or unexpected details emerged. Because of the mutual respect established Informant 1 and the interviewer have remained in contact, which lead to access gained to Informant 2.

The second interview was much richer than the first maybe due to the fact that the interviewer had better control of the interview in addition to the informant being very knowledgeable. Once rapport was established with Informant 2 the interview ran smoothly. From the first interview it was learned that certain questions evoke more details than others so the interviewer rearranged the question to better match the funnel style purposed. Even though Informant 2 is a customer of VGR-IT a great deal of insight was gained into VGR-IT and the service they provide. The case of VGR-IT and Borås Hospital was further strengthened by documents published by IBM, CA Technologies, and Global 360. Considering the amount of data that was compiled from two interviews it could be viewed that interviews are very useful for generating qualitative data, other forms of data collection lack the richness of conversational text and socioemotional cues.

### 6.4 Results Evaluation

The strategy for evaluating the data generated as discussed in section (2.5) is triangulation. A triangulation of data sources consisted of in depth interviews and published documents, which holds the merit to validate consistency and integrity. For the purpose of establishing trustworthiness a criteria set has been proposed by (Lincoln & Guda, 1985)

*Credibility* – measures the quality of being trustworthy. Although the time invested in the research phenomenon has been short the author’s knowledge of information systems and organizational studies have allowed him to confidently gather and interpret data pertinent
to virtual organizations. The research strategy [case study], sampling strategy [typical case sampling], data generation method [interviews], data analysis technique [comparative analysis] are established techniques for generating and interpreting qualitative data. The texts and the diagrams depicted for the theoretical study show consistency with themes and theories related to the research phenomenon. Participant organization chosen fits the population criterion of a virtual organization and the informants interviewed possessed knowledge pertinent to the current research phenomenon. Semi-structured interviews were conducted using open-ended questions. The informants interviewed were an account manager for VGR-IT and an IT strategist for Borås Hospital.

Transferability – pertains to the applicability of research results across a given population. The implications for generalization may be explored through the sampling strategy [purposive sampling]. Through purposive sampling the data source population was identified by explicitly defining a set of requirements for the data source of interest. Purposive sampling is in essence equivalent to defining a sample frame. The data source population is defined as a professional organization representing a virtual structure that provides healthcare or is in alliance with a healthcare organization. Through an inquiry of virtual organization types four were identified: organization network, network organization, objective virtual organization, and subjective virtual organization. Since each organizational type displays unique characteristics further defining was necessary. An objective virtual organization or permanent virtual organization [defined as – a formal organization with human and virtual agents that have defined roles and functions] type was selected. The organizational size of the selected data source is basically a smaller organization but capable of scalability. In light of the fact that virtual organizations have been implemented at a steady rate over the past decade available population size is difficult to define. Due to the research strategy of interviews and the fact that qualitative case studies are generally small in size the data source population was limited to Sweden. An Internet search returned a total of (32) hospitals in Sweden and out of this small population size four counties were identified as having healthcare organizations virtually connected. As a result of a typical case sampling Västra Götaland County was selected. After being informed that the IT infrastructure of the county hospitals was out sourced to VGR-IT, VGR-IT became the typical case sampling. Searching VGR-IT’s web directory access was gained to the contact information of (35) organizational members that hold positions from lower management through upper management. Considering that the goal was to generate data from an informant that conducted tasks both internally and externally a customer relations manager and an IT strategist were chosen as research informants.

Dependability – shows how well the research has been recorded so that an audit trail can trace the steps taken to arrive at the results concluded. A significant challenge for qualitative research is the constantly changing environment. Time spent reviewing literature and experience in a particular field of study strengthens the researchers ability to apply relevant methodologies for studying an environment. A research infrastructure is established that supports replication of a given study. Research that is unique and specific where replication is not possible has limited influence outside of the context of the study
(Jensen, 2008) SAGE. Changes in the research design must be accurately documented so that methodological and theoretical foundations can be connected to data uncovered. The research design applied consisted of a research strategy [case study], data generation methods [interviews & documents], and qualitative data analysis [comparative analysis]. The case selected was VGR-IT, a virtual organization located in the Västra Götaland region of Sweden; the unit investigated was located at Borås Hospital. Two interviews were conducted: informant 1 is an account manager for VGR-IT and informant 2 is an IT strategist for Borås Hospital. Both interviews took place at Borås Hospital: the first interview was held November 24, 2010 and the second was held December 17, 2010. Four documents were retrieved from an Internet search: “Swedish Council maximizes budget and improves public services with automated and integrated IT management” produced by CA Technologies, “Case Study: Borås Hospital” produced by Global 360, “ITIL – resan på VGR-IT” produced by Anna Wallqvist Projektledare ITIL – införandet, VGR begins transition to knowledge-based organization with IBM WebSphere Information Integrator OmniFind Edition produced by IBM. The research data generation method is a triangulation of the two interviews conducted and the analysis of the above documents. The results of a relevant literature review were cross-referenced with the empirical results and comparatively analyzed.

**Confirmability** – illuminates the degree to which a participants actions and perceptions are interpreted within a given context. Here evidence is provided to substantiate the interpretive efforts of the researcher and is presented to support the audit trail. Confirmability may be assessed through the explicit presentation of results from the interview guide, transcribed interviews, results from the empirical study, and results of the comparative analysis. Chapter 2 documents the methodological steps taken as I progressed through the research methodology. Understanding that a congruency must exist between areas like research questions, chosen method, and results retrieved is discernable however logic of connectedness is further demonstrated through the symmetry of data generated and analysis, theoretical and empirical studies, and the results and practice (Whittemore, Chase & Mandle, 2001).

**Ethics** – relate to the moral principles in research. By adhering to an ethical code means that the author has an obligation to conduct him/herself with integrity in all aspects of research. Whether directly or indirectly related to this research study process the author has treated all persons with dignity, adhered to intellectual property rights, and upheld rights entitled to the informants. The informants have been fully informed about the rights to not participate, to withdraw, to give informed consent, to anonymity, and the right to confidentiality. This includes but is not limited to recording data accurately and completely, plagiarism, and to review others work ethically.

### 6.5 Possibilities to generalize

Traditionally case studies are believed to only apply to the case under study, however broader inferences may be drawn that have relevancy outside of a given study (Oates, 2006). Qualitative research often pertains to small sample sizes limiting generalizability. The research case of virtual organizations has general aspects that are typical to other
virtual type organizations. The knowledge generated in this thesis relates to information interchange a common factor present in most organizational types. Since most knowledge-based organizations employ some form of intranet for informative, regulative, innovative, or integrative objectives the assumption can be made that network effectiveness is somewhat prioritized. If this assumption is logical then research that illuminates determinants of effective information interchange may have implications to organizations that share characteristics with the research case. The organization chosen for the empirical case is representative of emergent organizational models, which are an increasing commonality as a result of globalization, technological innovation and market unstableness. These organizational types: organization network, network organization, objective virtual organization, and subjective virtual organization have standardized a wide array of ICT and information systems as a part of core operations. The research case may also have generalizations to the field of information systems. Since most organizations have information systems (Avison & Fitzgerald, 2006) efforts to cope with a competitive landscapes will require more flexible organizational structures. From this it can be inferred that future IS researchers and system developers [information systems & ICT] may find information interchange effectiveness a related issue to systems development.

The MERiSii model developed and introduced in this thesis approaches communication (information interchange) from a systems perspective. Since the universal function of communication encompasses information interchange and information interchange exists in many organizational types the MERiSii model may have implications in organizational communication research outside of the given case. The possibility may exist to employ the MERiSii model in a survey that maps the effectiveness of information interchanges within and between sub-systems of an organization. Data generated through questionnaires could be used to verify what relational aspects of the MERiSii model impact information interchange and too evaluate its effectiveness. This may be accomplished by using the MERiSii model as a basis for an Episodic Communication Channels in Organization (ECCO) analysis where employee’s responses can be quantitatively measured. If an organization displays characteristics congruent with the MERiSii model’s descriptive framework the possibility exist to statistically measure and visualize organizational relationships using one of the many Social Network Analysis (SNA) software tools.

6.6 Ideas for Continued Research

The study of virtual organizations is so dynamic that although large amounts of research data overlap only small aspects of this phenomenon may be undertaken within each study. Areas of interest for future research may include: information security within virtual organizations, information interchange within a private virtual organization, and information interchange within a global virtual organization. Continued research of the MERiSii model could investigate the impact of knowledge management in a virtual organization to further develop the knowledge process illustrated in the MERiSii model.
6.7 Speculations for the Future

A possible future trend that is beginning to emerge is the virtual organization/virtual network that utilizes cloud technology as its infrastructure. Since most objective [permanent] virtual organizations are classified as small with scalability potential it is possible that this organizational type has begun and will continue to increase in size.
REFERENCES


University of Borås is a modern university in the city center. We give courses in business administration and informatics, library and information science, fashion and textiles, behavioral sciences and teacher education, engineering and health sciences.

In the School of Business and Informatics (IDA), we have focused on the students' future needs. Therefore we have created programs in which employability is a key word. Subject integration and contextualization are other important concepts. The department has a closeness, both between students and teachers as well as between industry and education.

Our courses in business administration give students the opportunity to learn more about different businesses and governments and how governance and organization of these activities take place. They may also learn about society development and organizations' adaptation to the outside world. They have the opportunity to improve their ability to analyze, develop and control activities, whether they want to engage in auditing, management or marketing.

Among our IT courses, there’s always something for those who want to design the future of IT-based communications, analyze the needs and demands on organizations' information to design their content structures, integrating IT and business development, developing their ability to analyze and design business processes or focus on programming and development of good use of IT in enterprises and organizations.

The research in the school is well recognized and oriented towards professionalism as well as design and development. The overall research profile is Business-IT-Services, which combine knowledge and skills in informatics as well as in business administration. The research is profession-oriented, which is reflected in the research, in many cases conducted on action research-based grounds, with businesses and government organizations at local, national and international arenas. The research design and professional orientation is manifested also in InnovationLab, which is the department's and university's unit for research-supporting system development.