

# NAVAL POSTGRADUATE SCHOOL MONTEREY, CALIFORNIA



## THESIS

**ANALYSIS AND DESIGN OF AN  
INFORMATION SYSTEMS NETWORK IN THE  
FORMER SOVIET UNION**

by

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March, 1996

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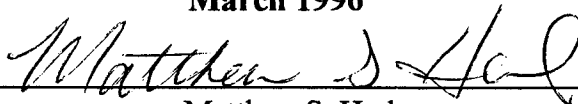
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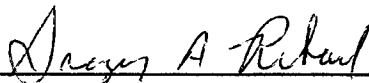
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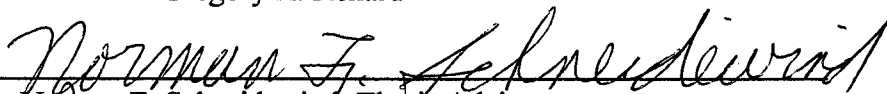
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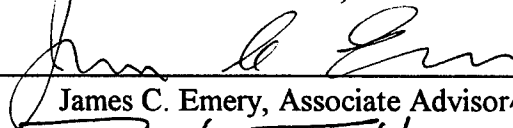


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## **ABSTRACT**

In an effort to facilitate democratic reforms in the Former Soviet Union (FSU), the President of the United States authorized the establishment of American Business Centers (ABCs) through the Freedom Support Act of 1992. The Act promotes U.S. economic interests by establishing commercial partnerships between the United States and the FSU. Integral to this transition is the role of information technology. The purpose of this thesis is to assist the ABCs in defining their information system needs by producing a network model that takes into account the unique operating environment within the FSU. The essential elements of this model are range, reach, and responsiveness. They characterize the utility of an information system to an organization. The model is applied to the ABCs to form a baseline assessment that provides a point of reference from which a target architecture can be formulated. It is this target architecture that is intended to serve as a baseline configuration for local/wide area enterprise networks to be used by the ABCs within the FSU. The thesis concludes with a discussion of those drivers that could significantly affect the viability of the American Business Centers.



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## I. INTRODUCTION

New technological realities have caused the use of computers, networks and telecommunications to become global in nature. But differences in cultures, socio-political structures, existing technological bases, and prevailing economic conditions mean that the information revolution will proceed at different paces and, very likely, in different directions in various nations of the world.<sup>1</sup> In the Former Soviet Union (FSU) an information revolution is proceeding. It is a complex and contradictory phenomena. Proceeding in response to official policy, it seeks to define and channel both the development of information technologies and their application. It has been formed by the unplanned, but powerful, interplay of bureaucratic interests, institutional forces and prevailing parochial self interests that operate in the post-Soviet system and is largely driven by members of the intellegencia who increasingly desire close linkage between the information revolution and the longing for a degree of control and stability reminiscent of the old Soviet system.<sup>2</sup> However, their activities have generated an increasing desire for the average citizen to receive some amount of benefit from the newly instituted democratic reforms.

In an effort to facilitate democratic reforms in the FSU, the President of the United States authorized the establishment of American Business Centers (ABCs) through the Freedom Support Act of 1992. The tenants of the Act are to promote economic interests by

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<sup>1</sup>R.W. Judy and V. L. Clough, The Information Age and Soviet Society, (Indianapolis: Houston Institute, 1989), p.3.

<sup>2</sup>Ibid., p. 4.

establishing commercial partnerships between the United States and the FSU. The purpose of these centers is to enhance the ability of businessmen internal to the FSU to meet the needs of their own economies, assist the transition from a command-driven economy to a free market system, and to aid in the demonstration and use of United States equipment and technology.<sup>3</sup>

Interest in this topic was generated by the ongoing transition of the post-Soviet economy. Integral to this transition was the role of information technology. One of the vehicles used to introduce the technology is the American Business Centers. In an attempt to measure the effectiveness of these centers on post-Soviet society, a personal sight survey was conducted to aid in our research. These insights provided the basis for this thesis and resulted in an exercise in system analysis and design. Our goal is to assist the American Business Centers in defining their information system needs. Discussion will not only focus on the technological aspects of information, but also examine the environmental dynamics inherent in the post-Soviet era. Chapter I will provide the reader with a historical perspective of socio/technological responses to change in Soviet society. Chapter II focuses on the problems of information management in post-Soviet society today. Chapter III details the nature of information and its importance to an organization whose goal is to facilitate business relationships on a global level. Chapter IV establishes our model of an information network along with attributes used to measure its performance. Chapter V examines the baseline for the current system used by the American Business Centers. Chapter VI focuses on the design

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<sup>3</sup>22 USC 5821, Sec. 301.

of a target system that will meet the ABCs' needs. Finally, Chapter VII will discuss those drivers that could significantly affect the viability of the American Business Centers.



## II. HISTORICAL BACKGROUND

"History is not unitary, but pluralistic. Every region and area has its own history, and the investigation of causation becomes possible when it is seen that the activities of men under different conditions may be compared."<sup>4</sup>

Large scale socio/technological change is not new to Russia, and historically neither has been her response to such change. Russia has had her fair share of visionary leaders, but tragically all too often these agents of change are quickly followed by an aggressive anti-thesis. This one step forward, followed by two steps back, cyclical tendency led Sir Winston Churchill to remark, "Russia is a puzzle, wrapped in a riddle, surrounded by an enigma." Ever since a lone twelfth century Teutonic knight wandered into a bizarre kingdom east of then-known Christendom, Russia has been an enigma to the West. General descriptions of the Muscovite state since the sixteenth century included and repeated three main features:

- The state government was always of a military structure.
- There was a supreme, centralized, and authoritarian structure based on service, not rights and privileges.
- The head of the government possessed all-encompassing authority and supreme jurisdiction.<sup>5</sup>

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<sup>4</sup>Frederick J. Teggart, as cited in Robert F. Berkhofer's A Behavioral Approach to Historical Analysis (Toronto: Collier-Macmillan Canada, Ltd., 1969), p. 250.

<sup>5</sup>Tibor Szamuely, The Russian Tradition, ed. Robert Conquest (New York: McGraw-Hill, 1974), p. 74.

Numerous intimate details and insight were provided by a certain Prince to the Marquis de Custine who traveled throughout Russia in 1839. He described a backward nation consisting of oppressed and disenfranchised millions, in which the people have reacted violently to change. The society's entire structure seemed to revolve around the Tsar -- a servitude oppressive in nature and accepted by the people as the way it should be.<sup>6</sup> And here, it should be noted, the most condemning evidence of despotism and servitude was given not by Custine, but by Tsar Nicholas I, himself, who said, "Despotism still exists in Russia, since it is the essence of my government; but it is in keeping with the character of the nation."<sup>7</sup>

Traditional Russian core values that represent the character of the nation have been manifested in the state structure, as noted by the preeminent Russia Studies Professor, Timor Szamuely,

"Two of the factors that determined the Russians' attitude towards their State can be easily pinpointed. One was their acute consciousness of the fact that only a powerful centralized State, in full control of the nation's every resource, could ensure national survival. Another was the largely artificial, centuries old isolation from (Western) Europe, and the resulting ignorance and fear of the outside world: a feeling very similar to that which led early cartographers to decorate uncharted seas with the legend 'Here be monsters'."<sup>8</sup>

It is here in these factors that can be found the essence of the "Russian Soul." In order

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<sup>6</sup>Astolphe L.L. Marquis de Custine, Custine's Eternal Russia: A New Edition of Journey For Our Time, ed. and trans. Phyllis P. Kohler (Miami: Center For Advanced International Studies, 1976), pp. 84-87.

<sup>7</sup>Ibid., p. 79.

<sup>8</sup>Szamuely, op. cit., p 60.

to obtain any situational awareness into the current Russia, one must accept that Russians were, are, and will continue to be fundamentally different from Western peoples. The existence of these differences has been commented upon by academicians in statements such as,

“Anyone familiar with peasants and their village life can easily see that all the paradoxical, contradictory and enigmatic characteristics of what is so often called the "Russian Soul" -- so mysterious to the Western World-- are to be found in the villages, today, as they have been for centuries.”<sup>9</sup>

The historic natures of the individual Russian, combined with traits ascribed to the Russian Soul, have molded these people and their culture into a strangely different society, the enigma in which few Western ideals produce the desired effect, if any at all.

“It is hard to change the mentality of a people; it is not a matter of a day or even a reign. It is true that nothing is abolished in Russia without danger; peoples who lack guarantees lean only on their customs. Stubborn attachment to customs, protected by riot and poison, is one of the pillars of the social order, and . . . this order can command respect.”<sup>10</sup>

Throughout Russian history liberal reforms have been put forth by a courageous few, but have always quickly fizzled. They have always failed because of the intelligentsia elites' drive for security, stability, and predictability. Peter the Great's reforms were thwarted by Nicholas I, Alexander II's visionary reforms were almost immediately derailed by his son, Alexander III.

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<sup>9</sup>Victor Herman and Fred E. Dohrs, Realities: Might and Paradox in Soviet Russia, Illus. Mary Ellen Dohrs (Southland, MI: Independent Publishers, Inc., 1982), p. 67.

<sup>10</sup>Custine, *op. cit.*, pp. 90, 110.

Even Vladimir Lenin was short changed by Joseph Stalin and Khrushchev's reforms suffered a step backwards under the Brezhnev watch. But, none the less, Russia continues to rally and attempts to pursue changes. Being faced with an undesirable, and perhaps untenable situation, the most resent manifestation of change was introduced by Mikail Gorbachev. These changes are strikingly similar and closely parallel the reforms of Alexander II. *Perestroika* and *Glasnos*, rebuilding and openness, accomplished many of the same goals that Alexander II did by emancipating the serfs. Unfortunately, however, emancipation of the serfs in Russia failed to answer the same question as the emancipation of the slaves failed to answer in America ... what do these millions, recently emancipated, do to survive?

In the case of Alexander II, once he "freed Russian society from the rigid controls his father had imposed, the expectations of public opinion moved ahead at a far more rapid pace than did his reform program. As a result, even though the Emancipation Acts of 1861 were far more generous than anyone dared to dream when Alexander ascended the throne, they fell short of Russia's expectations."<sup>11</sup> This accentuated the dichotomy between the Russian Intelligentsia elite and the disenfranchised masses, as has the current round of changes. And just as in Alexander II's day, the emancipation whetted the appetites of the masses for more liberalizing reforms but threatened the power base of the elite. The difference this time lies in that while Alexander II's reforms failed, the Gorbachev revolution is, as of yet, undecided. Because in this case, the reformers, led by Boris Yeltsin, actually won the first battle. Only time will tell if Yeltsin will have to pay the price his predecessors had to for threatening

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<sup>11</sup>W. Bruce Lincoln, The Romanovs: Autocrats of all the Russias, (New York: The Dial Press, 1981), p. 595.

Russian security, stability, and predictability.

However, history is not generally prescriptive and societies can, and do, change in opposition to their heritage. Both post-WWII Japan and Germany made liberal transformations in a remarkably short period of time. But both of those countries had the added benefit of a strong amount of external influence to assist in the required transition. Indeed, there appears to be significant empirical evidence that strong external influence and support for liberal reform are the key ingredients for a rapid and successful transformation of a society to occur. The Soviet Union, on the other hand, rebuked outside influence and, as such, has had to wait until the early 1990's for their liberal transformation to begin. The fledgling countries of the Former Soviet Union will need to make the same transition from a one-party political system and its associated command economy that Germany and Japan did in 1945. Along the same lines, the United States, Japan and Western Europe are providing the external influence and assistance to facilitate the changes necessary to bring free market reforms and political stability to the region.



### III. INFORMATION CHALLENGES IN TODAY'S FORMER SOVIET UNION

The Soviet Union, as an organization, had one of the worst information management records in history. It was, and post-Soviet society continues to be, rooted in secrecy, misinformation, central control and privileges for a small and well-connected group of elitists. In the communist state, a person's social status was defined by the measure of control he exerted over the disbursement of scarce resources. This control was exercised by insulating one's activities from the collective decision process by maintaining tight security over all information. This institutionalized paranoia resulted in widely dispersed industrial sights with highly specialized production facilities and the resulting singularly skilled labor force. The Soviet Union operated as the largest centrally-run surveillance system in the world. Its policies reflected practices of a self-absorbed conspiratory gang. Governance existed only on paper and its lack of open system's doctrine<sup>12</sup> denied information to everyone, including its own managers. The end result was that the Soviet Union disintegrated in the largest political/informational implosion in history. Governance based on violence, self delusion, and lies cannot function for any sustained period in modern times. No other industry typified this better than the Soviet defense industry.

Integration between firms and communication across political boundaries was forbidden. Following the disintegration of the Soviet Union, Moscow lost most, if not all, of

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<sup>12</sup> "Doctrine" is defined as fundamental principles by which an organization guides the action of its members in support of stated overarching objectives. A doctrine is authoritative, but requires individual judgement in how to apply it. (Stassmann).

its influence over vast regions. This has allowed the formerly state-controlled industries to transform themselves into entrepreneurial enterprises located in satellite towns in, or near, industrial centers. These satellite towns were a prominent feature of the former USSR, and are quickly becoming the foundation on which the nations of the Former Soviet Union are basing their reforms. A typical satellite town has:

- a well educated and trained workforce;
- industrial networks, and;
- research and scientific institutes attached to technical universities.

These elements provide the basis for market-oriented industrial complexes with the potential to exploit comparative advantages in a number of products and services for domestic consumption and eventual export.

The single largest obstacle to overcome is, as these firms are privatized, they lose state orders for military production. Both old and new spin-off companies need to change their management style, accounting systems, sources of finance, and market focus. Well-educated Eastern European scientists and engineers need to develop a more Western-style management technique to successfully develop and market commercial applications for their ideas, technologies, products, and services.

What is needed is a way to connect existing successful centers throughout the Former Soviet Union, so that real world problem solving can take place, and import western managerial, financial, accounting, and manufacturing expertise electronically, as needed. But satellite towns lack a modern telecommunications infrastructure, since in the past they were

developed as "top-secret" societies, and were specifically denied open communications. Only one in 50 workplaces has a telephone line, and these lines are of extremely poor quality and sharply limited capacity. There has been investment in a new communication infrastructure, but until it can be fully implemented, a workable cost-effective solution to provide access to information, contacts, and markets needs to be found.<sup>13</sup>

As part of the U.S. commitment to work in partnership with the FSU during the transition to democracy and a free market economy, the U.S. Agency for International Development (USAID) established an FSU cooperation program in April 1992. In the authors' opinion, it is in the U.S. National Security interest to support the countries of the FSU. USAID has identified target industries that would greatly benefit from assistance in their radical reorientation. Successful transition will create a permanent shift to competitive markets and productive investment, enabling the FSU to realize the benefits of trade and international cooperation.

USAID finances technical assistance and training to support reformers who demonstrate a vision for change and the will to pursue it. By identifying target industries and linking American experience and expertise to a specific project, USAID seeks to facilitate the construction of mutually beneficial relationships between the U.S. and the FSU.

The U.S. Congress, in section 301 of the Freedom Support Act, authorized the U.S. Department of Commerce to administer the American Business Center Program through the USAID office. The program's goal is to promote the rapid expansion of U.S. influence, trade,

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<sup>13</sup>Custine, *op. cit.*, pp. 90, 110.

and investment in the republics of the Former Soviet Union.

Five ABCs are operated and located within U.S. & Foreign Commercial Service (US&FCS) posts in St. Petersburg and Vladivostok, Russia; Kiev, Ukraine; Almaty, Kazakhstan; and Tashkent, Uzbekistan. In addition, nine ABCs are being established and operated by non-governmental entities (NGO's) with funding from the U.S. Government in cities with no US&FCS presence. ABCs currently are or soon will be located in Chelyabinsk, Khabarovsk, Nizhnevartovsk, Nizhny Novgorod, Novosibirsk, Volgograd, Yekaterinburg, and Yuzhno-Sakalinsk, Russia, as well as, Minsk, Belarus.<sup>14</sup>

The ABCs are to provide American companies and their FSU partners with a broad range of business development and facilitation services to include: counseling on local market conditions and business practices; international telephone and fax; temporary office space and computer use; seminar, conference, and exhibition space; ground transportation services; organizing business meetings; interpretation and translation services; secretarial assistance; and photocopying.

The ABCs outreach activities are designed to help American companies cultivate close contacts with local firms and benefit local firms with training, technical assistance programs, and information about commercial, legal, and technical issues. The ABCs enhance the local firm's practical business knowledge and abilities, and hence their viability as trade and investment partners for U.S. firms. The ABCs are to form a vital link between U.S. and FSU firms and are laying the foundation for the U.S. Government and American business

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<sup>14</sup>See Appendix A: American Business Centers in Russia and the Newly Independent States.

community to supply capital, technology, and business-related training and assistance to support development of strong market economies in the FSU.

The American Business Center Program is a vehicle through which USAID is funneling this support to its targeted industries by accomplishing regional demonstration projects. ABCs hope to provide a means of supporting the informational needs of newly formed business ventures between Former Soviet Union and American entrepreneurs. The research objectives of this thesis will provide a general baseline model for the implementation of an Internet capable local/wide area network in the FSU. The primary research areas are logical design of a local/wide area network given user requirements and the physical design of that network based on the environmental constraints. Additionally, research will be conducted to determine which software applications should be available to users to maximize the utility of the local/wide area network. Finally, the most appropriate way to connect the local/wide area network to the Internet will be explored.

The scope of this research is to produce a network model that takes into account the unique operating environment within the FSU. This model will serve as a baseline configuration for local/wide area enterprise networks to be used by the American Business Centers within the FSU. It must be robust enough to support a diverse client base while allowing for future upgrades as the technological infrastructure of the FSU improves. The system is intended to support newly formed business ventures between FSU and American entrepreneurs. In order to adequately design a network that will be responsive to the needs of its end users, an understanding of the dynamics of information is required.



#### IV. THE NATURE OF INFORMATION

Information is a fundamental resource of an organization. It is essential to the operations and management of an organization. Managers need information to define goals, set objectives, and monitor organizational viability. Information is used as a vehicle to formulate plans, communicate ideas, coordinate activities, and establish whether or not execution is proceeding satisfactorily. But the essence of information is power. It is important to view information as the output of the information process. In doing so it highlights the "purpose" of the information, rather than its "processing" aspects. The underlying premise in acquiring information is to assess and reduce uncertainty. The need for information to reduce uncertainty activates the information process as it provides the basis for defining what information must be produced and consequently what data must be input.

The information process has one, and only one, function: to facilitate the functions of the enterprise. Each of these enterprise functions systematically contributes to the reduction of uncertainty encountered in the performance of the various tasks that comprise the process of management. The management process comprises three major groupings: planning and forecasting, operational execution, and managerial/quality control. These groupings are similar to the U.S. Marine Corps Command and Control philosophy regarding the three types of significant problems organizations regularly face.<sup>15</sup>

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<sup>15</sup>Headquarters United States Marine Corps, Command and Control, (Washington, D.C.: U.S. Printing Office, June 1993) pp. 1-11.

- Strategic Planning is the process of deciding on objectives of the organization, on changes in these objectives, on the resources used to attain these objectives, and on the policies that are to govern the acquisition, use, and disposition of these resources.
- Operational Execution is the process of assuring that specific tasks are carried out efficiently and effectively.
- Managerial/Quality Control is the process of assessing the specific tasks to ensure that they obtained the required resources, and the resources were used efficiently and effectively in direct support of the organizations objectives.<sup>16</sup>

Information is required in an organization in order to facilitate and even make possible the fundamental functions of strategic planning, operational execution, and managerial/quality control.

Information for strategic planning supports problem solving and decision making concerning the design of the organization's structure, facilities, and operations on a periodic basis. The planning function involves a preoperating analysis which deals with defining objectives, forecasting demand, committing resources, and budgeting funds. In this context, information is required to define and evaluate alternative objectives, resource allocation patterns, and policies. Only information can provide a means for comparing the expected relative costs and benefits of various operating alternatives and can serve as the basis for optimal selection.

The use of information for operational execution is communicative in nature. Information is the means for conveying objectives, plans, policies, and procedures to all

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<sup>16</sup>Ibid. pp. 1-11.

segments of the organization. Such information directly supports the coordination of operating forces in a real-time process. Operational execution involves a continual insuring that the operations of the organization are being carried out as planned. It includes the coordination of the individual efforts of those involved in group tasks and the regulation of resource and work flows between different work groups. Operational information links the organization with its environment. In its operational control context, information serves both as a process activator by communicating requirements to each group and as a feedback mechanism by providing a basis upon which to determine whether requirements were received, understood, and carried out.

In the not too distant past, information for managerial/quality control focused entirely on post-operations analysis presented in a periodic form. The current need has evolved into a requirement for a more dynamic flow of information. The essence of managerial/quality control lies in its ability to provide information on a continuous vice periodic basis.

To clarify, the facilitating function of an information systems network reduces the uncertainty inherent in the performance of the planning, operational execution, and the managerial/quality control functions of management. Information serves as the vehicle to perform the design, communicative, and analytical purposes within an organizational framework. The functions of management are interrelated and cyclic in nature, i.e., planning leads to executions which require control, which initiates replanning, and the cycle begins again. Similarly, the types of information utilized in design, communications, and analysis are interrelated and cyclic as they facilitate the performance of planning, operational execution, and managerial/quality control. These types of interrelationships are the essence of

management in a viable organization.

## V. AN INFORMATION SYSTEM MODEL

### A. DEFINITIONS AND THE CATER PRINCIPLE

Based on the tenants discussed in the nature of information, a more precise definitional model of an information system can be constructed by observing that for the system to be effective, trusted, and efficient, several design factors must be considered. The system must be consistent, accurate, timely, economically feasible, and relevant. This principle, commonly referred to as CATER, results in a system that is utilized to its fullest extent.<sup>17</sup>

A system is an arrangement of components that are integrated to accomplish the manipulation of data, the collection of raw facts in isolation. Data describes the organization. These isolated facts convey meaning but generally are not useful by themselves. Data is, in and of itself, a resource that helps to better manage other organizational resources. Data that has been manipulated so it is useful to someone is defined as Information. It must have value to the organization or it remains simply data. Information tells people something they do not already know or confirms something they suspect. It derives its value based on its relevance to the organization. Relevance is the ability to reduce risk within the organization and is obtained by passing the data through a series of filters. The filtering process results in separating data which has value (information) from irrelevant data (noise).

Organizations, either functionally or geographically separated, require integrating/coordinating devices. In the realm of information management this is called a

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<sup>17</sup>Jerry Fitzgerald, *Business Data Communications*, (New York: John Wiley and Sons Inc. ,1993), p. 308.

network. In the abstract, a network is a set of devices or entities that share common sources of data and are able to directly access each other. In the real sense, networks are the distribution of people, data, activities, and technology to suitable organization locations, and the movement of data between those locations.<sup>18</sup>

The goal of a network is to provide cooperative processing between systems, computers, and people. They are the technical arrangement that interconnects computers and peripherals so that they can exchange and share technical resources. Finally, a network consists of data and processes that have been divided into subsets that are technically distributed to or duplicated in multiple locations. Taken as a whole, this forms a set of mutually exclusive collectively exhaustive unique addresses that define the boundaries of an information systems network.

Therefore, an information system network is an arrangement of people, activities, data, equipment, and technology that are integrated for the purpose of supporting and improving the day-to-day operations in an organization, as well as fulfilling the problem-solving and decision-making informational needs of organizational managers. An information system can be characterized by three traits: range, reach, and responsiveness, as illustrated in Figure 5-1. Plotted on axes that run perpendicular to each other, they form a cube establishing the boundaries within which the information system operates. Each axis varies from simple to complex. The greater the complexity along an axis, the greater the need for integrating organizational functions and technology. Consequently, an information system

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<sup>18</sup>Ibid., p. 309.

can be defined as the point in the three-dimensional space that is the vector sum of each of the single dimensional vectors related to range, reach, and responsiveness.

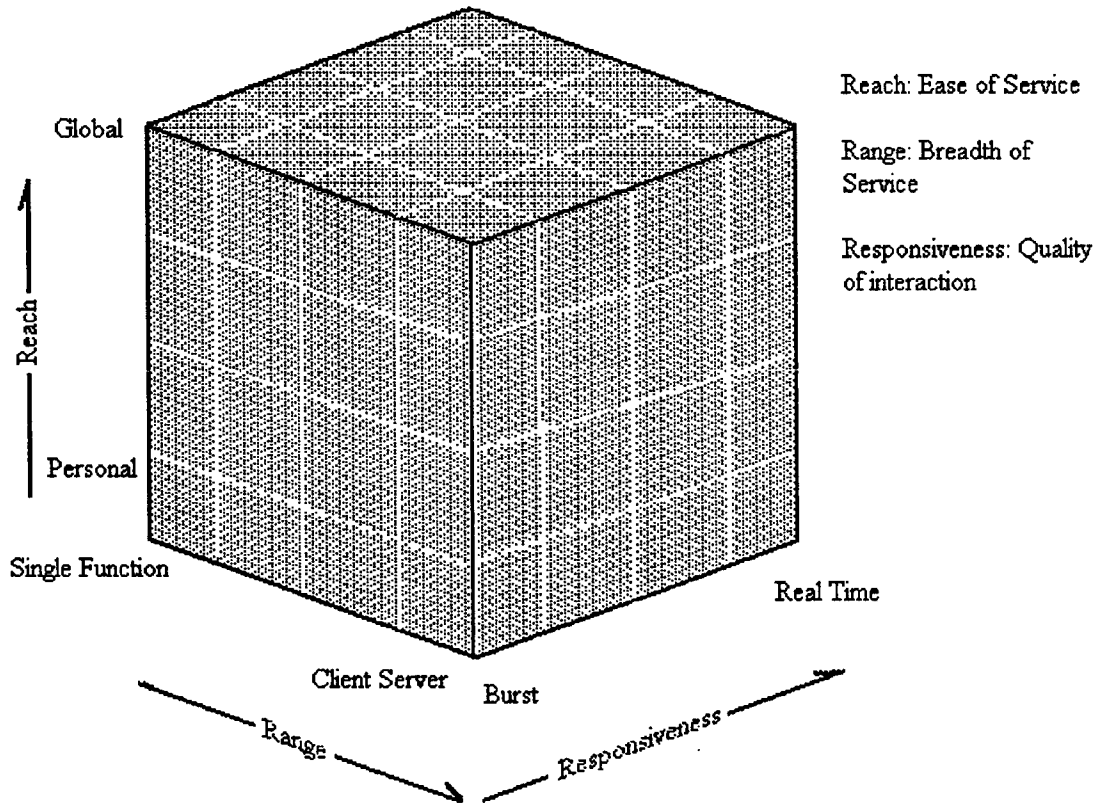


Figure 5-1: The Information System's Environment<sup>19</sup>

It should be noted that this model is not intended to be a quantitative assessment of any one particular system in isolation. The intent is to provide the conceptual framework for qualitatively comparing systems. The end result is a methodology that measures a system's ability to meet the principles set forth in the CATER framework. The discriminating power of this qualitative approach incorporates the users' knowledge and judgement in formulating

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<sup>19</sup>J. Michael Cummings and Peter Keen, *Networks in Action*, (Belmont, CA: Wadsworth Publishing Company, 1994), p. 427.

the analysis. Integral to this methodology is an attempt to gain functional quantification. Functional quantification is the qualitative assessment of fundamental elements, including risk, whose inter-relationships are determined through an acceptable technically correct algorithmic model.<sup>20</sup>

The traits of range, reach and responsiveness are directly associated with a series of quality factors. These quality factors must demonstrate a high degree of association with the trait they are linked to or else they will not accurately portrait the conditions of a product or process. The traits - range, reach, and responsiveness - provide the basis for the discriminating power of the model that determines if the information system network is either simple or complex along each axis. However, it should be noted that the quality factors associated with each trait are not independent. Under these resource constrained circumstances, improving one trait will cause either of the two others to be effected adversely. The goal of the model is to optimize the information system network by determining a balance between user requirements and environmental and technological constraints inherent in the quality factors. The technique to be used to accomplish this optimization is an application of multi-criteria decision making. Under multi-criteria decision making, the user's utility for each quality factor determines the quantifiable means that place it on the continuum between simple and complex.

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<sup>20</sup>Will Ozier, "Issues in Quantitative Versus Qualitative Risk Analysis" Datapro Reports, March 1992, p. 101.

## B. MODEL ATTRIBUTES

### 1. Range

Defined as the horizontal axis in Figure 5-1, range represents the information an organization is required to share across functions and processes. Measured on a continuum from the most simple of messages (e-mail) to client-server processing, as illustrated in Figure 5-2, it is the property of a telecommunications network that represents the scope of information directly and automatically shared. Additionally, it defines the extent of cross-linking information over different vendors' systems, technologies' and applications.

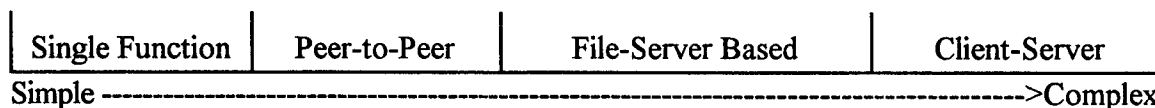


Figure 5-2: The Range Continuum

For clarification and the purposes of this model, the segments names are defined as follows<sup>21</sup>:

- **Single Function:** A computer or group of unlinked computers that perform separate, discrete and independent tasks.
- **Peer-to-Peer:** A linked group of independent computing platforms that share files, printers, and applications.
- **File-Server Based:** A network in which one or more nodes have special status as dedicated servers. Computers must go through a server for resources on other machines. This is in contrast to a peer-to-peer arrangement, in which each node may either be a server or workstation as the need arises.
- **Client-Server:** A sophisticated version of a server-based network where a workstation makes a query or request to the server. The server processes the query or request and returns the result to the client.

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<sup>21</sup>Werner Fiebel, Novell's Complete Encyclopedia of Networking, (Alameda, CA: SYBEX Inc., 1995), p. 649.

In order to determine where in the continuum an information system's range can be plotted the following attributes must be evaluated by the intended users of the system:

- **Flexibility:** The adaptive aspects of system maintenance and modification to work in different environments. It also includes the dynamic range of the network via interfaces or alternations of data.<sup>22</sup>
- **Functionality:** An attribute that bears on the existence of certain properties and functions that satisfy stated or implied needs of users<sup>23</sup>.
- **Portability:** An attribute that bears on the ability of the information contained at various nodes to be transported from one environment to another.<sup>24</sup>
- **Distributivity:** The degree to which the operational effective failures is minimized. The goal of distributivity is to avoid single points of failure that can result in a system-wide degradation or failure. Allocation or replication of functions and data at different nodes will result in execution alternatives in case of a single failure.

## 2. Reach

Defined as the vertical axis in Figure 5-1, reach represents the property of a telecommunication network that measures the extent of interconnection among people, locations, and organizations. A function of geography, technology base, and system users, its limits range from one person with one computer in one building (personal) to anyone with any computer connecting from anywhere (global) as illustrated in Figure 5-3.

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<sup>22</sup>M. S. Deutsch and R. R. Willis, *Software Quality Engineering*, (Englewood Cliffs, NJ: Prentice Hall, 1988), p. 48.

<sup>23</sup>Schneidewind et. al., IEEE Standard for a Software Quality Metrics Methodology, (New York: Institute of Electrical and Electronics Engineers, Inc.), 1992, p. 19.

<sup>24</sup>Ibid, p. 19.

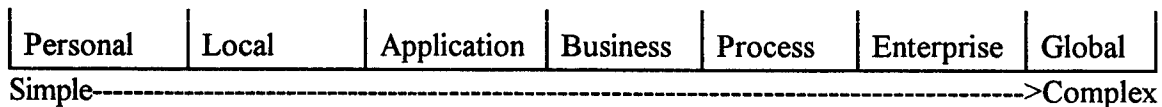


Figure 5-3: The Reach Continuum

In order to determine where in the continuum an information system's reach can be plotted the following attributes must be evaluated by the intended users of the system:

- **Manageability:** Deals with the administrative aspects of modification to the network. It includes tools to support changes such as configuration, control systems, databases, and media control.<sup>25</sup>
- **Maintainability:** An attribute that bears on the level of effort needed for specific modifications. The degree of effort required to handle exceptions automatically, correct failures or errors (reconfigurability) and cope with user complaints.<sup>26</sup>
- **Expandibility:** The degree of effort required to improve, modify or enlarge the network. It deals with the perfective aspects of system maintenance by increasing the size, functionality or performance in order to satisfy user needs.

### 3. Responsiveness

Defined as the z-axis, as illustrated in Figure 5-1, responsiveness represents the property of a telecommunication network that measures the level of service provided on a consistent basis. Responsiveness can be measured on a scale from burst transmission with batch processing to continuous and real time where system reliability is equal to 1.0, delay is equal to zero, and data is transmitted error-free while retaining its authenticity and integrity. This is illustrated in Figure 5-4.

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<sup>25</sup>M. S. Deutsch and R. R. Willis, op. cit., p. 48.

<sup>26</sup>Schneidewind et. al., op. cit., p. 19.



Figure 5-4: The Responsiveness Continuum.

In order to determine where in the continuum an information system's responsiveness can be plotted the following attributes must be evaluated by the intended users of the system:

- **Efficiency:** An attribute that bears on the relationship of the level of performance to the amount of resources used under stated conditions. Resource allocation needed to provide required functionality.<sup>27</sup>
- **Reliability:** An attribute that bears on the capability of the network to maintain its level of performance under stated conditions for a stated period of time.<sup>28</sup>
- **Availability:** The degree to which the network remains operable in the presence of system failures.<sup>29</sup>
- **Accuracy:** The degree to which the system achieves required correctness in its calculations and outputs. The system is accurate if it produced results that are within required accuracy tolerances.

A successful network must combine differing levels of range, reach and responsiveness in such a manner that a balance is struck between the needs of the users and the ability of the system to process and distribute information of value to the organization. Table 5-1 summarizes the authors model for an information systems network. These elements of an information systems network will be applied in Chapter V: the baseline assessment.

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<sup>27</sup>Ibid, p.20.

<sup>28</sup>Ibid, p. 19.

<sup>29</sup>Ibid, p. 20.

<u>Trait</u>	<u>Quality Factor</u>
Range	Flexibility
	Functionality
	Portability
	Distributivity
Reach	Expandability
	Manageability
	Maintainability
Responsiveness	Efficiency
	Availability
	Accuracy
	Reliability

Table 5-1: Information System Trait and Quality Factor Summary



## **VI. THE AMERICAN BUSINESS CENTERS: A BASELINE ASSESSMENT**

### **A. ORGANIZATIONS AS PROBLEM SOLVERS AND INNOVATORS**

One of the reasons organizations are created is to solve problems. More than simply structural boxes on a hierarchical chart, an organization is the patterns of interactions and coordination that link technology, tasks, and human components into a dynamic flow of inter-related processes. This enables an organization to attempt to accomplish its objectives.<sup>30</sup> It should be noted that not all organizational processes are necessarily efficient, effective, or appropriate for the context of the problem. This chapter will examine what problem the ABCs were created to solve, how they went about implementing their solution and what were the driving factors that significantly influenced the final design of their organization.

All process improvement should begin with studying the failures of those who have tried the idea before. Failed U.S. government programs provide more useful credible information about process improvement than from any other source. As reported by its own agencies, some of the most horrific examples of how not to acquire, manage, or use information technology can be found. These records form a comprehensive collection of good ideas gone bad, and bad ideas turning into disaster. In regards to information systems, it is from these stories of hard-to-believe persistent ineptitude by the U.S. government that the ABCs were created.

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<sup>30</sup>Robert Duncan, Organizational Dynamics, (New York: American Management Association, 1979), p. 311.

## **B. THE AMERICAN BUSINESS CENTERS: FORMING THE BASELINE**

An organization's information structure needs to accomplish two objectives. First, it needs to facilitate the flow of information within the organization. This reduces the uncertainty related to decision making. As presented in Chapter IV, this facilitation of information flow corresponds to the reach dimension of the information system model. Secondly, range is achieved through effective coordination. This integration across functional aspects of the organization is essential when there is a high level of interdependence between operating units, as in the ABCs. Responsiveness is essentially a function of the other two dimensions. However, the ABCs have experienced great difficulty in understanding how to implement these concepts. Range problems are largely due to organizational structure mismatches, while difficulties with reach can be attributed to the operating constraints imposed by the technological environment in which the ABCs are forced to operate.

Symptoms of poor organizational structure fit were observed during the authors' site survey interviews conducted in June 1995. While the Freedom Support Act of 1992 was quite clear as to a vision for the ABCs, a high degree of role conflict was noted. This is largely due the ABC's myopic view of each centers' function. Each unit, as outlined by the Freedom Support Act, has been organized by function, but must operate in a dynamic environment characterized by a plethora of inter-relationships. This functional organization has significantly constrained the decision-making adaption process for managers and has created a high level of frustration among clients who seek information about programs of interest to them. For the most part, individuals at the ABCs were unclear as to their roles in the organization.

Those wishing to conduct business in the FSU must deal with the realities surrounding the remnants of the East European centrally planned economies. These industries suffer from outdated technology, lack of competitive incentives, and shortages of production materials. These factors have resulted in low productivity rates. The FSU has had little experience with commercial banking and securities markets and their currencies are, for the most part, unconvertible. This has greatly hampered international trade and investment. To further aggravate the situation, most countries in the FSU have large foreign currency debt levels, which severely limit their ability to resolve domestic economic problems.

The FSU also faces massive infrastructure needs. Roads, railways, telecommunications, and port facilities are inadequate for expanding international trade. Years of depending on heavy industry for development, relying on environmentally damaging high-sulfur coal for power, and refusing to control or treat hazardous wastes have extensively damaged vegetation and water resources. These conditions have begun to significantly effect the health of the population. Pollution/radiation related cancers, infant mortality, and the number of people dying from environmentally induced diseases are increasing and health standards are less than half of those found in nearby Western Europe.<sup>31</sup>

Per capita gross national product of the FSU remains considerably below that of the United States and standards of living are far below those of their Western European neighbors. Based on the site survey conducted in June 1995, the availability of common consumer goods could be characterized as good, but very few individuals can afford market

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<sup>31</sup>Summary of Statements by Sergei Belyaev, World Vision Center, personal interview, Gomel, Belarus, June 1995 World Vision Center.

prices. This is largely due to the low wage levels received by a large relatively highly educated labor base.

These realities are the bane and the promise for the FSU. They have been transformed into 13 areas of specific U.S. interest and any aid or assistance must fit into one or more of these project areas:<sup>32</sup>

- Special and Emergency Humanitarian Initiatives
- Energy Efficiency and market Reform
- Environmental Policy and Technology
- Health Care Improvement
- Private Sector Initiatives
- Food Systems Restructuring
- Democratic Pluralism Initiatives
- Housing Sector Reform
- Economic Restructuring
- Eurasia Foundation Projects
- Enterprise Funds
- FSU Exchanges and Training
- Energy and Environment Commodity Program

Not surprisingly, nearly all American business activity in the FSU has centered around

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<sup>32</sup>See Appendix B for a listing of program managers.

one or more of the preceding program areas. A combination of grants, tax relief, and guarantees have resulted in American businesses expressing a desire to work closely with U.S. Government agencies, international organizations, and host countries throughout the FSU. But, as extensive as these incentives are, many risks remain in developing an information system to bridge the end-user needs of several project offices. This has resulted in informational policies that reflect the parochial interests of individual offices and, in several instances, openly adversarial behavior aimed towards other offices and/or agencies. Information and services required by American businesses to properly assess the investment landscape in the FSU has been stifled due to a spawning of rice-bowls among the American Business Centers.

In an effort to determine customer satisfaction with the American Business Centers, a cross-section of client businesses was interviewed. The results of the survey are illustrated in Figure 6-1 and Figure 6-2. Interviews were conducted both in person and by e-mail.

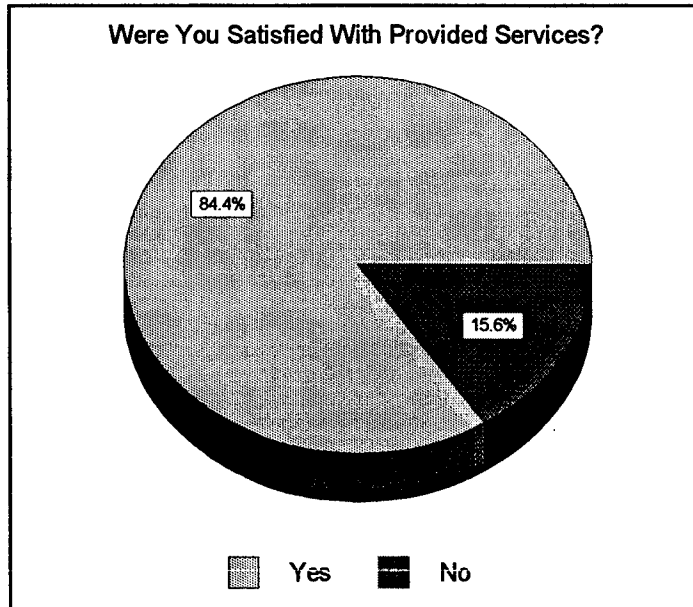


Figure 6-1: Usage By Service

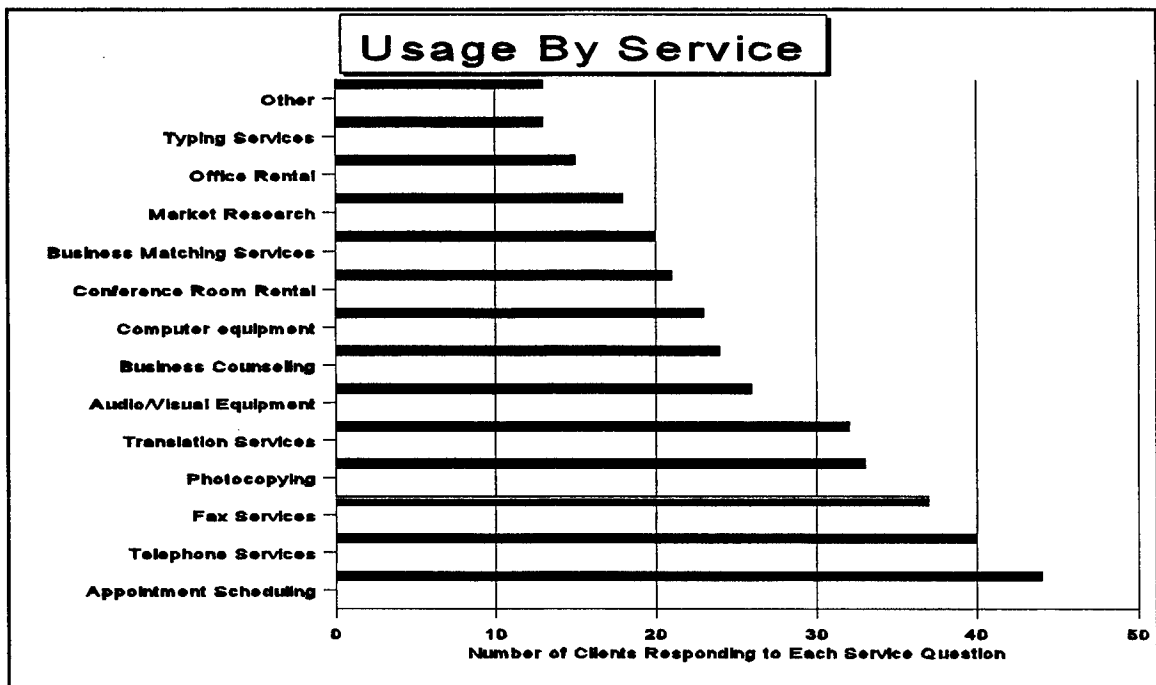


Figure 6-2: User Satisfaction With ABCs

While the interviews yielded a variety of opinions and differed significantly from site to site, and between collocated and independent ABCs, a number of general conclusions can be drawn from the information:

- The majority of clients felt that the ABCs were providing excellent logistical support, i.e., convenient location meeting location, ground transportation, and basic office equipment use.
- Most clients felt that the prices for available, though limited, services were fair and reasonable, considering that they were entirely unavailable elsewhere in the FSU.
- The vast majority of clients, however, stated that they were not engaged in business in the area of responsibility of the regional ABC because of the presence of the ABC. Actually, very few even knew of the existence of the ABCs prior to their arrival to the FSU. Used mostly for logistical related requirements, convenience was the primary factor in the decision of most businesses to use the ABCs.
- Not surprisingly, most clients thought the ABCs were a valuable resource, appreciated their presence, and would likely use their services again. However, they agreed that the ABCs were not critical or decisive in their business decisions or activities.

Potential import/export entrepreneurs and investors wishing to do business in the FSU are deterred by the chaotic business climate, political uncertainties, and economic risks of doing business. The top concerns expressed by U.S. firms are:

- Instability of laws and regulations (particularly unpredictable changes in tax rates and policy).
- Uncertain ownership of plants, equipment, and resources.
- Inadequate banking facilities that complicate currency conversion.
- Severe lack of commercial and market-specific information.

- High cost of establishing offices.
- Major inadequacies of transportation and telecommunications infrastructures.
- Inability to effectively coordinate activities across U.S. funded programs.

The ABCs are in the unique position of being able to provide valuable information to businesses. The end result of this would be to significantly reduce the uncertainty around these key issues and greatly enhance the probability of their initiating contact with targeted industries in the FSU.

American business clients have not found the ABCs of any significant value because the ABCs simply do not provide the one element they seek and cannot find in the FSU - one-stop shopping for information. The ABCs have completely missed the mark by failing to understand their most essential function, that of an information clearinghouse. To characterize the FSU as unstable is an enormous understatement. To attract the interest of business clients, the ABCs must be able to provide specific, reliable, and timely information across a wide spectrum of programs.

#### **1. Range**

The key tenants of the range dimension are flexibility, functionality, portability, and distributivity. These quality factors form the horizontal dimension of our information systems network model. It is the level to which they are employed and how closely they are inter-related that directly reflect their usefulness to an organization. The failure of the ABCs' top management to think strategically in regards to information technology management has resulted in an inability to provide the range of essential information needed by their clients.

Figure 6-3 shows where in the continuum an ABC's information system's range can be plotted.

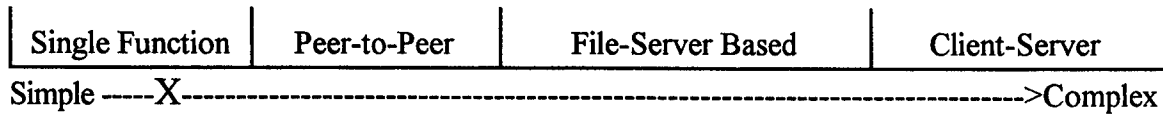


Figure 6-3: Baseline Assessment Range

Further supporting the relatively low level of range for the ABCs, the following quality factors have been analyzed:

- **Flexibility:** Although the information problems plaguing the ABCs are complex and vary from site to site, they generally reflect a basic weakness in leadership and lack organizational direction from top management. Pressure for quick solutions to complex problems works against strategic planning - the essence of good system design. The U.S. Congress, which provides funding, and USAID, the controlling agency, are focusing on short-term results at the expense of long-term significant impact in the FSU private sector. While USAID has a general purpose mission statement, the ABCs specifically do not. There exist no unifying goals, as evidenced by a decided lack of focus on the part of field ABC managers. This has resulted in an ad hoc program development due to managers facing competing demands and no real way to measure progress.
- **Functionality:** The ABCs are demonstrating uncertainty as to what they should be providing as an organization. Each office currently exists as an island unto itself. What is needed is further analysis to determine a set of critical success factors for the ABCs that define what essential functions need to be performed and then communicate them to the group. The ABCs were designed to give American firms a competitive advantage in the difficult, but potentially lucrative, FSU market by providing business services and facilities at select sites. One of the key components is to cooperate with other efforts designed to increase trade and investment within the FSU. If ABCs are to play a critical role as a multiplier and expander of these programs, they need to link together to form a network that can facilitate communication, coordination, and continuity across the thirteen program areas.
- **Portability:** This attribute is primarily focused on the ability of needed information to be available at any node, anywhere, anytime. The state of portability in a typical ABC is dismal. Program managers and clients struggle to wrestle the information

they need from the data collected by the ABCs. By far the largest percentage of the information is still in paper form. Even when available and entered electronically, the information is scattered across multiple machines and software applications. This has made it all but impossible to perform time-critical analyses and develop sound consistent policies, and has greatly slowed interaction between clients and FSU businesses.

- **Distributivity:** Attempting to minimize operational failures has not been attempted at the ABCs. There is essentially no allocation or replication of functions and data at different nodes. A client is faced with having to use whatever data, applications, and connectivity reside at a particular ABC.

The ABCs have been unable to provide time critical and essential information. In the authors' opinion, a network of ABCs would be able to provide:

- time-sensitive trade, investment, and procurement opportunities in major industry sectors;
- U.S. company "Success Stories" (e.g., export sales, joint ventures, partnerships);
- a distributed database of lessons learned in the FSU market;
- a means to request technical assistance;
- off-the-shelf industry sector and region specific market research;
- the status of foreign competition;
- synopsis of competitive position for U.S. firms;
- U.S. position in future investment activities;
- recent central and local government actions (legislation, decrees, establishment of agencies) and, more importantly, how to navigate the bureaucracy;
- profiles of FSU firms;
- a "best" prospects for U.S. exports listing;
- allow for the direct connection between entrepreneurs without the inconvenience

of an additional bureaucratic layer or the interference of local governments.

These specific examples denote information of value for which clients are willing to pay and are in line with the basic principles for developing an Information Systems Network as defined in Chapter IV. Directly related to these basic principles, the Critical Success Factors for the ABCs should be to:

- encourage private investment;
- promote competition;
- create a flexible operating environment that minimizes the FSU regulatory framework and can keep pace with rapid technological and market changes;
- provide open access to telecommunications networks for all information providers;
- ensure universal service to all users.

## 2. Reach

The extent of interconnection between people, locations, and organizations within the ABC organization is severely limited. The need to communicate is great, but the technological infrastructure is inadequate for the task. Largely due to the unavailability of hardware, software, and connectivity in the FSU, the reach is at a low level, as shown in Figure 6-4.

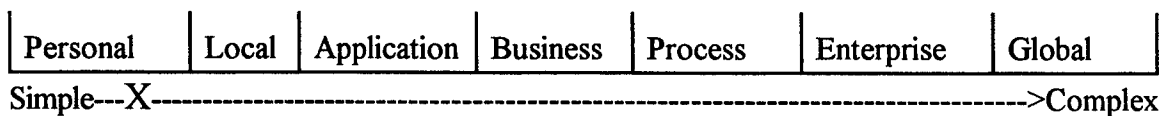


Figure 6-4: Baseline Assessment Reach

For all practical purposes, the production of indigenous hardware components came

to a screeching halt in 1990. At that time, only five models of computers were in production with varying degrees of capability. Table 6-1 illustrates the computers being produced and their comparable American counterparts.

	Name of Computer				
Features	Mikrosha	Krista	L'vov	Sura	BK-0010
Processor	KR580	KR580	KR580	KR580	K1810
U.S. Equivalent.	I8080	I8080	I8080	I8080	PDP-11
Byte Size (Bits)	8	8	8	8	16
RAM Size (Kbytes)	32	32	64	64	32
RAM Expandable?	Yes	Yes	No	Yes	No
ROM Size (Kbytes)	2	2	16	16	32
ROM Expandable?	Yes	Yes	No	Yes	Yes
Storage	Cassette	Cassette	Cassette	Cassette	Cassette
Monitor	TV	TV	TV	TV	TV
Compatibility	Krisa	Milrosha	No	No	No
Year Intro	1986	1987	1988	1988	1985
No. Produced/Yr	2450	1600	3000	3000	20000

Table 6-1: Soviet Era Computing Platforms<sup>33</sup>

These computers were produced in extremely small numbers, and to a great extent without peripheral equipment or product support. The limited output of domestically produced machines resulted in their being distributed like any other scarce resource, primarily to state organizations. The bottom line is that domestically produced machines are not

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<sup>33</sup>*Vestnik Statistiki*, 1988, p.62, and data presented at the Computer Technology pavilion during the FSU Networking Conference, June 1995.

available, and even if they were, the ABCs wouldn't want to use them. Commercially available indigenous software is nonexistent. Despite a veritable army of software programmers available in the FSU, there exists no software industry due to a total lack of production and distribution facilities.

Western computer hardware and software is available from legitimate dealers. But after local governments extort fees, frequently in the range of 70%, thinly veiled as taxes and import tariffs, the prices are unreasonable. The ABCs have been able to address this problem by gradually importing business equipment and software into the FSU as personal baggage. The result has been a mixed bag of computers and software, with little or no consideration given to manageability, maintainability, and expandability.

But these difficulties pale in comparison to the connectivity problems inherent in the FSU. Public telecommunications in Russia and the Former Soviet Union can best be described as dysfunctional. There exists no one network or connected subnetworks that efficiently link all areas in the region.<sup>34</sup> Based on aging 1960's analog technology, the system can best be typified by Moscow's archaic system - the central gateway through which all connectivity must pass. Four hundred analog switching arrays and 80,000 km of copper cable connect nine million Muscovites to each other and the rest of the world. Sixty of these switches use rotary mechanisms to select a call's destination. An additional 250 of the switches use a matrix of levers to route calls, take up 15,000 square feet of floor space, and tower twelve feet into the air. Aisle upon aisle of vacuum tube cabinets spell a maintenance nightmare to

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<sup>34</sup>George Lawton, The End of the Party Line, (London: Wired Ventures Ltd., 1995) p. 2.

those entrusted to keep the system functional. In comparison, the San Francisco Bay area is serviced by nine digital switches capable of handling a volume ten times as great.<sup>35</sup>

Touch tone dialing is unavailable via the public telephone system, as is direct international phone service. Line quality is so poor that data transmission, when possible, can only be accomplished at speeds that rarely exceed 2400 baud. Telephone density is a small fraction of that found in Western Europe. This has led to a reliance on public pay telephones for basic communication's needs. Many outlying villages have no phone service at all. Some villagers have to travel hundreds of miles just to send and receive telegrams, which, surprisingly, are one of the only forms of communication that is reliable.<sup>36</sup> Long distance and international phone calls must be placed at regional phone centers usually located at post offices or government-sponsored phone centers. In some cities, digital service is available through private fiber optic networks, but without international connections and at prices that the average Russian, making the equivalent of \$50 a month in wages, cannot afford.

This sharply contrasts with the telecommunications systems in the United States and Western Europe. They can be characterized as a parallel system of local and long haul communications networks where a series of analog and digital lines connect users to computerized local switches. These switches route calls within the local service area, serve as store-and-forward devices for voice and data transmission, and route out-of-area calls to regional exchanges where, if analog, are converted to digital format for transmission over the

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<sup>35</sup>Ibid., p. 3.

<sup>36</sup>Ibid., p. 5.

long-distance carrier's fiber optic network.<sup>37</sup> The links in the network act as a common carrier for the various services provided its users. A subscriber has direct access to these services and all other subscribers, domestic and international, via his local loop to the local exchange. Private circuits leased from the carriers are included in the same transmission bearing network. However, these circuits are connected together in a semi-permanent fashion via hardware or software packages at the nodes in order to provide fixed routings. Although data transmission services are growing rapidly, telephony is still the predominant service provided by public telecommunications companies. Programs are well underway to provide digital service to local subscribers, replace the copper-based analog local loop with digital fiber optic systems, and increase access to mobile analog and digital phone service.<sup>38</sup>

### **3. Responsiveness**

Responsiveness measures the level of service provided on a consistent basis. The American Business Centers are in the unfortunate position of having to measure their system responsiveness with a calendar instead of a stopwatch. In the best case, communications between ABCs and their sponsoring offices in the United States can only be accomplished via a rudimentary and unreliable e-mail system. Client-to-client links are primarily accomplished by phone and fax. Inexpensive, reliable, and interactive communications and file transfer are nonexistent. The ability to access, query and search archives is beyond the reach of the

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<sup>37</sup>Roger L. Freeman, Telecommunication Transmission Handbook, (New York: Wiley Interscience, 1992) p. Xx.

<sup>38</sup>Fraidoon Mazda, Telecommunications Engineer's Reference Handbook, (London: Butterworth and Heinemann Ltd., 1993) p. Xx.

current system. As illustrated in Figure 6-5, the ABCs responsiveness is below the minimum level for our model.

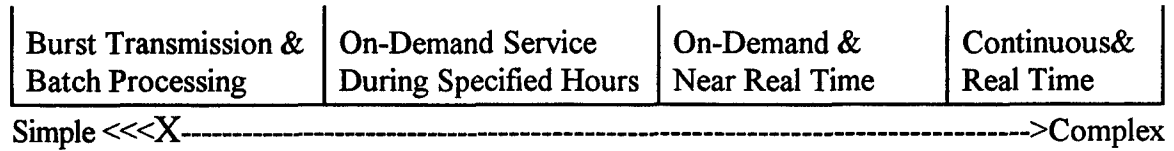


Figure 6-5: The Responsiveness Continuum.

To further support the authors' evaluation of the ABCs responsiveness, the following quality factors have been examined:

- **Efficiency:** Since the information system was developed in ad-hoc fashion and contains a mixture of hardware and software, it is incredibly inefficient. A lack of common interfaces, applications, and distributed databases has stifled the flow of information in, around, and through the ABCs.
- **Reliability:** Access to reliable communication links is not available. Making a connection is a formidable task. It often requires multiple attempts. Even if a connection is made, there is no guarantee that data can be transmitted over it or that it will last for the length of time required to complete the transaction.
- **Availability:** Interconnectivity between the ABCs, at first glance, appears to be sufficient.<sup>39</sup> A wide variety of wide area network providers seem to be available and are more than willing to charge exorbitant fees. But upon closer examination, they all suffer from the same fault. In order to access them, a dial up connection is required. The reliability of the dial-up service negates any possible benefit touted by these providers.
- **Accuracy:** In this environment, simple burst transmissions have the best probability of making it through the FSU domestic phone system but random noise will cause data corruption. Increasing accuracy by using error correction hardware and software increases packet overhead, thereby increasing transmission time. This increase in transmission time raises the probability that the connection will fail during the transaction.

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<sup>39</sup>See Appendix C Figures C-1, C-2, C-3, and C-4: Network Connectivity in the Former Soviet Union.

## **VII. THE AMERICAN BUSINESS CENTERS: A TARGET ARCHITECTURE**

### **A. ESTABLISHING THE CORRECT PERSPECTIVE**

Having established the need for an information network in the previous chapter, a viable target architecture for the American Business Centers information management system must be developed. In order to fully justify the target architecture, the reader will be presented with the authors' view of the future world and the Former Soviet Union's place in it. This thesis is not an exercise in prognostication. However, it is necessary to gain insight into the FSU's "best case" place in the world order to ascertain those success factors that will allow it to succeed as a stable, successful, and democratic world power. This is the arena in which the American Business Centers will have to work. As stated in the historical background, democratic and free market reform in the FSU has been a long time goal of the United States. The authors have shown that one instrument in meeting this goal is a viable network of American Business Centers providing a reliable link between FSU and U.S. businessmen. The baseline assessment has already discussed the lack of critical success factors being utilized by the American Business Centers, pointed out their shortcomings, and developed a new set that serves to meet the mission, vision, and goals set by the President and Congress of the United States. This chapter will apply the set of critical success factors developed in Chapter V to determine the correct range, reach, and responsiveness that an American Business Centers network must provide to facilitate a flow of information. The chapter will conclude with an overview of the hardware and software requirements to institute such a network.

## B. A VISION FOR THE FUTURE

In researching this portion of the thesis, two distinct schools of thought have emerged in regards to a vision for the near-term future. For the sake of this discussion, the near term is defined as a ten-year span. This is not an arbitrary choice. In the opinion of the United States General Accounting Office, "any reforms currently being instituted in the FSU will require a long-term perspective to assess their success or failure in producing substantive changes in their society."<sup>40</sup> The pessimistic argument can be summed up by the following quotation: "The power of population is indefinitely greater than the power of the earth to produce subsistence for man."<sup>41</sup> In other words, the gap between the "haves" and the "have-nots" will continue to grow. The optimistic argument can be related in the following manner: "The capacity for self-improvement, and breakthroughs in knowledge will one day lead to a society that is much more equitable, free of crime and disease, even free of war."<sup>42</sup>

This debate, in one form or another, continues to be argued to this very day. What should be taken away from all the rhetoric is that the interrelated issues of overpopulation, migration, and social instability are being held in balance by an exponential growth in the power of technology. Insofar as the power of technology is able to stay ahead of the problems of overpopulation, migration, and social instability, movement toward the

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<sup>40</sup>Government Accounting Office, Eastern Europe: Donor Assistance and Reform Efforts, (Washington D.C.: Government Printing Office, November 1990), p. 5.

<sup>41</sup>T. R. Malthus, An Essay on the Principle of Population as It Affects the Future Improvement of Society, (London 1798); reprinted with notes by J. Bonar, New York, 1965, p. 13.

<sup>42</sup>R. L. Heilbroner, The Worldly Philosophers (New York, 1986 edn.), pp. 77-78.

optimistic view is possible but if the power of technology cannot keep pace with those forces, the gap between the “haves” and “have-nots” of the world will widen.<sup>43</sup>

Now that the Cold War has ended there has been a fundamental shift away from military threats dictating economic policy towards expanding transnational trade and commerce. Several examples of this can be seen in the NAFTA treaty, European Union, and the expanding Pacific Rim. Thus, most peoples of the world can and are responding positively to changes in the new world order. The foundations for these changes are rooted in,

“the existence of a market economy, at least to the extent that merchants and entrepreneurs are not discriminated against, deterred, and preyed upon; the absence of rigid, doctrinal orthodoxy; freedom to inquire, to dispute, to experiment; a belief in the possibilities of improvement; a concern for the practical rather than the abstract; a rationalism that defies mandarin codes, religious dogma, and traditional folklore.”<sup>44</sup>

As discussed in the historical background this is not currently the state of affairs in the FSU. The region is plagued with large foreign currency debts that severely limit their ability to resolve domestic economic problems. Also, these countries have had little experience with commercial banking and securities markets, thus limiting trade and investment. Having risen to “superpower” status in the early stages of the Cold War and subsequently raping their environment and infrastructure to maintain it, the FSU is slow to transform its society into

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<sup>43</sup>Paul Kennedy, Preparing for the Twenty-First Century, (New York: Random House, 1993), pp. 11-15.

<sup>44</sup>Ibid, p. 17.

one as envisioned by Paul Kennedy in Preparing for the Twenty-First Century. Accepting the change means acknowledging that communism was wrong and democracy is better. It calls for those in power to redefine their whole being and risk all that they have accumulated under the old system. It is along these lines - economic reform - that the United States hopes the American Business Centers will have their greatest impact.<sup>45</sup>

Extrapolating these and other world trends out ten years, the world community will continue to move towards being divided into information-based, industrial-based, and materials-based societies.<sup>46</sup> The information-based societies will comprise nations in which global service-providing corporations will dominate the economy. They will produce most of the technology, innovation, information, media, and trade. Consequently, they will reap most of the wealth because they will dominate a large majority of the financial and information-based assets. The goals of these societies will be to promote global commercial relations and transnational political cooperation.

Industrial-based societies will comprise nations dominated, in the economic sense, by nationally or internationally based industrial corporations. These societies will pursue aggressive and expansive politics, because they will be squeezed by the information-based societies, whose goal is to extract maximum profits from them, and the materials-based societies, whose members are struggling to escape from poverty. The industrial-based

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<sup>45</sup>Eastern Europe, op. cit., p. 8.

<sup>46</sup>For further discussion of these trends the reader should refer to Paul Kennedy's Preparing for the Twenty-First Century and Alvin and Heidi Toffler's War and Anti War: Survival at the Dawn of the 21st Century.

societies will rely on the power of the nationalistic state as a way to protect their interests. Key to their strength will be limitations on the flow of information and protection of local means of communication.

Materials-based societies will encompass the rest of the global community. They will be dominated by religious, tribal, or factional elements. This sector will produce most of the agriculture and raw materials used by the other societies and will be the centers of deep unrest as poverty will be the norm instead of the exception. Members of this society will feel exploited and vulnerable to the more prosperous societies above them. Local dictators will exploit this friction for profit and glory and will seek total control over electronic communications in any form. In addition, they will seek to disrupt information and commerce flow between the two other societies, living off the spoils of their follies.<sup>47</sup>

Thus, the main creators and controllers of technology and wealth will be large, multinational corporations with more global reach than responsibility.<sup>48</sup> They will be less concerned with the interests and values of their country of origin and concentrate more on competing for world market shares. These corporations will require information management networks based on the latest and best technology has to offer to ferret out advantages in economies of scale and protect themselves from fluctuations in currencies, differentiated economic growth, and political indifference.<sup>49</sup> The overriding rule for all will be “if one does

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<sup>47</sup>Straussman, op. cit., pp 484-485.

<sup>48</sup>Kennedy, op. cit., p. 47.

<sup>49</sup>Ibid, p. 51.

not follow the rules of the market, one's economy will suffer."<sup>50</sup> These are the very corporations the American Business Centers are trying to marry up with fledgling businesses in the FSU. By fostering these economic ties, local businesses will learn to compete in a market that, up until the fall of the Soviet Union, was totally foreign to them. As these fledgling businesses grow, they will establish the economic base required for a stable society.

As for the Former Soviet Union, the region's best hope lies in the prudent management of the change from a communist state to a quasi-democratic region with institutionalized democratic and capitalistic reforms. These peoples must seek to reestablish themselves as an industrial society. Developing an economy driven by consumer demand and the entrepreneur requires moving away from an emphasis on quantity to one of quality.<sup>51</sup> These reforms are being instituted but the process of developing the financial and entrepreneurial systems that can aid domestic economic growth are slow in coming. At present, all that is seen is the chaos, struggle, economic collapse, and ethnic disintegration that was observed by the world in 1918. However, infusions of western capital and programs, like the American Business Centers, are providing the extra incentives that the governments of the FSU are using to help make the reforms a reality.

### **C. CRITICAL SUCCESS FACTORS FOR THE AMERICAN BUSINESS CENTERS**

In Chapter V, a set of critical success factors was backward engineered from the current business practices of the ABCs. Operations at the ABCs were characterized as

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<sup>50</sup>Ibid, p. 56.

<sup>51</sup>Ibid, p. 236.

adversarial in nature, with each center seeing itself in competition with all the others. Additionally, no integrated information management systems were on-line; in fact, information was closely guarded and metered out only when absolutely necessary.

This points to a serious error in strategy. The “marketing centric” approach currently being pursued by the centers clearly misses the mark since the level of interaction between U.S. and FSU firms is quite low and communication channels between the FSU and the rest of the world are tenuous, at best. The recurring theme of “if we market our services more aggressively, they will come,” has done little to induce either U.S. or FSU businesses to establish ties with each other. As was shown, the American Business Centers failed to correctly address the true nature of mission, vision, and goals set forth by President Clinton and the Congress of the United States. Therefore, a new set of critical success factors was proposed. The key element of the revised set of factors is a strategic reliance on the flow of information between the FSU and the rest of the world. In other words, the ABCs must move toward an information centric approach, becoming a conduit for information rather than another layer in the bureaucracy. They must establish clear and reliable communication paths and establish themselves as a clearing house for firms seeking each other out. This can be done by connecting the American Business Centers into one integrated network with a direct path to the western world via the Internet.

**D. ESTABLISHING THE BOUNDS FOR AN AMERICAN BUSINESS CENTER INTEGRATED NETWORK**

The critical success factors defined in Chapter V indicate that an integrated network would serve to meet the mission and goals of the American Business Centers. This subsection

will step through the authors' information system model as presented in Chapter IV to determine the appropriate range, reach and responsiveness for the network.

### **1. Range**

Range represents the information an American Business Center must share across functions and processes. The businesses utilizing the ABCs will require access to word processing, database management, spreadsheet, multi-media presentation, e-mail, and Internet browsing software. In addition, multiple workstations will be required to handle the influx of customers requesting these services. As presented in the baseline assessment, the current system utilizing unlinked single function computers has been wholly inadequate. It is the authors' opinion that these applications and workstations are best managed via a local area network that meets the requirements contained in following quality factors:

- **Flexibility:** An ABC's local area network must be highly adaptive with respect to system maintenance and its ability to operate in different environments. Changing business conditions, constantly upgraded applications, and dynamic data types necessitate uncomplicated maintenance and modification routines. In addition, operating conditions in the FSU vary greatly from city to city. Unstable electrical power and electromagnetic interference are the norm instead of the exception and are not forecasted to change in the near future.<sup>52</sup>
- **Functionality:** An ABC's local area network must provide a high degree of functionality. This is the core competency the centers must master and the main reason why businesses will want to seeking out the American Business Centers. Mastering this core competency will require providing business related services<sup>53</sup>,

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<sup>52</sup>M. Makhaniok, Joint Project Proposal for a Research and Development Computer Network of the Republic of Belarus, (Belarus: Institute of Engineering Cybernetics Academy of Sciences), June 1995.

<sup>53</sup>Business related services include providing meeting rooms, fax and copying services, training in economic theory, and access to the ABC network.

communication channels, and access to global markets at a price that local businesses can afford. As mentioned in Chapter V, none of these services is currently available as an integrated package.

- **Portability:** The ability to browse, download, and modify the information stored at various nodes is also important to the American Business Center's network. Businessmen both in the United States and Former Soviet Union must be able to search for information about prospective business partners. Databases and digital storefronts<sup>54</sup> will need to be updated as changing economic conditions warrant. Additionally, businessmen within the FSU will want to network among themselves to provide the best combination of services for foreign investors and aid in rebuilding their industrial infrastructure.
- **Distributivity:** Since each American Business Center will establish its own local area network, the issue of distributivity is minimized with regards to system wide degradation or failure. Prudent archival, security, and backup procedures will serve to minimize failures on the local area networks thus eliminating, or greatly reducing, the need for allocation or replication of functions and data at different nodes. But, since terrestrial lines of communication are unreliable, some degree of distributivity will need to be built into the communications channels utilized between each ABC and the global community

Table 7-1 illustrates the advantages and disadvantages of each of the networking architectures relating to these requirements.

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<sup>54</sup>A digital storefront is defined as a homepage on the Internet.

	Flexibility	Functionality	Portability	Distributivity
Peer-to-Peer	low	low	medium	low
File-Server Based	medium	high	high	medium
Client-Server	high	high	high	high

Table 7-1: Relative Strengths of Network Architectures

In the authors' opinion, Peer-to-Peer networks do not afford the level of flexibility, functionality, portability, and distributivity necessary to support the ABCs. This network architecture fails to provide sufficient security and privacy features, is not easily scalable for large number of users, and degrades the performance of the user whose machine is being accessed. Conversely, the client-server architecture is overly complex, cost prohibitive, and labor intensive. Since each center will be responsible for establishing its own local area network, cross-linking information over different vendors systems, technologies, and applications will be required as universal procurement of the entire system will not be possible. Thus, Figure 7-1 shows where in the continuum an ABC's information system's range can be plotted.

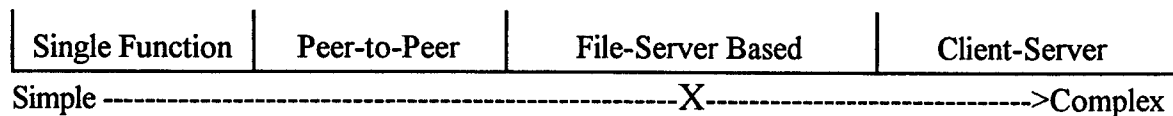


Figure 7-1: Target Architecture Range

## 2. Reach

Reach represents the extent of interconnection among people, locations and organizations. As such, the integrated American Business Center network must be global in nature. Businessmen using the network at a particular ABC must be able to communicate

with others in the same center, those businesses that have digital storefronts in other ABC cities, and with their counterparts throughout the rest of the world. The Internet is a perfect medium for such dialogs and, therefore, must be an integral part of the wide area network. Thus, Figure 7-2 shows where in the reach continuum the ABC's integrated information system can be placed.

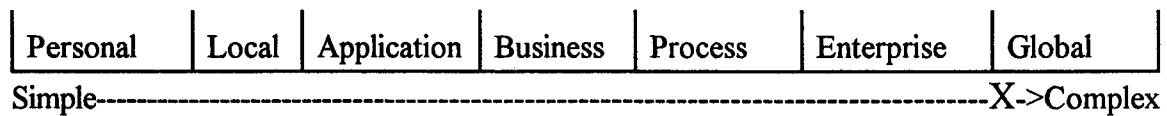


Figure 7-2: Target architecture Reach

Further supporting the need for global reach, the following quality factors have been analyzed:

- **Manageability:** Modifications to applications, the local area network, and the integrated network must be straightforward, uncomplicated, and accessible to local system administrators. Since there are no indigenous technicians to call upon, extensive customer support and on-site vendor assistance will only be possible if it is brought in, at great expense, from Western Europe or the United States. Therefore, on-site system administrators will have to be the local experts on their systems.
- **Maintainability:** Since local system administrators will be the only points of contact for maintaining the integrated network, the level of effort needed for specific modifications must be fairly low. The degree of effort required to handle exceptions automatically, correct failures or errors (reconfigurability), and cope with user complaints should be equally low.
- **Expandability:** Ideally, each local area network and the integrated network, as a whole, should be able to grow as the individual American Business Centers gain in popularity. On the local level, increasing the size of the network is not seen as a large problem since it is simply a matter of upgrading hardware to accommodate additional users. However, as intra-theater and transcontinental traffic increases, service delays may result as communications links become saturated.

### 3. Responsiveness

Responsiveness represents the level of service provided on a consistent basis. In the case of the American Business Center's Integrated Network, responsiveness should be on-demand and near real-time with the ability to verify authenticity and data integrity. Thus, Figure 7-3 shows where in the responsiveness continuum the ABC's integrated information system can be placed.

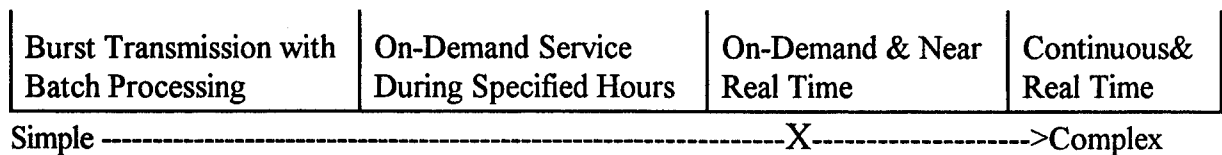


Figure 7-3: Target Architecture Responsiveness

Further supporting the need for on-demand near real-time processing, the following quality factors have been analyzed:

- **Efficiency:** Economic constraints dictate that both the local area and integrated networks be as efficient as technologically possible. The investment in high performance computers, network components, and communication channels will serve to provide a solid foundation on which to base the level of functionality described in the range subsection. Well thought out configuration management will add to efficiency as hardware and software conflicts will be kept to a minimum.
- **Reliability:** Since businessmen are paying for the network services provided by the American Business Centers, reliability needs to be high. Local systems must maintain adequate levels of security; back up data, applications, and system files to hasten recovery in the event of system failure; and be able to bridge to alternative communications channels in the event of internodal communications failure.
- **Availability:** Since the network will have global reach, applications, data, and systems must be available twenty-four hours a day.

- Accuracy: Data authenticity and integrity checks must be included to permit accurate and timely transmission of information.

## **E. THE AMERICAN BUSINESS CENTER'S INTEGRATED NETWORK**

### **1. Wide Area Network Connection Options**

In the previous section, the authors' model was fitted to the American Business Centers requirement for an information management system. The result is a framework that can be considered an Integrated Wide Area network. This level of connectivity will meet all the requirements set forth in the previous section. As such, each American Business Center will maintain its own homepage and homepages for local area businessmen on a dedicated server. In effect, each American Business Center acts as a clearing house and repository of area expertise. Where there was only local exposure for area business, now there will be global access and contact via the Internet. Clients the world over can obtain information from companies and local businesses can gain contacts on a truly international level. In summary, the target architecture will be required to support file-server based computing on a global scale with on-demand, near real-time processing. The following subsections will discuss the various options available to establish the wide area communication links necessary for global reach and near real-time responsiveness.

#### ***a. Public Switched Telecommunication Networks (PSTN)***

Utilized by many wide area networks in the United States and Western Europe, the public switched telecommunications network - in the form of dial-up service, leased lines, the Integrated Services Digital Network, and, in the near future, Asynchronous Transfer Mode - has become an integral and affordable means of connecting widely dispersed

nodes in a wide area network. However, use of a similar scheme for transporting data throughout the Former Soviet Union, and, in particular, a proposed American Business Center network runs into several problems that make its use infeasible.

Long distance and international phone calls must be placed at regional phone centers usually located at post offices or government-sponsored phone centers. In a move to ease this situation, companies, such as Sprint, have established parallel systems to provide digital leased line and international long distance service. Their efforts have centered on providing connectivity to the major urban centers. However, connection charges currently are in the range of \$1000 per month per 64Kbps line.<sup>55</sup>

In addition to the technical difficulties of using the PSTN, the breakup of the Soviet Union created 14 separate countries, each with their own PSTN regulating body. Unlike their Western European and U.S. counterparts, whose regulatory bodies are seeking to standardize tariff and data transmission standards, the regulatory agencies of the FSU are seeking to create fiefdoms within their borders. For example, in Russia, "usage of nets require a licence" but the type, and its associated fee are still under legal debate.<sup>56</sup> The result is that there exists no consistent telecommunications tariff, licencing, or standards policy between nations in the region.<sup>57</sup> Thus, establishing a wide area network between the ABCs entails establishing licencing agreements with 14 different governmental agencies with the

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<sup>55</sup>M. Guriev and S. Belysev, Networking in Russia, meeting transcript, October 1993.

<sup>56</sup>Ibid, p. 2.

<sup>57</sup>Ibid, p. 2.

ensuing 14 different tariff structures and restrictions on the flow of data. Clearly, the administrative and financial burden this would levy on the American Business Centers far outweighs the utility of utilizing the public switched telecommunication network in each country.

*b. Private Fiber Optic, Microwave, and Satellite Networks*

In order to compensate for the lack of a reliable public telecommunications infrastructure, many academic and private organizations have turned to dedicated private networks utilizing fiber optic, microwave, and satellite transmission channels for network connectivity. In an effort to circumvent the PSTN of each country in the FSU, each local American Business Center could "piggy-back" on the network services provided by these private networks thus establishing a wide area network via the Internet. The following summarizes several private networks operating in the FSU. Fee structures are listed in Table 7-2:

- **Glasnet:** Established as the first non-profit, non-governmental telecommunications network in the Former Soviet Union, Glasnet provides its users with telnet, ftp, gopher, e-mail services, and world wide web access. Access to Glasnet is via modem or public data networks using the X.25 transmission standard. Thus, customers are either forced to connect via the unreliable telephone system or pay exorbitant per megabyte charges for the use of X.25 based packet switched network. One benefit, however, is that users are charged in rubles for on-line time but calls into the network are billed in accordance with the user's telecommunication provider and those charges are usually billed in dollars or marks. Internet access is via a 64 Kbps satellite channel shared by all Russian networks and donated by the Soros Foundation. This means that bandwidth is very limited and must be shared with many other organizations.<sup>58</sup>

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<sup>58</sup>Bill Frick and Michael Neubert, Boosting the Baud Rate: E-Mail and Connectivity in the Former Soviet Union, Internet article, pp. 5-6.

- **Sovam Teleport:** Established as a private corporation, Sovam Teleport provides “turn-key” solutions to private networking needs. Integration to the global telecommunications infrastructure is via the Sovam-Net. The company offers a wide range of telecommunication equipment including modems and X.25 equipment to its users. The Sovam-Net is a global packet switched network that provides full compatibility with national and foreign packet networks. Access to foreign global networked is provided through cable and satellite channels. For direct connection with the Cable & Wireless Global Digital Highway, Sovam Teleport has an earth satellite station in Moscow with high speed satellite channels to London. Since this is a for-profit organization, equipment fees and access times are at a premium.<sup>59</sup>
- **Relcom/Demos:** Established as Relcom in 1990 at the Kurchatov Institute of Atomic Energy, Relcom/Demos make up the largest and fastest growing e-mail provider in the FSU. Formerly a single network, it split in 1992 but remains a largely seamless service. Internet connection with the West is via a T-1 leased line. A local node consists of a 386 or 486 PC running the Unix operating system, several dial-in modems and a high-speed modem (28.8Kbps or switched 56 Kbps) connection via a leased line to Moscow. However, the system is plagued with rather limited bandwidth and data speeds.<sup>60</sup>

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<sup>59</sup>Ibid, p. 6.

<sup>60</sup>Ibid, p. 5.

Fee Schedule	Glasnet	Sovam Teleport	Relcom
Setup	\$60.00	\$150.00	\$40.00
Monthly	\$25.00	\$20.00	-0-
Connect	PSTN tariff	\$10.00/hr	\$6.00/hr
Traffic	-0-	Sliding Scale	Not Available
Other	-0-	\$50.00 Domain Name Support	-0-

Table 7-2: Fee Structure for Internet Access Providers<sup>61</sup>

Insofar as there are private terrestrial Internet service providers available, hooking the American Business Centers into these providers is impractical for several reasons. All of these providers are bandwidth limited, relying on, at most, T-1 connectivity with the West. Except for Sovam Teleport, each relies on modem access to Internet nodes. As discussed above, the phone systems of the FSU are unreliable and grossly inadequate for data transmission. In those cities where digital service is available, it is extremely expensive and requires state-issued licences to establish a network. Finally, access coverage is not universal. As currently configured, securing Internet access through private terrestrial service providers cannot meet the needs of the American Business Centers for global reach combined with on-demand near real-time responsiveness.

*c. Commercial Very Small Aperture Terminals (VSAT)*

Very Small Aperture satellites use small ground antennas to provide point-to-point network services. As shown in Figure 7-4, the VSAT satellite system is based on a hub and

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<sup>61</sup>West Research, Comparison of Internet Providers in the CIS Internet article, 1995, p. 1.

spoke relay configuration. Direct terminal-satellite-terminal relays are not possible since all communications must be processed through the hub. Internet access is provided at the hub and can accommodate data rates equal to those found in the West. With data rates up to 56Kbps per downlink, VSAT offers flexible, reliable satellite communications for all regions of the Former Soviet Union.<sup>62</sup> Commercial VSAT vendors are expanding in the FSU as operators and equipment companies refine their market strategies to utilize VSAT applications in integrated network solutions. They realize that the widespread use of VSAT as a stand-alone communications system is no longer realistic. The new strategy is to create dynamic, rapidly-deployed networks used in conjunction with other networks. Supporting this strategy is a change in the market for VSAT communications. Demand no longer comes from just a few oil companies and large banks. Economic development in the region (e.g., retail chains, distributors of goods, utilities) has heightened the need for quality point-to-multipoint/multipoint-to-point communications.<sup>63</sup>

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<sup>62</sup>Government Accounting Office, Information Superhighway: An Overview of Technology Challenges, (GAO/AIMD-95-23), January 1995 pp. 52-53.

<sup>63</sup>International Technology Consultants Newsletter Volume 6, Number 7 July 15, 1995, p. 1.

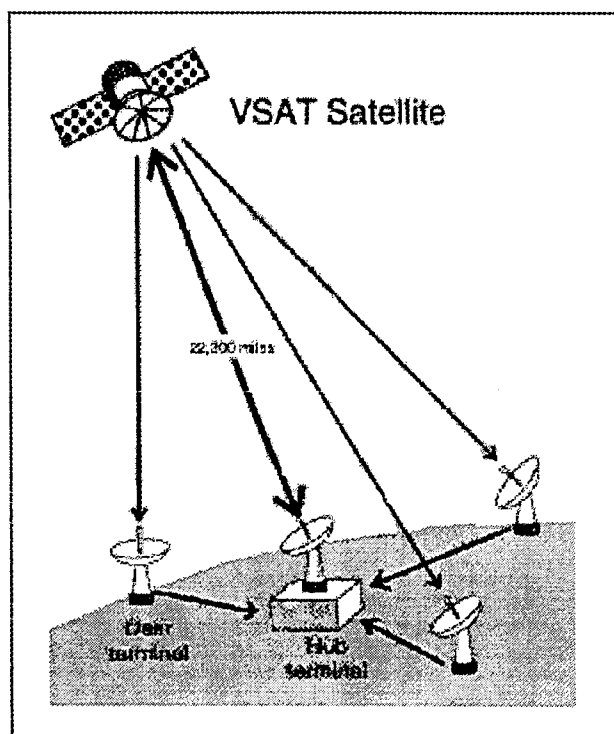


Figure 7-4: The VSAT Satellite System<sup>64</sup>

Coinciding with the development of these new economic conditions is the regulatory liberalization of VSATs. While many operators complain about VSAT regulation in the region, it is clear that the environment is improving. Many ministries of communication now allow alternative providers for value-added services. Type approval for VSAT systems also comes more easily. There is more space segment coming on line as the large satellite organizations - EUTELSAT, INTELSAT, INTERSPUTNIK & PANAMSAT - as well as smaller, private

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<sup>64</sup>Government Accounting Office, op. cit., p.52.

satellites such as Orion 1, seek to further develop VSAT communications. Changes with regard to obtaining access to space segments from the large carriers have also occurred. INTELSAT, for example, now grants direct access to private operators, bypassing involvement by national signatories and their accompanying markup fees. VSAT operators can pass this cost savings on to customers, making VSATs an even more attractive option for network planning.<sup>65</sup>

The advantages of VSAT systems for the American Business Center Integrated network are many. They can be rolled-out rapidly, creating flexible, reliable networks for end users that do not rely on hard to obtain and costly licences or connections to a public telephone system. They can serve as reliable links until the public telephone system is upgraded sufficiently to handle high data-rate communications. At that time, the ABCs can switch over to a more conventional means of wide-area connectivity. In addition, VSAT systems provide secure reliable communications at data rates that provide reasonable access to the Internet. In terms of cost, VSATs are competitive with private terrestrial access providers and are more cost effective than other options because, "VSATs offer a traffic cost component of 20%, meaning that a network system can double its traffic and only increase cost by 20%."<sup>66</sup>

## **2. Local Area Network Options**

Now that the options for wide area connectivity have been explored, attention can be focused on the local area network of each American Business Center. The goal for these networks is to support small scale (less than 50 users) file-server based processing, ftp, telnet, e-

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<sup>65</sup>Ibid, p. 1.

<sup>66</sup>Ibid, p. 1.

mail, and Internet access. Additionally, these networks must interface and be compatible with the VSAT system that is envisioned to provide wide area connectivity and Internet access. Based upon the organizational and environmental constraints presented in the baseline assessment only two of the established network architectures will be explored:

- **Token-Ring:**Based on a ring network topology and a token-passing strategy to control access to the network, the token ring architecture works best with networks that handle heavy traffic from many users. Founded upon the IEEE standard 802.5, the token ring architecture operates at either 4 or 16Mbps, is internationally supported, and is easy for network managers to install. Even though there is more overhead associated with using the token scheme, it is significantly more stable than other schemes at high traffic loads. On the down side, network components (e.g. network cards, multistation access units, and cabling) tend to be more expensive than their Ethernet counterparts.<sup>67</sup>
- **Ethernet:** Based on a shared-media network architecture, Ethernet utilizes a bus topology and collision detection. Defined in the IEEE standard 802.3, Ethernet operates at 10 Mbps, is a well-known and thoroughly tested technology, the most widely used architecture, and is easily adapted for use by system administrators. This architecture is indicated when traffic load is light (less than 25% of capacity) or consists of few long transmissions. Under high loads, CSMA/CD based networks spend a great deal of time resolving collisions, thus slowing throughput. Troubleshooting is more difficult and, since all nodes are connected to the main cable, a break in the transmission line can bring down the entire network. Network components are readily available and are less expensive than their Token Ring based counterparts.<sup>68</sup>

Either architecture will meet the local area networking needs of the American Business Centers. The choice as to which networking standard best meets the needs of each ABC should be left up to its field manager. This decision should be based on statistical estimates of traffic

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<sup>67</sup>Werner Fiebel, op. cit., pp. 969, 987.

<sup>68</sup>Ibid, pp. 342, 362.

loads and transmission lengths. In the case of high traffic loads and long transmission lengths, token ring is indicated. Alternatively, low traffic loads and short transmission lengths indicate Ethernet should be utilized. Both Token-Ring and Ethernet are established networking standards, adaptable to the file-server based environment, capable of being upgraded to higher transmission speeds in the future, and suited for use as the basis of a wide-area network.

### **3. Operating Systems, Protocols, and User Applications**

The final subsection of this chapter will highlight choices for operating systems, protocols, and users applications. The choices described here are neither all inclusive nor vendor specific but represent what is currently available commercially off the shelf. Since the American Business Centers are only marginally funded, a tailored wide-area network package is beyond the scope of their finances. In keeping with the theme of "easy to install, maintain, and modify," the purpose of this subsection is to illustrate what types of software should be included as a basic foundation for the local area networks the various American Business Centers could establish.

- **PC Operating Systems:** Since this network will consist of commercially purchased personal computers, only two operating systems, UNIX and MS-DOS, need be explored. Either operating system will support local area networking, so the choice as to which system to use should be left to the individual ABC. It should be noted that UNIX, the basis for academic computing in the FSU, is a very powerful operating system both in stand-alone computing and in the arena of wide-area networking. However, difficulties in maintaining the operating system and lack of commercially available software and support in the FSU should be noted. As a result only experienced network administrators should consider basing their operating system on UNIX. Based on personal observations from the site survey, MS-DOS, has established itself in all the regions of the FSU as the system of choice for personal computing. When combined with MS-Windows, it greatly increases the application base from which users can draw. Finally, each operating system supports Cyrillic fonts and Russian language applications.

- **Protocols:** A protocol is a set of predefined rules that govern how two or more processes communicate and interact to exchange data. Protocols can be distinguished by the level or layer at which they operate. This is important only because the protocols used by the network operating system for the local area network must be able to communicate with the Internet via the VSAT link. As such, any network operating system used by the ABCs must support TCP/IP.<sup>69</sup>
- **Network Operating Systems:** The network operating system forms the basis for communications between member nodes of the network. Since the goal of the system is file-server based processing with Internet access, a network operating system should be chosen that not only can interface with the local nodes on the network, but also with the Internet. Novell's NetWare 4.X is an internationally supported network operating system that can support a maximum of 1000 nodes per server, global resource and naming, on-disk file compression, robust security features, extensive management capabilities, and optical drives. It is backward compatible with all other versions of NetWare.<sup>70</sup> However, it does not support the TCP/IP protocols necessary for interaction with the Internet without additional software support. On the other hand, Windows NT not only provides system administrators with the functionality of NetWare but also includes support for the Transport Control Protocol/Internet Protocol (TCP/IP), which is used in the UNIX and Internet environments; NetBEUI format, utilized by the OS/2 based network operating system; and NWLink, Novell's IPX/SPX protocols and data link control, which provides access to mainframe environments. Support for TCP/IP enables a Windows NT computer to function as a TCP/IP client while NWLink allows a Windows NT machine to function as a NetWare client. Consequently, either network operating system will meet the needs of the American Business Centers.<sup>71</sup>

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<sup>69</sup> Consisting of the Simple Mail Transfer Protocol (SMTP), to send and receive messages; the File Transfer Protocol (FTP), to transfer files from one machine to another; telnet, for terminal emulation and remote logon; the Simple Network Management Protocol (SNMP), to control management services and transfer management related data; the Transmission Control Protocol (TCP), to provide connection, stream oriented, and transport layer services; the User Datagram Protocol (UDP), to provide connectionless transport layer services; and Internet Protocol (IP), to provide routing and connectionless delivery services at the network layer, the TCP/IP suite is integral to communicating across the Internet.

<sup>70</sup>Feibel, *op.cit.*, p. 635.

<sup>71</sup>*Ibid*, p. 1049.

- **Applications:** At the top of the network hierarchy, the applications available to users are the entire reason a network is established. Compatibility should be the guiding factor in choosing which applications to incorporate. As such, an integrated office suite and application programs compatible with the Windows or NetWare operating system should be chosen. There are, however, several special factors that should be considered when choosing software packages for the business environment of the ABCs. Since most of the clientele speak only Russian, the office suite used for word processing, database management, spreadsheets, and presentations must support Cyrillic fonts and keyboard layouts. Experienced Russian computer users exhibit a fondness for the old DOS prompt. Therefore, their level of knowledge about Windows-based applications is relatively low and there will be some reluctance to make the switch.<sup>72</sup> Therefore, applications on the network will need to provide robust on-line help menus to guide users through even the simplest of operations. Wide area network operations, like e-mail, file transfer, and telnet operations should be managed by a robust world wide web (WWW) browser. Examples of WWW browsers that meet the needs in this area include Netscape 2.0 and Mosaic 1.6, to name two. Each browser provides full service access to the Internet. Finally, an integral requirement of each American Business Center will be to serve as a clearinghouse and one stop information repository. Business will need to develop Internet homepages for the world wide web community to browse. These homepages are developed using a Hyper Text Markup Language (HTML) editors. In this light homepage development software should be included in the basic software suite.

In conclusion, this chapter, as summarized in Table 7-3, has looked ahead at a target architecture for the American Business Centers, applied a set of critical success factors to determine the correct range, reach and responsiveness that an American Business Center network must provide to facilitate a flow of information, and presented an overview of the hardware and software requirements to institute such a network.

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<sup>72</sup>Fick and Neubert, op. cit., p. 7.

Wide Area Links	VSAT
Local Area Topology	Bus or Star (depends on network type)
Network Type	Ethernet or Token-Ring
Computer Type	IBM or UNIX Compatible
Operating System	DOS/Windows or UNIX
Network Operating System	NetWare 4.X or Windows NT
Applications	Office Suite World Wide Web Browser HTML Editor

Table 7-3: The American Business Center Integrated Network



## **VIII. RECOMMENDATIONS AND CONCLUSIONS**

### **A. SUMMARY OF FINDINGS**

Since the fall of the Soviet Union, the United States government as sought to promote economic and political stability in a region of the world that, up until 1990, had been centrally controlled from Moscow. American Business Centers were established with the goal of facilitating economic reforms that, it was hoped, would accelerate the transition to a free market. To date, these centers have had little, if any, significant impact on trade and investment in the FSU due to their misapplication of information technology. Utilizing the fundamental principles of information technology management, this thesis has identified the problematic shortcomings inherent in ABCs' organization; analyzed the nature of information; illustrated that, in order for an information system to be considered useful, it must address certain levels of range, reach and responsiveness; superimposed the model over the ABCs organization as a template for a baseline assessment; tailored it to address the unique set of circumstances currently found in the FSU; and proposed an information system network capable of meeting the needs of both the program managers and their clients.

### **B. CONCERNS FOR THE FUTURE VIABILITY OF THE AMERICAN BUSINESS CENTERS**

The information presented has the potential to dramatically improve the usefulness of the American Business Centers. But of greater concern is the growing realization that:

- The ABCs will not be able to make a meaningful contribution to the program's basic goals if political and economic conditions in the Former Soviet Union do not improve. Specifically, an unstable ideologic, legal, and regulatory environment, unpredictable

tax rates, an inadequate banking system, crime and corruption, in addition to infrastructure problems, threaten to undermine any productive work the ABCs may accomplish.

- The ABCs program managers either are unaware of or have not fully utilized the wealth of knowledge, contacts, and resources of the USAID and Foreign Commercial Service's domestic U.S. networks. These networks could provide valuable contacts between American entrepreneurs and foreign businesses. At the same time, this network would help solve the problem of matching U.S. customers with FSU businesses and vice versa.
- Even though self-sustainability is a primary goal of the ABC program, unless substantial non-governmental revenue is generated, several ABCs will be forced to cease operations by the end of fiscal year 1997. While some ABCs appear to be financially solvent and will be able to continue their operations, it is likely that some will fail. In order to keep these ABCs open, other appropriated funds must be made available. Given the current U.S. political climate, this is unlikely to occur. What is required is a fundamental shift in the strategic thinking of the ABCs. They must conclude that their role as an information broker and clearinghouse is essential in generating the revenue needed for continuing operations.

The need to fully integrate the American Business Center program into the United States' programmed interests in the Former Soviet Union cannot be overemphasized. The window of opportunity is quickly closing. The ABCs can and should be used to leverage U.S. business involvement by ensuring closer program coordination with other trade-related federal agencies, international organizations, and host countries within the Former Soviet Union. As demonstrated in our thesis, the proper application of information technology management can result in a system whose processes are efficient, effective, and appropriate. Unless substantial changes are made in the American Business Centers' informational structure, application of technology, and organizational management, this program will join the ranks of other failed U.S. government initiatives.

**IX. APPENDIX A. AMERICAN BUSINESS CENTERS IN RUSSIA AND THE NEWLY INDEPENDENT STATES<sup>73</sup>**



Figure A-1: The American Business Centers

<sup>73</sup>United States Department of Commerce, International Trade Administration (DOC/IRM-6831), September 1995, pp 35-36.

ABC	Operator's Name	Type	Cost to USG	Cost to Operator	Length of Award (yrs)	Focus
Chelyabinsk	International American Products	Profit	\$750,000	\$601,298	3	All
Khabarovsk	Professional Business Services Inc.	Profit	\$600,000	\$489,282	2.25	All
Minsk	Americon, Inc.	Profit	\$999,998	\$1,836,042	3	All
Nizhnevartovsk	Environmental Planning Group, Inc.	Profit	\$999,704	\$249,926	2	Oil and Gas
Nizhny-Novgorod	American Graduate School of International Management	Non-Profit	\$946,707	\$237,962	2	All
Novosibirsk	Science Applications International Corp.	Profit	\$986,511	\$257,510	3	All
Volgograd	American Graduate School of International Management	Non-Profit	\$946,707	\$237,962	2	All
Yekaterinburg	Pragma Corp	Profit	\$732,257	\$185,393	3	All
Yuzhno-Sakhalinsk	Foundation for Russian/American Economic Cooperation	Non-profit	\$797,693	\$390,217	2.75	Oil and Gas
Almaty	US&FCS	DOC	\$420,000	N/A	Through FY 1996	All
Kiev	US&FCS	DOC	\$410,000	N/A	Through FY 1996	All
St. Petersburg	US&FCS	DOC	\$480,000	N/A	Through FY 1996	All
Tashkent	US&FCS	DOC	\$418,000	N/A	Through FY 1996	All
Vladivostok	US&FCS	DOC	\$306,000	N/A	Through FY 1996	All

DOC = Department of Commerce      USG = United States Government

Table A-1: American Business Center Vital Statistics

**X. APPENDIX B. PROGRAM MANAGERS FOR MAJOR INITIATIVES  
FUNDED BY THE FREEDOM SUPPORT ACT OF 1992<sup>74</sup>**

The twelve million dollars in program funds that the USAID transferred to the Department of Commerce only represents about three percent of the four hundred twenty-one million dollars in total funds authorized by the Freedom Support Act for the FSU. Funds provided by USAID to carry out the act are obligated by USAID as a reimbursement to other agencies, or are transferred to other agencies for obligation. The Department of Commerce initially received the money for the ABC program through a 632(b) reimbursement, but now it receives the money through a 632(a) transfer to International Trade Administration (ITA). Freedom Support Act funding for the assistance and initiatives in the FSU involves programs administered by various Federal agencies, including the following:

- The Overseas Private Investment Corporation (OPIC) encourages investment in overseas projects by reducing the risk for U.S. investors through loan guarantees, investment insurance, and match-maker programs. OPIC received fifty-six million dollars in Freedom Support Act funds in fiscal year 1994 to support activities in the FSU.
- The U.S. Trade and Development Agency (TDA), a small independent agency of the Federal government, funds feasibility studies, orientation visits, training grants, and technical assistance for business opportunities in developing and middle-income countries. In fiscal year 1994, TDA obligated sixteen million dollars for ninety-two activities in Russia, Ukraine, Kazakhstan, the Kyrgyz Republic, Moldova, Georgia, Belarus, Turkmenistan, and Uzbekistan.
- The Export-Import Bank of the United States (Ex-Im) has programs to support U.S. exports to most of the FSU. Ex-Im insures the U.S. exporter, or financing institution, against risks of nonpayment by a foreign buyer or bank. Ex-Im

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<sup>74</sup>Ibid, p. 75.

received a total of three hundred million dollars in Freedom Support Act funds.

- Three bilateral Enterprise Funds (Russian-American, EF, Central Asian-American EF, and Western NIS EF) have been established by the USAID to stimulate the creation and expansion of privatized businesses in the FSU. A total of two hundred fourteen million dollars has been obligated for taking equity positions or making loans in these countries.
- The Department of Commerce receives USAID assistance funds for its Business Information Service for the Newly Independent States (BISNET) unit; for fiscal year 1994, the amount was \$1.9 million. BISNET provides information, counseling, contacts, and trade leads to U.S. companies interested in doing business in the FSU.
- The Special American Business Internship Training (SABIT) program is a private sector-U.S. government effort designed to support the FSU's transition to a market economy. Under SABIT, the Department of Commerce provides grants to U.S. companies to help defray the costs of hosting FSU managers and scientists for three to six months of hands-on training in their U.S. facilities. In fiscal year 1994, the program received five million dollars, which brought total funding to nine million dollars.

# XI. APPENDIX C. NETWORK CONNECTIVITY IN THE FORMER SOVIET UNION

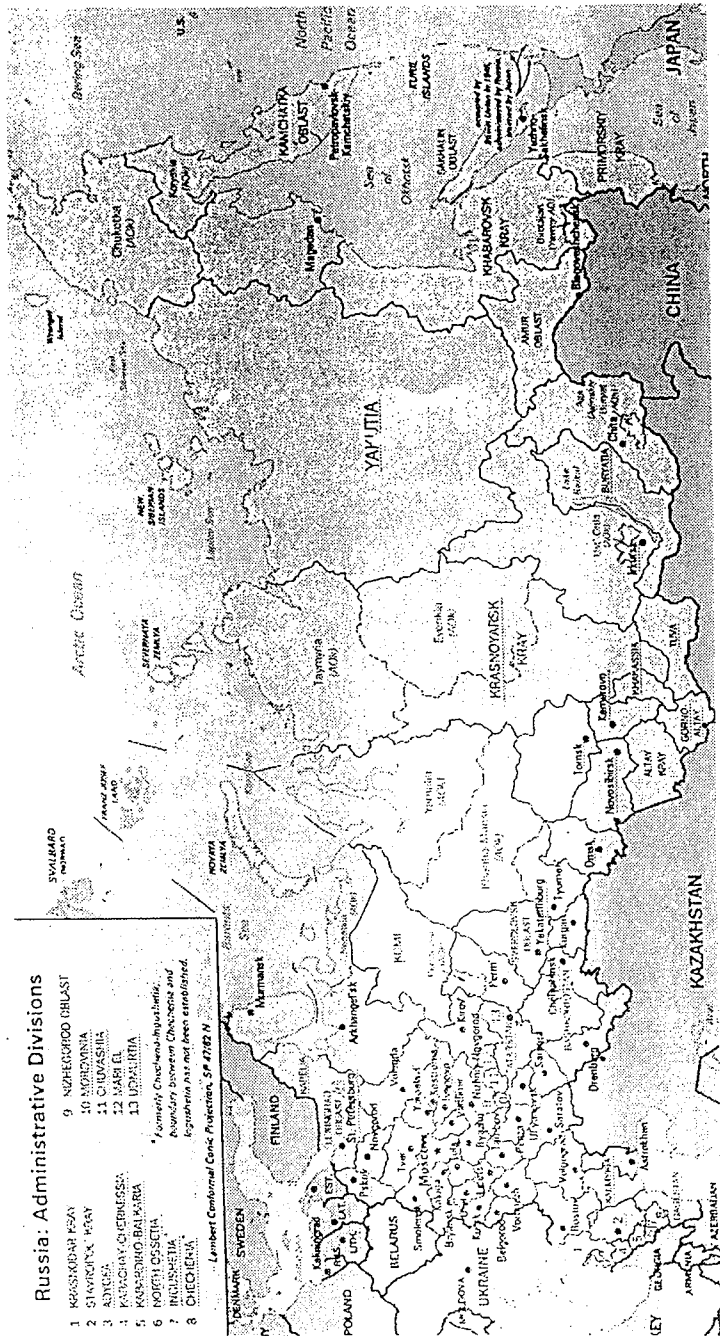


Figure C-1: Overview of Network Connectivity in the Former Soviet Union

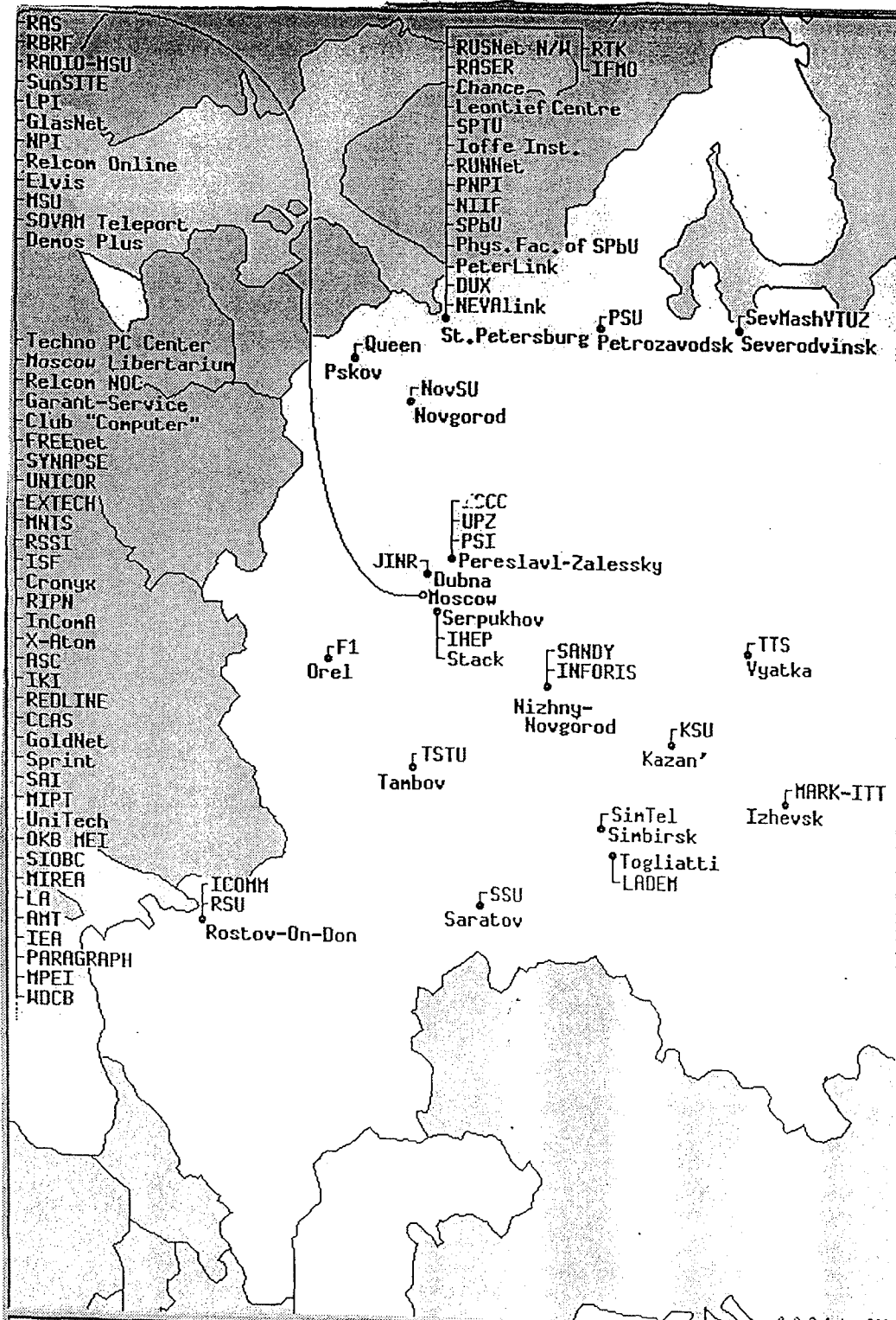


Figure C-2: Network Connectivity for the Western Republics

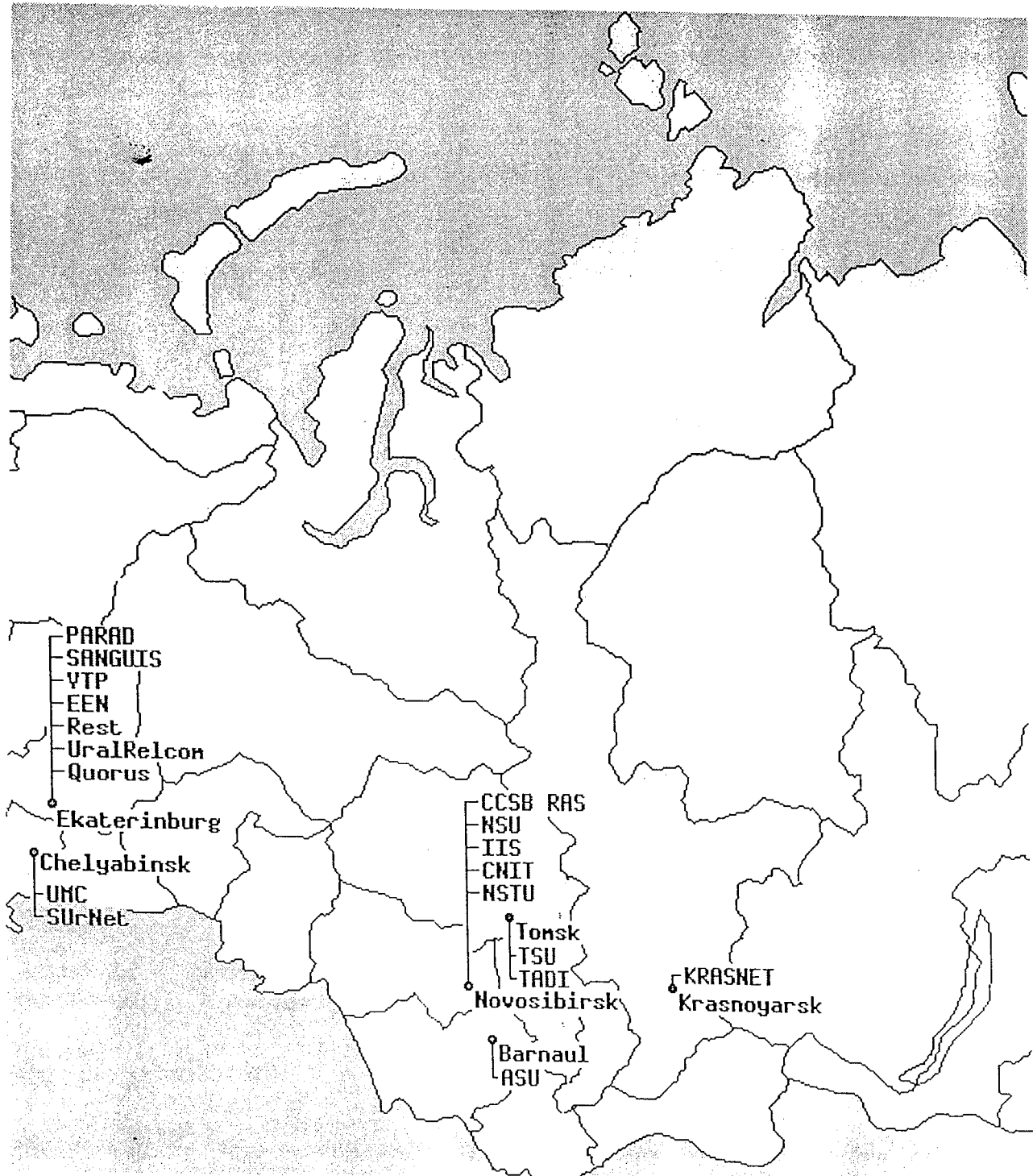


Figure C-3: Network Connectivity for the Central Republics

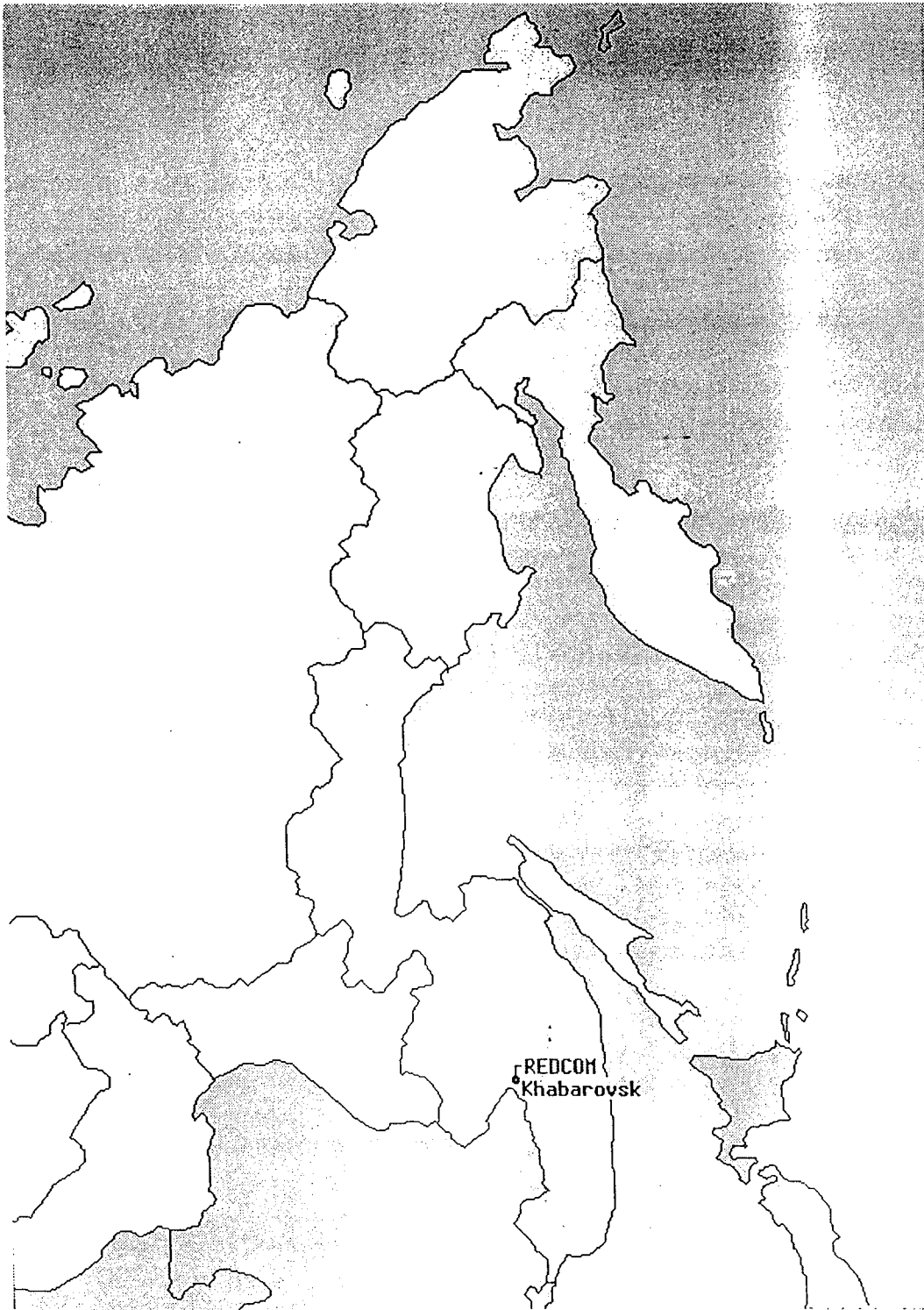


Figure C-4: Network Connectivity for the Eastern Republics

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