Phase I Report

Increase private sector awareness of, and enthusiastic participation in, the National Spatial Data Infrastructure (NSDI).

This initiative is designed to further the goals of Executive Order 12906, "Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure."

National Spatial Data Infrastructure

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SPATIAL TECHNOLOGIES INDUSTRY ASSOCIATION

About the STIA: The Spatial Technologies Industry Association

- Established July 23, 1996 by a group of private sector companies dedicated to expanding the industry's presence in the public sector to focus on programs, funding, legislation, and regulations impacting the spatial technologies industry – over 100 companies have participated in STIA activities since its founding.

- STIA is a mechanism for industry to participate in defining the public sector role in the evolution of this industry from its origins in the U.S. defense and intelligence sector to a mass-market commercial industry.

- Spatial technologies include remote sensing satellites, the Global Positioning System (GPS), transmission and imagery networks, data developers and suppliers, geographic information systems (GIS) software and applications, and location-based services.

- STIA's goal is to foster public sector policies conducive to the industry achieving it's full potential in public sector, private sector and global markets.

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1.0   PURPOSE

This report presents findings of the first phase of the STIA's program to increase private sector awareness of, and enthusiastic participation in, the National Spatial Data Infrastructure (NSDI).

This initiative is designed to further the goal of maximizing participation in the NSDI by the private sector.

The report summarizes the findings in this initial stage of the project with respect to the current status of private sector participation, issues with private sector participation, and our proposed recommendations to address some of these issues and increase private sector participation.

2.0 EXECUTIVE SUMMARY

The National Spatial Data Infrastructure (NSDI) has not attracted the level of private sector participation expected when the program was established in 1994. To begin to address this problem the Spatial Technologies Industry Association was awarded a Grant to examine ways to increase private sector participation in the NSDI.   This project begins to examine ways to address this issue as well as identifying obstacles – perceived and real – that have limited the private sector from participating in the NSDI.

The Federal Geographic Data Committee (FGDC) in 1994 was tasked Presidential Executive Order with championing the development of the National Spatial Data Infrastructure (NSDI), an effort at the Federal level to improve utilization of geospatial data. This undertaking envisioned participation and cooperation with state, local, tribal government, and the private sector.

Since the program's inception, activities have been undertaken by the FGDC to accomplish the goals for the NSDI including:

- building a National framework of data,
- addressing standards issues including metadata,
- creating a National Geospatial Data Clearinghouse linking data producers with data users,
- providing funding to local communities to develop framework data, and
- soliciting private sector participation in NSDI activities, including the GeoData Forums.

This Section Addresses

- Objectives of the Phase I Report

- Explains technology drivers

- Product not process is important to the private sector

- NSDI must articulate value proposition to private sector

- **Summary of Findings and Recommendations**

Since 1994, the spatial technologies industry "private sector" has grown significantly addressing market defined needs, addressing interoperability issues, expanding into new, growth areas, including location-based services and enhanced E(mergency) 9-1-1 services.   This industry sector has grown at a compound annual growth rate of approximately 20% since the mid-1990's.

From the federal perspective, however, participation by the private sector in the FGDC's NSDI effort has not met expectations.

This project and the Phase I Report is intended to examine ways to increase private sector awareness of the NSDI and to build participation in the NSDI effort. Further, the project is intended to examine ways to expand knowledge of the NSDI in the private sector and to develop methodologies to identify private sector advocates of the NSDI.

The project also identifies industry drivers (key factors) that can help expand usage of the NSDI throughout the user community.

As we explored the Federal government's expectations for the NSDI through authorizing circulars and orders and discussed the NSDI with influential companies that make up the spatial technologies industry, we became aware of a broad-based reluctance on the part of private sector companies to participate in the NSDI. Before we could effectively begin to increase private sector participation in the NSDI we felt it essential to identify private sector concerns to more broad-based private sector involvement in the NSDI.

Some of the concerns of getting to an NSDI were recognized by the National Academy of Public Administration (NAPA) in its 1998 report, namely that the challenges of getting to a National Spatial Data Infrastructure (NSDI) were "daunting, complex, and time-consuming."

This recognition is in part due to the Federal government's jurisdictional issues – "neither FGDC nor any other central office or coordinating body can require any two or more agencies to work together, much less to consolidate any of their GI functions."

In addition to federal jurisdictional issues, private sector data suppliers and users expressed skepticism on their part toward NSDI concepts. The NAPA study stated, "Most data suppliers and data users are skeptical of NSDI concepts or they do not see sufficient benefit to modifying their own practices for collecting and maintaining data, particularly if it is more costly to implement a federally endorsed standard."

Notwithstanding identified obstacles, the FGDC has championed this effort.

The NSDI, under the auspices of the FGDC, holds out the promise, through its policies, standards, and activities, to establish more comprehensive, integrated, and available geospatial data than has ever existed.

The NSDI is a national resource capable of contributing to the Nation's economic activity well beyond what the NSDI framers' envisioned. The market for location-based services is emerging as a growth market. Other drivers of spatial technologies include:

- the requirement for all wireless phones to be capable of providing a location reference on wireless phone callers within 75 meters, 70 percent of the time on E-911 calls by the year 2001 is driving demand for accurate spatial infrastructure. To meet this FCC requirement and comply with the FCC's E911 Phase II mandate that requires all wireless carriers to be able to pinpoint a caller's location for emergency purposes, the spatial technologies, telecommunications, and emerging wireless technology companies are developing business models and products that are geodata-dependent.

- the integration of GIS, GPS, remote sensing, and agricultural decision support applications technologies has created a whole new industry called "precision agriculture", and

- the convergence of these technologies and the growth in demand is resulting in dramatically lower cost systems increasing demand still further.

The private sector is an important stakeholder in this national initiative. It is both an important contributor (the private sector performs most of the production work for NSDI Framework) as well as a significant beneficiary (value added services are being offered by the private sector that utilize pubic domain spatial data extensively).

For the NSDI to realize its potential it must recognize how the private sector spatial technologies markets function for the NSDI to attract private sector support and participation. For this national program to be responsive to the nation's needs, the public and private sector interests must be fully recognized and understood by the private sector firms that make up the spatial technologies industry.

This report:

- Reviews the authorities establishing the NSDI Initiative and the assumptions made at the outset by the public sector with respect to private sector participation in the NSDI;
- Examines and validates the low private sector participation in the NSDI to date and suggests reasons for the lack of private sector involvement;
- Identifies private sector drivers (motivators) to participation in the NSDI;
- Summarizes impediments to achieving the goal of the NSDI; and
- Offers subsequent activities to address the findings in this first phase report and to develop processes and programs supporting private sector growth in participation in the NSDI.

2.1 Technology Drivers

Information technology is the engine that is driving the United States' economy. Computing performance has increased exponentially, while the cost of computing technology has declined steadily. Moore's law, named after Intel Corporation's chairman Gordon Moore predicted that the performance levels of computers would double approximately every eighteen months resulting in dramatic declines in the cost of computing power.

The Internet has evolved from a network linking the country's national laboratories' supercomputers to a global data backbone supporting new commercial business models capable of increasing business opportunities, while significantly reducing transaction costs in nearly every business sector.

Commercial software applications are proliferating, putting information technology productivity into everyone's hands; empowering even those who are incapable of writing computer code.

In the past few years, the GIS software industry has segmented into two markets; the computer "power/professional user" and the mass-market or "casual/occasional user."   As Geoffrey Moore – no relation to Gordon Moore - professes, "One of the keys to success is to relentlessly simplify the whole product in order to make it more suited to general-purpose use and easier and less costly to deploy and maintain."   This is beginning to happen in the spatial technologies sector and can ultimately lead to much broader market penetration.

The information and telecommunications sectors now account for approximately 20% of the Nation's gross domestic product and drive another 40% of the nation's economy. According to the National Academy of Public Administration's (NAPA) 1998 study "Geographic Information for the 21st Century," geographic information is associated with national economic activity estimated at some $3.5 trillion in 1997 or nearly 50% of the Nation's $8.3 trillion gross domestic product. The NAPA Report identified 11 economic purposes; from property and voting rights to national defense that have geodata dependencies.

The evolution of satellite navigation systems developed and deployed for national defense have been made available for civilian purposes. Remote sensing technologies, long the domain of the U.S. defense intelligence community, have been developed for commercial purposes since the passage of the Land Remote Sensing Policy Act of 1992. And, geographic information systems (GIS) have evolved with information technology, database technology, display technology, and advances in communications' technologies.

According to the International Space Business Council Remote Sensing/GIS Revenues for the period 1998-2002 are estimated at $9.8 billion. GPS revenues for the same period are estimated at $26.6 billion for a total of $36.4 billion for the spatial technologies industry.

With the growth of the commercial spatial technologies industry, enabled by commercial technology breakthroughs, the availability of public sector assets such as the Global Positioning System's constellation of 24 Department of Defense satellites, and the authority granted to commercial U.S. companies to deploy half meter resolution satellite imaging systems, the industry is developing rapidly to meet growing market needs.

The question then is: what is the NSDI role and its relationship to the public sector in the evolution of the commercial spatial technologies industry; and what is the private sector's role in developing the NSDI.

2.2   It's The Data, Not the Process

Early on, it was recognized that data to support the evolution of geographical information systems (GIS) accounted for as much as 80% to 90% of the cost of developing and deploying geospatial technologies for decision support. It was no surprise that spatial databases were expensive to create and, equally, if not more so, to maintain.

The Federal sector, championed by the Mapping Sciences Committee, recognized in the early 1990's the value of coordinating spatial data development and usage. The realization that significant benefits, and cost savings, could accrue from a national effort to address the need to coordinate and share spatial data lead to the Executive Order that directed the FGDC to develop the National Spatial Data Infrastructure (NSDI).

Notwithstanding the authorities vested in the FGDC by Executive Order 12906 and the OMB Circular A-16 to coordinate federal spatial data programs and to champion the development of the NSDI, numerous federal programs function independently of the NSDI. Programs championed by federal agencies to meet defined agency mission requirements, including U.S. Bureau of Census, TIGER; National Highway Performance Network, National Hydrology Survey, HUD's Community 20/20 proceed concurrently with the NSDI's data objectives. For the NSDI to succeed in the eyes of the private sector, these overlapping and seemingly competing activities need to be harmonized into a common, complementary Federal effort.

One of the core elements of the NSDI was the identification of the seven major framework layers. This effort focused on the need to develop a common national

spatial data set to facilitate production and use of geographic data to meet national needs by providing a reliable, standardized source for commonly needed and used geographic data themes.

While much has been accomplished to develop these framework layers – the National Digital Orthophoto Program (NDOP) is an example with over 90% of the country complete with 7.5' quadrangles, other data layers are lacking leading to the criticism that much of the FGDC's effort has been focused on process at the expense of building useful framework data sets.

2.3   Public Sector Expectations of the Private Sector

From a recommendation by the National Performance Review completed in 1993, President Clinton, in 1994, directed the Executive Branch of the Federal government to develop, in cooperation with state, local, tribal governments, and the private sector, a coordinated national spatial data infrastructure.

The Executive Branch was directed by President Clinton to develop the NSDI in cooperation with the private sector to support public and private sector applications dependent on geospatial data in such areas as transportation, community development, agriculture, emergency response, environmental management, and information technology.

Since the NSDI's inception, private sector consultation and advice has been sought to aid in the development and implementation of the objectives of the President's order.

During the same period, a pronounced growth occurred in private sector digital mapping and data collection, creating for the first time a healthy private sector mapping business community.   While the private sector was addressing end-user needs in the marketplace, the expectations of the NSDI program for the private sector spatial technologies industry, as expressed in the National Performance Review, were unrealistic in terms of financial contribution and were not articulated clearly as to what was meant by private sector cooperation.

In the Fall of 1999, the Spatial Technologies Industry Association (STIA) proposed to the FGDC to examine the level of private sector cooperation in the development of the NSDI. It was generally perceived at that time, that the level of private sector participation, as envisioned in the National Performance Review (NPR) and President Clinton's Executive Order directing the development of the NSDI, had not been realized. The Framework Data Survey conducted by the National States Geographic Information Council (NSGIC), in conjunction with the FGDC, confirmed private industry's low level of data sharing and participation in data sharing activities. Furthermore, private sector participation in NSDI events

including the 1999 GeoData Policy Forum held in Washington, D.C. did not meet organizer's expectations.

As a private sector trade association, STIA was interested in exploring why private industry was reluctant to participate in the development of the NSDI. Was it because of lack of awareness of the program? Was it due to a lack of understanding of the benefits that would accrue to private sector participating companies? Was it perceived competition between private and public sector mapping concerns? Was it due to unrealistic expectations for the private sector? Or was it due to other factors such as a lack of industry input into the NSDI process or the differences between private and public sector drivers?

For working purposes of this report, "private sector" is defined as two separate types – producers and users:

1) Producers of geospatial data, solutions and software providers, such as GIS software companies, data providers, and GIS consultants, GPS, and remote sensing providers, etc.

2) End-users of geospatial technology such as telecommunications companies, utilities, insurance companies, transportation services, agriculture, emergency management, and the like.

From a purely marketing perspective, it is our contention that to address the issue of private sector participation in the NSDI, we need to consider evolving market dynamics – producers and users – and to understand the private sector drivers of participation. Who are the potential participants? What industry sectors are most inclined to participate, and in what capacity? We then need to consider the NSDI in the context of the private sector.

In this Phase I Project and Report, we have examined 1) the expectations of the Executive Branch for private sector participation in the NSDI, 2) economic and business factors that drive private sector business decisions, and 3) actions to consider to increase private sector awareness and participation in the NSDI.

The STIA believes that the NSDI is a critical national enabler that can contribute to significant economic expansion over the next decade. A robust and successful NSDI, focused on the needs of both the public and private sectors, could contribute to economic expansion. For these reasons, the STIA is pleased to be able to contribute to a discussion of this important national program.

In summary, the drivers of private sector participation, the conclusions and recommendations put forth in this report are:

Drivers of Private Sector Participation in the NSDI
• *Private sector participation in the NSDI must consider firms private sector drivers*
• *Economic: increased revenues and profits; decreased costs*
• *Competitive Advantage: uniqueness, security, and privacy*
• *Time-to-market: completeness, availability, ease of use*
• *Quality: accuracy and completeness*
• *Cultural: Expectations of geospatial providers and end-users*

Conclusions
• *NSDI must address private sector interests and accommodate the private sector's role*
• *NSDI must complement the private sector's activities*
• *NSDI lacks a business plan focused on action not process*
• *Multiple NSDI and NSDI related activities at the Federal level confuse the private sector marketplace*
• *Knowledge of NSDI offerings and advantages to the private sector are lacking*
• *The NSDI must address demand factors in the marketplace – both public sector and private sector*
• *Security and availability of information needs to be improved*
• *NSDI must address scale and accuracy of data*

Recommendations
• *Redefine the NSDI articulating public sector responsibilities and the private sector's role*
• *Evaluate the existing NSDI framework program and develop a plan for building and maintaining the framework layers*
• *Examine OMB oversight role to ensure federal programs sponsored by federal agencies do not overlap with the NSDI initiative*
• *FGDC needs to better understand private sector needs and how the public and private sectors can become complementary*
• *FGDC should refocus its efforts on coordinating federal spatial data activities with expanded liaison with the private sector*
• *Convene a private sector advisory group to tackle the higher level issues outlined in section 12.3*
• *Seek private sector consultations and input on NSDI initiatives such as the GeoData Alliance, Aurora Partnership, and the I Teams Initiative*

Recommendations (Cont'd)
• **Develop outreach to private sector targeted toward specific industry sectors**
• **Establish a NSDI Private Sector Advocate**
• **Build and maintain a database of companies that make up the spatial technologies industry and end-user community to better understand their needs from the NSDI**
• **Use this database for marketing activities designed to increase awareness and participation**

3.0 INTRODUCTION AND BACKGROUND

3.1 NSDI Defined

The National Spatial Data Infrastructure (NSDI) was established by President Clinton's Executive Order 12906 on April 11, 1994 to implement the recommendations of the National Performance Review published by his Administration in the Fall of 1993.

The Executive Order described the need for a National Spatial Data Infrastructure as follows:

> "Geographic Information is critical to promote economic development, improve our stewardship of natural resources, and protect the environment. Modern technology now permits improved acquisition, distribution, and utilization of geographic (or geospatial) data and mapping. The National Performance Review has recommended that the Executive Branch develop, in cooperation with state, local, tribal governments, and the ***private sector***, a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data in such areas as transportation, community development, agriculture, emergency response, environmental management, and information technology."

This Section Addresses

- What is the NSDI

- Defines the Spatial Technologies Market Model

- Validates the lack of private sector participation in the NSDI

- Identifies NSDI issues from a private sector perspective

The NSDI consists of "the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data." Thus, the NSDI is a means to assemble geographic data nationwide to serve a variety of users, both public and private. The Executive Order called for:

- Executive Branch leadership

- Development of a National Geospatial Data Clearinghouse

- Development of standards for data documentation, collection, and exchange

- Development of a National Geospatial Data Framework, and

- Partnerships for data acquisition

The NSDI provides an environment within which organizations and technology interact to foster activities for using, managing, and producing geographic data. In addition to calling for executive branch leadership for development of a coordinated NSDI, the E.O called for the development of a National Geospatial Data Clearinghouse, the development of standards for implementing the NSDI, the development of a National Digital Geospatial Framework, and the development of strategies for maximizing cooperative participatory efforts with State, local, and tribal governments, the private sector, and other nonfederal organizations *to share costs* and improve efficiencies of acquiring geospatial data consistent with the Executive Order.

The private sector is an essential contributor to realizing a robust, successful NSDI and a beneficiary of a comprehensive, accurate, and current NSDI. The NSDI's charter, articulated in the Executive Order, envisioned cooperation from state, local, tribal governments, and the private sector to develop the NSDI. Some key questions to ask might be:

- What exactly is expected of the private sector?

- How realistic are these expectations?

- What contribution is expected from the private sector?

- What metrics should be used to evaluate private sector participation in the NSDI?

- Is it realistic to expect extensive private sector data sharing?

- Under what circumstances and conditions would private sector participation in the NSDI be expected?

- Are there limitations to the NSDI components of metadata, clearinghouse, and framework data that define the NSDI as less than a "whole offering"?

- And what, if anything, needs to be done at the Federal level to provide the elements of a whole offering that would drive increased private sector participation and support for the development and continued maintenance of the NSDI Framework?

It is important to set realistic expectations on partners in partnership efforts at the outset to:

- Lessen the prospect for disappointment, and

- Be capable of measuring performance against realistic goals.

It was the purpose of the Department of the Interior Grant, over four identified phases to:

- Examine the underlying principles of the NSDI relating to the private sector

- Look at the level of private sector awareness of the NSDI

- Examine current private sector participation in the NSDI effort

- Outline strategies to increase private sector awareness and enthusiastic participation in the future development of the NSDI.

3.2   Spatial Technologies Market Model Overview

The STIA defines the industry to include geographic information systems (GIS) and applications that incorporate positioning and imagery data, the Global Positioning System, transmission and imagery ground networks, remote sensing satellites, hardware and device manufacturers including computer manufacturers, manufacturers of PDAs, and mobile telecommunications and computing devices, data developers and suppliers, and location-based internet service vendors. STIA recognized the convergence of these technologies into a definable industry sector – spatial technologies industry in 1996.   Imagery products are integrated with GIS data sets and features and their locations are included in the data sets with GPS collected locations. GPS receivers collect location data for inclusion in location-based information and management systems. Thus, dependencies exit between GIS, GPS remote sensing technologies and the delivery of location-based services over wired and wireless communications systems.
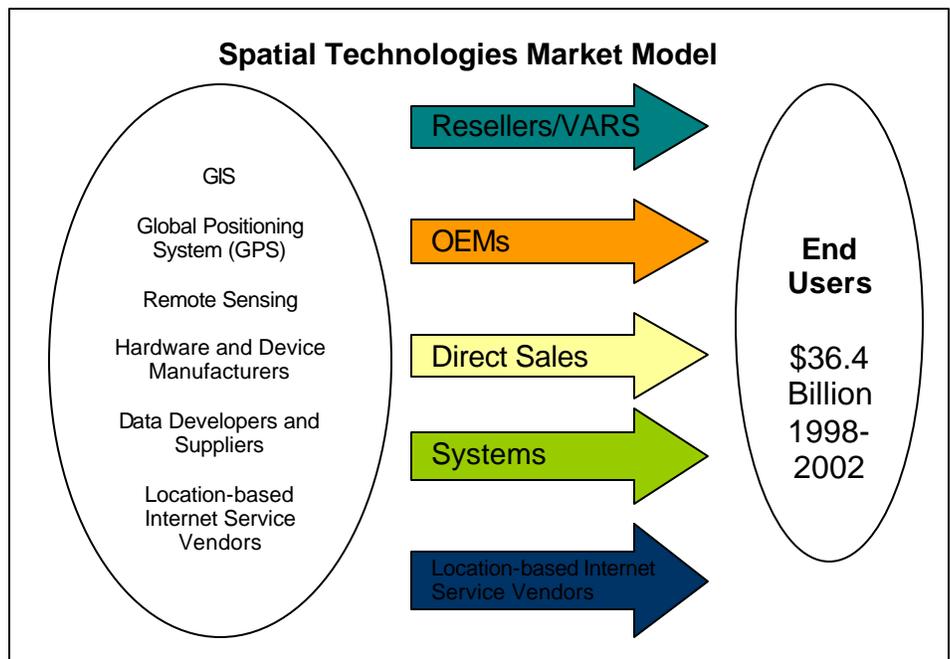
Spatial Technologies Market Model

GIS

Global Positioning System (GPS)

Remote Sensing

Hardware and Device Manufacturers

Data Developers and Suppliers

Location-based Internet Service Vendors

Resellers/VARS

OEMs

Direct Sales

Systems

Location-based Internet Service Vendors

End Users

$36.4 Billion 1998-2002

These technologies are converging into mainstream computing technology with the current commercial growth being driven by advances in information processing, telecommunications technology, ease of use, and the increasing availability of "spatial data" from private sector commercial sources including

commercial satellite imagery companies, and commercial spatial data providers.

The end-user community includes vertical markets from agriculture to residential zoning. In car navigation systems available from On-star integrate computing and GPS hardware, telematics, and digital street maps to provide the automobile driver with an integrated navigation solution.

Thus, the private sector is actively engaged in building the "National Spatial Data Infrastructure" to meet market place needs defined as business opportunities. The Open GIS Consortium of over 200 private sector, public sector, universities and not-for-profit organizations representing technology users and providers is addressing the issue of easy access to spatial information in mainstream computing. OGC is working to develop open software approaches that facilitate the development and use of location dependent software applications using spatial data to increase farm productivity, identify disease and health threats, assist police and law enforcement in identifying crime patterns and many more.

3.3   Definition of the Issue

The framers of the National Spatial Data Infrastructure envisioned active and substantial private sector support and participation to develop the NSDI including the framework layers, the clearinghouse, and supporting the Federal metadata initiative.

The Vice President's National Performance Review (NPR) went so far as to envision private sector funding for the collection, processing and distribution of the NSDI because of the value of the data, especially to profit-seeking private sector companies. It was contemplated that as much as 50% of the NSDI's project costs could come from the private sector.

The Framework Data Survey was the first quantitative study of the development of the NSDI Framework. The Survey's purpose was to measure progress of the nation's framework activities or "uncover the nation's hidden framework assets." From 1996 to 1998, some 13,000 questionnaires containing 118 questions were distributed to organizations in the 50 states representing:

Organization	Respondents	Percentage
Federal Agencies	273	5.2%
Non-Federal		
Counties	1920	36.2%
State Agencies	772	14.6%
Regional Agencies	392	7.4%
Municipalities	1187	22.4%
Tribal	107	2.0%

Private Industry	433	8.2%
Academia	215	4.0%
TOTAL	5299	100%

The Survey was an invaluable tool to:

- Better understand how the NSDI effort is progressing nationwide

- Measure the success of existing efforts to develop the NSDI

- Develop future activities to achieve the goals of the NSDI program or modify activities based on the current understanding of how organizations participate in the NSDI effort.

The Data Survey validated the lack of private industry data sharing. Private industry exhibited the lowest sharing rates, and private industry participated the least in data sharing coordination groups. This finding is entirely understandable in that the private sector companies that participated in the survey can only sustain their activities by profitably serving marketplace needs. In the case of commercial remote sensing companies, significant capital investment is required to place in space imaging satellites and ground stations to capture the imagery to produce the first deliverable product. Thus, some of the underlying data sharing assumptions are not well articulated. Further, licensing and other intellectual property arrangements are in need of being defined.

From our review of the NSDI program, we have identified a number of issues that need to be addressed to increase private sector participation:

- Build a Plan: Plans outlining activities to attract private industry to support the NSDI have not been developed. What elements of the NSDI can industry agree on? Are there activities such as a national funding program to support a community enterprise spatial resource planning capability that would be part of the NSDI. Other activities could include increased private sector awareness through a promotional campaign highlighting the benefits of the NSDI is needed and "all the elements needed to convert the aspirations into reality within a reasonable time" need to be articulated.

- Include the Private Sector: Private industry interests are not represented at the FGDC and thus, the private sector does not have a vested interest in the NSDI. The NAPA Study addressed this issue with the recommendation that a National Spatial Data Council be created legislatively to establish an entity that would represent national interests, including the private sector in policy, planning and administrative councils responsible for the success of this national effort. Many have remarked that the FGDC should refocus its activities more toward coordinating

Federal agency spatial data activities and less on the role assigned to the FGDC to develop the NSDI in Executive Order 12906.

- Review and Target the NSDI: The seven Framework layers have not been completed and concerns are expressed by NSDI "customers" of the need to develop the various layers beyond digital orthophotos offering a common, complete Framework of value to the end-user community. The May 11, 2000 report prepared by the Design Study Team, Commissioned by the Federal Geographic Data Committee, "Improving Federal Agency Geospatial Data Coordination," recommended focusing Federal agency efforts toward building and distributing integrated national geospatial data assets. The "whole NSDI offering" needs to be considered.

In marketing, it is critical to understand the whole product concept, its importance to marketplace acceptance, and its relationship to the technology adoption life cycle. Customers least in need of whole product support are the technology enthusiasts or early adopters. In order to achieve "mass market" appeal the "product" must met certain criteria.

The Whole Product Model

| | Data Sources | Data Brokers | Product Generation | Product Handling | VAR | Decision Support |

NSDI Framework

The whole product is defined as the minimum set of products and services needed for customers to achieve the value proposition needed.
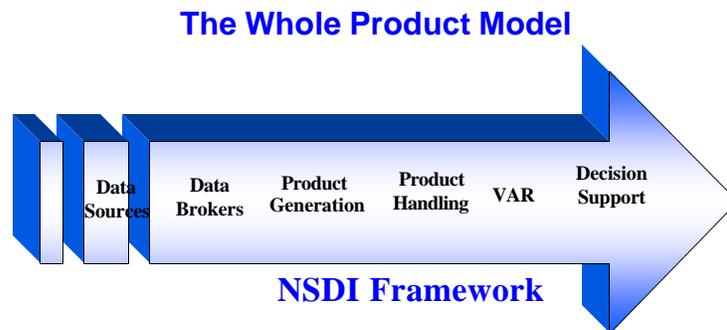
The Gartner Group stratifies enterprises into Type A, Type B and Type C based on the aggressiveness of their technology adoption. The meaning of these types is:

- Type A: pioneers, technology-driven, cutting-edge

- Type B: mainstream, moderate adopters, implement proven technologies

- Type C: followers, risk-averse, cost-conscious, late adopters

To shift enterprises from Type A to Type B requires that technology providers address these issues:

- Type B users require industry-specific solutions where Type A users are willing to perform customization themselves.

- Type B users want turnkey solutions where Type A users are willing to either pay for custom integration or perform integration themselves.

- Type B users don't need all of the functionality that Type A users needed and they will not be willing to pay for Type A features they don't need.

- Type B users are not power users and require more templates, interfaces and Web-enabled tools.

- Type B users have less internal IT support. They need single-point-of-contact support from the technology providers they choose, even if their solution is an integration of many technologies.

To succeed in increasing private sector participation in the NSDI, the drivers to private sector participation must be better understood. The NAPA study commented that, "Although the FGDC has promulgated a vision, goals, and objective for achieving the NSDI, no one has thought through all of the elements needed to convert these aspirations into reality within a reasonable time." The lack of a strategic plan to "convert these aspirations into reality within a reasonable time" impacts private sector participation in the NSDI effort.

4.0 METHODOLOGY AND APPROACH

The objective of this project is to examine private sector awareness and participation in the National Spatial Data Infrastructure in order to develop methodologies and approaches to gain greater understanding, interest, and participation by the private sector for this national effort.

We hope that this report can provide insight to the Bush Administration as it addresses policy issues relating to the Federal government's geospatial technologies policy. Our industry association would welcome the opportunity to provide on-going support to the development of the NSDI that is consistent with the needs of our industry member companies.

In the course of this First Phase Study we have:

- Reviewed literature, market studies, proceedings from conferences, and other secondary materials that address the spatial technology industry market and channels, structures, and end-user markets.

- Analyzed the spatial data industry including primary, secondary and tertiary members and identified those companies that benefit most from participation in the NSDI.

  This Section Addresses

  - Summarizes the approach the study team took on this project and the development of this report.

- Built an understanding of primary drivers of participation.

- Researched and built criteria to prioritize and select the key drivers.

- Recommended the development of a knowledgebase of companies well-suited for participation in the NSDI, using criteria developed in preceding research.

The first step in our approach was to validate the issue of lack of private sector awareness and participation in the NSDI. This has been done largely through literature reviews and interviews with private sector industry representatives. We have participated in conferences, meetings, forums, and interviewed industry leaders over the past 12 months. The following is a partial list of events which we have participated in that have contributed to this report:

- National GeoData Policy Forum – Making Livable Communities a Reality, June 7-9, 1999

- National GeoData Policy Forum – Thread 7, "Pillars of the Community: Framework Data and Product Development", June 9, 1999

- NSGIC/FGDC Framework Data Survey, 1997 – 1999

- FGDC Demonstration Project Presentations

- Pecora 14/Land Satellite Information III Conference, December 6-10, 1999, Denver, Colorado

- Aurora Partnership, September 29-30, 1998 and September 28-29, 1999

- GeoData Organizational Initiative, October 13-15, 1999, Denver, Colorado

- STIA Forum, December 14, 1999: Legislative Priorities for the Spatial Technologies Industry in the 106th Congress – Representative Paul Kanjorski, Rayburn House Office Building, Washington, D.C.

- OMB Information Initiative – Collecting Information in the Information Age, October 5, 2000

- STIA Briefing on Geospatial Readiness: A Discussion of the Major Findings of the NRO, NIMA, and Space Commissions' Reports, February 8, 2001

- The Commercial Remote Sensing Industry in the 21st Century and the Knowlegde Gap: A Discussion of Remote Sensing Education and Training Needs, Representative Ralph Regula, Chairman, Chairman, Labor, Health and Human Service, Education, and Related Agencies Subcommittee, Committee On Appropriations, May 22, 2001

We reviewed all existing NSDI authorities to understand the vision, goals, and objectives for achieving an NSDI. Further, we wanted to examine all of the elements of implementation plans developed by the FDGC to achieve the reality of the NSDI in a timely manner. We believe this chronology of authority is important to ensure that our recommendations and findings in this report are consistent with existing authorities.

We then reviewed all current and relevant research to ensure that we were knowledgeable of those findings and recommendations. The NSGIC/FGDC Framework Data Survey conducted from November 1997 to October 1998 provides a wealth of information to validate the basic framework concepts and to provide insight to refine these concepts going forward.

Urban Logic, Inc.s' extensive work "Financing the NSDI: National Spatial Data Infrastructure – Aligning Federal and Non-Federal Investments in Spatial Data, Decision Support and Information Resources," makes the case for a thorough analysis of spatial data market dynamics. The Study states, "Research has not uncovered a thorough circa-Digital Economy study (post 1998) of the market size, players and customers for Spatial Data (as distinct from spatial technology, hardware, software and services) supply and demand, and of the direct and

indirect value of spatial data as part of gross domestic product or other measures of the digital economy."

And finally, "Improving Federal Agency Geospatial Data Coordination," prepared by the Design Study Team, Commissioned by the Federal Geographic Data Committee, May 11, 2000, provided confirmation of comments we heard at the National Geodata Policy Forum, Thread 7 Session on Framework Data. Accuracy of Federal data, completeness of framework data, and currency of data were consistent themes from the interview responses. One of the five recommended actions in the report is to "Focus Federal agency efforts toward building and distributing integrated national geospatial data assets." Further, the report stated, "Federal NSDI framework activities need a renewed commitment, reevaluation, and redirection of effort."

In Section 7 we address private sector demand for the NSDI, we review applications, markets, and private sector activities that support the NSDI. Section 7 also includes several private sector cases on significant NSDI involvement.

In Section 8, we identify private sector issues with the NSDI and general Federal approaches to geographic information.

We then focused on an articulation of the current 21st Century e-business market model that is driving e-commerce. The NSDI could become an integral element of this evolving market environment so it is essential to understand evolving product and market strategies.

In Sections 10 and 11, we outline an industry profiling, selection and prioritization schema as the basis for compiling a comprehensive database of spatial data users and describe a database approach for this industry.

In Section 12 we present specific steps to increase private sector participation in the NSDI.

5.0 NSDI AUTHORITIES

5.1 Chronology of NSDI Authority

Since our Nation's founding, the Federal government has been responsible for a wide range of surveying, mapping, and other geographic information functions. Many of these activities are inherent responsibilities of the central government enumerated in the Constitution's Commerce Clause, "To regulate Commerce with foreign nations, and among the several states, and with the Indian Tribes."

Federal mapping and surveying activity enables the central government to carry out its responsibilities. At the Federal level, the central government reserved the right to promote and regulate commerce among the states including river navigation and land transportation. Surveying and mapping was recognized as an essential element to carrying out its responsibilities under the Constitution. In recognition of the Federal government's surveying and mapping role, the Office of Management and Budget, through its Circular A-16, has recognized the need for Federal agencies to coordinate their activities to avoid duplication of effort and redundant cost by the executive branch.

As technology has evolved over the last decade, a number of organizations including the White House, the Executive Office of the President, the National Research Council of the National Academy of Science, the National Academy of Public Administration (NAPA), and the U.S. Congress, have focused on the need to avoid duplication of effort in an information and technology based economy. These various organizations have provided guidance and recommendations to establish an effective national policy in the digital surveying, mapping and geographic information functions. The technology developments within geographic information systems (GIS) changed the coordination landscape. As federal mapping agencies moved from paper and map chart-centric services to geo database driven services, the need for coordination and collaboration became critical for bot avoidance of redundancy and for interoperability of the geodata that was being developed by federal agencies. All of these efforts have called for better coordination at the Federal level and the need for 21st century institutions to coordinate Federal spatial data activities with non-Federal organizations.

This Section Addresses

- NSDI Chronology

- The Chronology of Authorities from OMB Circular A-16 to the Government Management, Information and Technology Subcommittee, Committee on Government Reform 's hearing on Geographic Information Systems

Thus, there is much guidance, and many recommendations, on how the Federal government should fulfill its responsibilities in this area.

For example, insurance companies need the geospatial data from several agencies such as NOAA, Census, FEMA, USGS and Army Corps of Engineers to effectively determine insurance risk in our nation's growing coastal communities.

However, building consensus support for policy initiatives to accomplish the goals of the NSDI that ***include broad-based private sector participation*** have been difficult, and the expectations of significant direct private sector financial support for the NSDI has yet to be realized.

It is the purpose of this study to examine private sector awareness of the National Spatial Data Infrastructure and develop a strategic plan to increase private sector participation in the NSDI effort.

While the NSDI program has not achieved the levels of private sector participation anticipated in the National Performance Review, at the same time, the private sector has contributed significantly to the realization of a National Spatial Data Infrastructure.   In fact, the development by the private sector of the information and telecommunications technology that exists today enables the development of the NSDI.

Standards for spatial data interoperability are being addressed by the Open GIS Consortium, an international organization of over 200 participants, through OGC's Web-enabled geospatial browsing test-bed program. Business to consumer (B2C) and business to business (B2B) Internet supply chains are evolving as we speak, changing the way businesses interact with customers and other businesses up and down their supply chains.

The spatial technologies industry is inventing itself in "Internet time." Internet portals facilitate navigating the Internet for specific vertical markets. E-commerce markets are being implemented for industries including aerospace and the global automotive industry.

The Geography Network (http://www.geography.com), a private sector initiative, is a global network of geographic information users and providers and includes links to the NSDI Clearinghouse. This organization seeks to provide access to information that is current and readily available. On their Web site, they state that the network is, ". . . a community of organizations and individuals that share a common goal – using geographic information to make better decisions about the things that affect our lives. This community is strengthened by

the generosity of its members sharing their ideas and resources with others."

The Internet is spawning new business models and location-based services are being rapidly integrated into the fabric of our information technology economy. Database companies are incorporating spatial capabilities in their product offerings and m-commerce (mobile commerce) is emerging in the wireless Internet space driven by the Federal mandate to enhance E-911 service. Geospatial readiness is becoming a key criteria for decision support systems as diverse as emergency management and agricultural production.

5.2 Chronology of Events

Since the concept of the NSDI was first discussed in the early 1990's, a number of events have occurred. The following summary of critical events traces the policies, purposes, and programmatic authorities for the development of the National Spatial Data Infrastructure (NSDI) over the past ten years.

5.2.1   OMB Circular A-16
(http://www.whitehouse.gov/OMB/circulars/a016/a016.html)

In 1990, the Office of Management and Budget, Executive Office of the President, issued OMB Circular A-16, replacing an earlier OMB Circular A-16 issued May 6, 1967, directing Federal departments and agencies to coordinate their surveying, mapping and related spatial data activity.

The Circular's major objective is to support the eventual development of a national digital spatial information resource, with involvement of Federal, state, local governments, and the private sector.

The development of this national information resource is intended to support the sharing and efficient transfer of spatial data between producers and users.

Circular A-16 established an interagency coordinating committee known as the Federal Geographic Data Committee (FGDC) to carry out the Circular's objectives. The Committee promotes the coordinated development, use, sharing, and dissemination of surveying, mapping, and related spatial data.

Further, the FGDC is to provide guidance and promote cooperation and coordination among Federal, state, and local government agencies and in the private sector in the collection, production, and sharing of surveying, mapping, and related spatial data. The coordination procedures established under A-16 extend to activities financed in whole or in part by Federal funds. Circular A-16 recognized that through a more coordinated effort:

> "Enhanced coordination will build information partnerships among government institutions and the public and private sectors, avoiding

wasteful duplication of effort and ensuring effective and economical management of information resources in meeting essential user requirements."

5.2.2 Mapping Sciences Committee, National Research Council, National Academy of Sciences (http://www.msc.gov)

The Mapping Sciences Committee serves as a focus for external advice to the Federal agencies on scientific and technical matters related to spatial data handling and analysis. The committee's purpose is to provide advice on the development of a robust national spatial data infrastructure for making informed decisions at all levels of government and throughout society in general.

In the early 1990's, the MSC began to examine the need for a coordinated Federal approach to spatial data both at the Federal level, as well as, a national approach to a more efficient and effective way to reduce redundant public sector activities in this area. In the Spring of 1993, MSC issued a report, "Toward a Coordinated Spatial Data infrastructure for the Nation," articulating its vision of an organizational approach to creating an NSDI. The report defined the elements of the NSDI and provided a conceptual framework for an enhanced spatial data infrastructure for the nation. The MSC recommendations included:

- The need to develop national policies, strategies, and organizational structures at the Federal level, to integrate data collection, use, and distribution.

- Strengthening the FGDC Charter defined in OMB Circular A-16.

- Developing on-line access to information describing spatial data.

- Establishing a spatial data-sharing program to enrich national spatial data coverage, minimizing redundant data collection at all levels, and creating new opportunities for the use of spatial data throughout the nation.

The MSC's concept of the NSDI, supporting "users" is illustrated below:
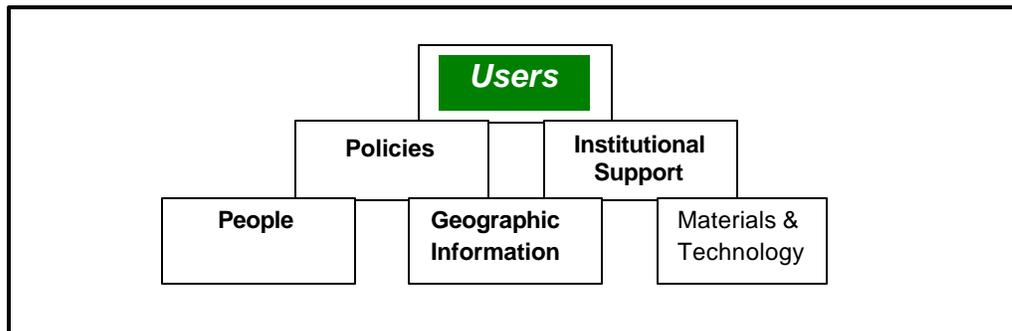
The MSC appropriately identified the importance of users in the development, evolution, and success of the NSDI effort. However, identifying and understanding users is extremely difficult in a dynamic market environment when technologies are changing, markets are being redefined in six-month cycles (Internet time), and direct contact with the "end users" is limited.
The MSC also noted that the "mechanism for the involvement of state and local governments and the private sector has yet to be established (1994)." This problem was specifically recognized in Executive Order 12906:

> The Secretary, under the auspices of the FGDC, and within nine months of the date of this order, shall develop, to the extent permitted by law, strategies for maximizing cooperative participatory effort with state, local, and tribal governments, the private sector, and other non-Federal organizations to share costs and improve efficiencies of acquiring geospatial data consistent with this order.

Issue: Since 1994, and the establishment of the E.O. 12906, private sector participation in the NSDI effort has occurred but not nearly at the desired levels anticipated.

Additionally, the understanding of the requirements of the two subsets of the private sector have nto been fully understood (ie. Privatec sector geospatial industry and the geospatial end-users.

5.2.3   The National Performance Review (http://www.npr.gov)

On September 7, 1993 the Vice President published the Report of the National Performance Review, an extensive six-month study of the Federal Government. As part of "Re-engineering Programs to Cut Costs," a recommendation to develop a National Spatial Data Infrastructure (NSDI) was included. It was envisioned "because of the value of the data, it will be possible to attract private sector funding for its collection, processing, and distribution. The Federal Geographic Data Committee, which operates under the auspices of OMB, plans to raise enough non-Federal funding to pay for at least 50 percent of the project's cost."

How this non-Federal funding was to occur has never been addressed.

Issue: Over the past seven years, the private sector contribution of over 50% contribution has not been realized.

5.2.4 Executive Order 12906 (Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure (NSDI) (http://www.npr.gov/library/direct/orders/20fa)

Recognizing the importance of geographic information, the President, in order to implement the recommendations of the National Performance Review, advance the goals of the National Information Infrastructure (NII), and to avoid wasteful duplication of effort and promote effective and economical management of resources by Federal, state, local and tribal governments promulgated E.O. 12906. The National Performance Review recommended that the Executive Branch develop, in cooperation with state, local, tribal governments, and the private sector, applications of geospatial data in such areas as transportation, community development, agriculture, emergency response, environmental management, and information technology.

Further, E.O. 12906 directed the Secretary within nine months of April 11, 1994 to develop strategies for maximizing cooperative participatory efforts with state, local, and tribal governments, the private sector, and other non-Federal organizations to share costs and improve the efficiencies of acquiring geospatial data consistent with the order.

Issue: As was mentioned earlier, It was envisioned "because of the value of the data, it will be possible to attract private sector funding for its collection, processing, and distribution. The Federal Geographic Data Committee, which operates under the auspices of the OMB, plans to raise enough non-Federal funding to pay for at least 50 percent of the project's cost." Clearly, this objective has not been met, calling into question the value of the data as a driver to private sector funding of up to 50 percent of the cost of developing the NSDI.

5.2.5 National Academy of Public Administration - Geographic Information for the 21st Century: Building a Strategy for the Nation (http://www.napawash.org)

According to the 1998 National Academy of Public Administration (NAPA) Study entitled "Geographic Information for the 21st Century – Building a Strategy for the Nation," nearly half of the nation's economic activity has underlying geodata dependencies.

Public sector dependencies include providing for public safety, comprehensive disaster management, supporting our national defense, preserving the nation's resources for future generations, enhancing the nation's food supply, and meeting the basic needs of an expanding economy.

The NAPA Panel, co-chaired by Fellows Ed David and Gerry Riso, advocated merging some Federal geographic information activities and creating a new

organization to oversee the creation and maintenance of the National Spatial Data Infrastructure. According to the report, "the Federal government should ensure full and rapid implementation of the NSDI in a cost-effective and cooperative manner."

The report's most significant recommendation was that Congress create a new private, nonprofit organization, The National Spatial Data Council (NSDC), as a forum for all organizations engaged in developing and maintaining the NSDI. The NSDC's charter and activities would complement those of the FGDC, but would better provide for "full participation by all the major parties and interests." The panel recommended that the FGDC concentrate on coordinating GI functions within the Federal government. The NAPA Report's goals included:

- Provide a national forum for developing and maintaining the NSDI

- Maintain state-of-the-art knowledge about advances in GI and related technologies

- Help ensure that goals set for the NSDI are actually carried out by serving as a catalyst for implementation

- Build a comprehensive and user friendly clearinghouse for Geographic Information.

- Provide a forum for discussion by all parties on national standards and possibly, over time, assume these responsibilities from the FGDC

- Provide training and education on the utility of and techniques for fostering the NSDI

The report also noted that until the NSDC was established, the FGDC should encourage stronger involvement by the private sector. Achieving stronger involvement by the private sector will be limited until the private sector's role is better defined and the value proposition for private sector involvement is understood.

Issue: One concern is data pricing and intellectual property rights. Federal data and pricing policies often conflict with state and local government and private-sector interests in generating revenue, a situation that is likely to be exacerbated as more data is digitized and becomes available on line. These practices constrain partnering to the mutual disadvantage of all sectors, but must be recognized and addressed for the private sector to increase its involvement in the NSDI effort.

5.2.6 Government Management, Information and Technology Subcommittee Hearing
(http://www.house.gov/reform/gmit/hearings/testimony/990609h.htm)

The Government Management, Information, and Technology Subcommittee of the House Government Reform Committee conducted a hearing on June 9, 1999 to discuss how Federal, state, regional, and municipal governments were using their geographic information systems to manage programs and services. The Committee wanted to learn how this information was being used by the private sector and how the Federal Government could help improve the compatibility of these networks and databases. In addition, the subcommittee addressed how the Federal Government might assist states, regions, municipalities and the private sector in forming partnerships to provide geographic information systems in a cost-effective manner.

Issues: Many of the witnesses before the committee raised a number of concerns including:

- The failure to establish and employ certain nationally accepted technical standards.

- The lack of coordination between local, regional, state, and federal government to collect, maintain, share, and integrate data.

- The unfamiliarity of public officials and government employees with how to use GIS in the decision making process.

The collection of geographic information is a multibillion-dollar business in the United States. Yet sharing this information is often difficult, because many software applications still cannot communicate with others, requiring public and private organizations to collect duplicate information on the same region.

In addition, there has been no commitment among governments and the private sector to share this information. Data collected by one local government may not be available to Federal and state government planners. Similarly, Federal databases are not always available to state and local government planners – or to the private sector. Millions of dollars are being unnecessarily spent on this duplication.

5.3 Conclusion

From a private sector perspective, the authorities and executive guidance to establish the National Spatial Data Infrastructure appear not to fully understand the commercial spatial technologies industry and how it relates to public sector spatial technologies programs like the NSDI.   As the private sector grows, the roles of the public and private sector change. To ensure that public sector policy reflects evolving private sector markets and market demands a mechanism is needed for the private sector to become more directly engaged in with the

Federal Geographic Data Committee. The Spatial Technologies Industry Association is well suited to provide an industry day to address the findings of this report with the FGDC and its federal government participants.

6.0   NSDI RESEARCH

6.1   NSGIC/FGDC Framework Data Survey

The National States Geographic Information Council (NSGIC) and the Federal Geographic Data Committee undertook a nationwide assessment of the NSDI's "Framework" development. Since the NSDI's inception in 1994, the FGDC has promoted and supported collaborative efforts to develop Framework data themes. Beginning in the Fall of 1997, the Framework Data Survey coordinators distributed a comprehensive survey consisting of some 118 questions, to participants in all 50 states, in an effort to capture data for all counties.

The final surveys were returned in October 1998. By June of 1999, the preliminary results were compiled, and Sheryl Oliver, President, NSGIC, and John Calkins, briefed the Framework Data and Product Development Thread of the 1999 GeoData Policy Forum. The survey provides a rough nationwide inventory of organizations that are producing or using framework data, which themes of data are being produced, the availability of metadata, data sharing practices of respondents, and key contact information.

This Section Addresses

- Research by independent organizations on different aspects of the NSDI

- Research includes:
  - The Framework Data Survey
  - Financing the NSDI, and
  - Improving Federal Agency Geospatial Data Coordination

The Framework Data Survey had two major goals:

- To take a snapshot of Framework Data development across the United States.

- To promote development of Framework activities.

The computer diskette format questionnaire was provided to over 13,000 respondents in late 1997. The Framework data themes surveyed included: geodetic control, orthoimagery, elevation, transportation, hydrography, governmental units, and cadastral information. By October of 1998 5,299 responses were received from counties, the federal government, states, regional authorities, municipalities, academia, private industry, and tribal councils representing a remarkable response rate of over 40%.

Some conclusions reached from the survey include:

- Framework data serves many difference uses;

- Substantial progress has been achieved in framework data creation;

- Framework development status is comparable across themes;

- Many different types of organizations are involved in framework development activities;

- Data sharing levels are very high;

- Private sector participation and sharing levels are significantly lower than public sector participants; and

- Coordination efforts are making substantial progress.

The study clearly identified that the framework benefits organizations in several ways:

- It can greatly reduce the time, effort, and expense involved in developing geographic data.

- It gives users ready, reliable data, in a consistent format.

- It gives data producers a reference source, standards, and guidance for creating geographic data, and

- The framework also makes it possible to combine data from many sources and areas.

Of the seven framework data themes, the framework data survey found the transportation theme to be the most developed/used by the survey respondents, followed closely by government units and hydrography.

Of particular interest is the role framework data plays in an organization's data needs. While framework data has never been intended to fulfill an organizations total data needs, it is intended to play an important role in many organization's GIS databases and operations.

The survey data collected valuable information to assess the underlying framework concepts and to validate them as they relate to the various markets the NSDI is intended to serve. The survey data provides a wealth of data to better understand the value of the NSDI framework effort and the private sector's participation role.

Framework validation addressed in the Framework Survey included:

- Are the seven data themes common to most organizations that deal with digital geographic data?

- What data resolution is needed for different organizations and applications?

- Are there differences in framework development patterns in different geographic regions?

- What factors affect the timing of framework data development?

- What operational needs affect framework data development?

- How do organizational differences affect Framework development?

- How does resource (money, personnel, software) availability affect framework data development?

- What factors influence coordination and data sharing?

- How important are incentives in promoting framework development?

The following table from the Framework Data Survey Preliminary Report summarizes the respondents activity in developing framework data themes.
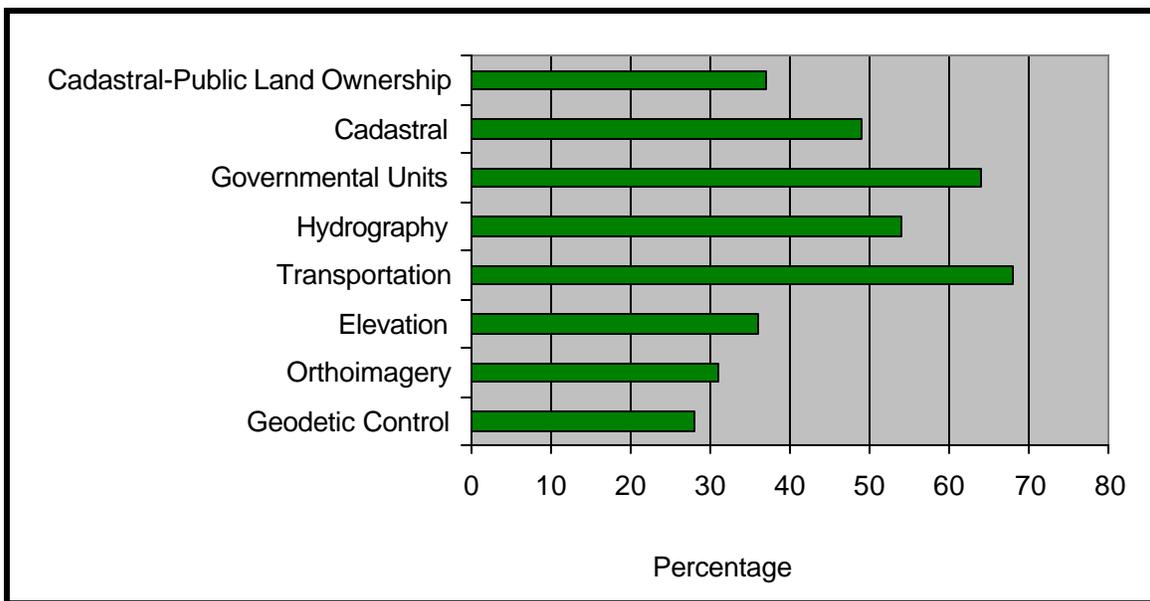
Of particular interest in the framework data study is the insight provided by the framework data survey respondents. Approximately 10% of the respondents were classified as private sector and their responses provide valuable insights into the private sector's framework data activity.

The following table presents the nine organization-types that were considered in the framework data survey:

Respondent	Numbers	Percentage
Counties	257	31.65
Federal	83	10.22
State	109	13.42
Regional	60	7.39
Municipalities	160	19.70
Academia	29	3.57
Private Industry	85	10.47
Tribal	29	3.57
Total	**812**	**100.00**

The framework survey preliminary report identified several private sector factors as follows:

- Utilities have Framework data activities similar to the public works department of a county government.

- The GIS software industry has segmented into "professional" GIS users and "non-technical" GIS users. Non-technical users work at desktop PC's or Web-enabled viewing applications.

- Private sector organizations are the most active in creating elevation data.

- Federal agencies and the private sector are most active in creating hydrographic data.

- The private sector distributes data at lower rates than other organizations.

- Data sharing levels are very high except for the private sector. The private sector is least likely to share data.

- The private sector is the least likely to permit unrestricted data redistribution.

- The private sector participates the least in spatial data coordination groups.

One of the purposes of the framework data survey was to provide a snapshot of framework data development and to enable analysis of the data to confirm or refute fundamental framework concepts. The above findings regarding the private sector provide us some fertile areas to examine in this study.

6.2 Financing the NSDI: National Spatial Data Infrastructure – Aligning Federal and Non-Federal Investments in Spatial Data, Decision Support and Information Resources

In Urban Logic's work on private financing approaches to finance the development of the NSDI, Mr. Bruce Cahan addresses the issues of how capital can be better used and invested in spatial data. This report also looks at the evolution of shared decision support tools that are driving the demand for spatial data.

The report advocates the creation of spatial data consortia to provide an "architectural unit" for public/public, public/private, and private/private partnerships to align their investments in spatial information services. The spatial information consortia would facilitate the pooling of capital and information resources among a number of needs, servicing Federal "data mandates."

Mr. Cahan identifies three types of consortia:

- Regional – Pacific Disaster Center (PDC), San Diego Association of Governments (SANDAG)

- Industry – such as Energy, Healthcare, Insurance, Real Estate, and Telecommunications

- Interest Groups – Association of Biodiversity, Intelligent Transportation Society (ITS) of America

Through these consortia, spatial data can be securitized to fund data development, data updating, and applications development to meet the multiple spatial data needs from precision agriculture to community zoning.

6.3 Improving Federal Agency Geospatial Data Coordination

As the FGDC has grown to 17 departments and independent agencies, and as directed by Executive Order 12906 to develop the National Spatial Data Infrastructure, FGDC members have voiced concerns that FGDC's expanded role to address a wider community has impeded the coordination work at the Federal level. It is the belief among many that the FDGC's coordination effort has slowed and key Federal agencies are absent from FGDC meetings. The purpose of the report, "Improving Federal Agency Geospatial Data Coordination," is to gather information, evaluate this information and recommend actions with respect to the FGDC's priorities.

The report identified a number of significant concerns/issues applicable to the FGDC:

- Senior officials within the FGDC have not had the opportunity or reason to develop an understanding or appreciation of the importance of geospatial data or GIS to the overall mission of the agency.

- Coordination among Federal agencies is generally ignored because oversight is not at a high enough level within the Executive Branch.

- The NSDI data assets need to be developed and distributed in a timelier manor based on "market demands."

- FGDC needs to be more responsive to the needs of member agencies.

- Management oversight and accountability is lacking.

While all of these issues do not appear to relate to a lack of private sector participation, they all actually do. All of these issues suggest a lack of clear purpose and mission and a mismatch between agency goals and those of their desired "customers." The private sector, driven by time-to-market, short-term profit, liability, and privacy issues, is not likely to take an interest in a program that is difficult to participate in or lacks relation to their own goals. They are also not likely to invest in programs without a clear purpose.

Notwithstanding the goal of developing the NSDI, including the national framework effort, realistic expectations of the private sector are not clear. Clearly, the private sector has different drivers than the public sector. The challenge is to align private sector NSDI goals with public sector NSDI goals to the maximum extent possible. The Spatial Technologies Industry Association is committed to addressing this issue on behalf of its member companies in conjunction with the Federal Geographic Data Committee.

7.0   THE PRIVATE SECTOR AND THE NSDI

7.1   Private Sector Demand for the NSDI

7.1.1 General Demand

Framework data are clearly available for much of the United States. However, differences exist in the resolution, quality, coverage, currency and other characteristics depending on the source of the data. The FGDC sponsored a large investigation of framework status in the United States by funding the National States Geographic Information Council (NSGIC) to conduct a Framework Data Survey, as discussed in a previous section.

The survey was distributed to organizations of all types as determined by designated state government coordinators located in each of the 50 states. Priority was placed on acquiring responses from counties. In total, 5,188 survey responses were received, including from 1,683 of the nation's 3,140 counties. This is the most reliable set of responses from a national standpoint, though the results cannot be compared across the country for these respondents like the others, due to different respondent sampling design and composition, priorities and methods. However, some of the results can be useful, such as the finding that transportation data is the most common theme developed by respondents, followed by governmental units. The results also clearly indicated the use of various data resolutions.   Some of the resultant statistics were:

This Section Addresses

- Private sector demands and uses of NSDI offerings

- Market segmentation model

- Identification of private sector activities that support the NSDI

- What did the private Sector say at the GeoData Policy Forum, Framework Data and Product Development Thread

- A case study of a service to the agriculture community by the private sector

- Of the 5,188 total respondents, 430 or 8% were from "private sector organizations," including utilities (either public or private), non-profit organizations, and for-profit private firms (Gillespie, 2000, 1).

- More than 75% of respondents reported being active in digital geographic data.

- Nearly 60% indicated being active in framework data; most often hydrography and transportation.

Similar to the discussion above about problems with the current seven framework themes, private sector respondents indicated more use of private land ownership

data (as would be in a Multipurpose Cadastre) than any of the framework themes.

While more information and investigation would be desirable about the private sector in terms of framework data and other needs than has been conducted or provided through this survey, anecdotal information indicates that wide spread interest in the NSDI is lacking. This is due, in part, to:

- the conflicted interests of the private vs. the public sectors,
- availability, reliability and other data limitations, and
- Public policy assumptions for private sector participation.

7.1.2 Data Providers

The private sector is not just made up of users. It is also made up of providers. These companies sell software solutions and data content, hardware, and consulting services, etc. Their inclusion to any program fostering increased private sector participation is essential. They bring rich data sets, lists of current and prospective customers, and success stories to the equation.

During our research, we attended many events where private sector data providers were exhibiting their wares. Most of them were excited that the FGDC was focusing on private sector needs and increasing private sector participation. The data providers were surprisingly receptive to data sharing. They felt that there was enough unique or custom content in their offerings to allow them to maintain a competitive edge. If a central storehouse maintained core data to industry standards, they would be able to focus on value-added data, at higher margins.

7.2   Applications

The framework can be used by private and public entities. Different organizations have needs for data with differing resolutions, however:

- Local and regional governments create and use data on a smaller scale, particular to their jurisdictions and regions.

- State governments use less detailed data for their larger regions, usually based on a theme. At times, they need very detailed data as well.

- Federal agencies also use less detail due to broader coverage and focus on specific data themes related to their operations. They do have a need for more detailed data at times.

- In the private sector, some users may be:
  - Utility companies
  - Companies requiring street networks, statistical data on particular areas
  - Firms requiring parcel data for land use studies
  - Companies creating detailed data for sale
  - Companies creating lower resolution data for large areas
  - Providers of hardware, software and other systems developing solutions requiring data
  - Service providers offering system development, database development, operations support and consulting services
- Non-profit and educational institutions also create and use a variety of geographic data and provide GIS-related services.

Within the private sector, participation has been limited even though the need for data has only grown. Many private sector companies have built their own data or purchased it and spent budget dollars improving this data for their own needs.

The user model of the framework has core data and applications data. Core data is used by most and shared by everyone. Applications-specific data is created and used by some participants, depending on their needs. This data is not widely shared and may not conform to Framework standards.

The seven layers of data include:

- Geodetic control – providing a common reference system to establish the coordinate positions for all geographic data.

- Orthoimagery – provides a positionally correct image of the earth prepared from aerial photography or other remote sensing information.

- Elevation – provides information about terrain. Elevation refers to a spatially referenced vertical position above or below a datum surface.

- Transportation – includes the following common features of transportation networks and facilities:
  - Roads
  - Trails

- Railroads
- Waterways
- Airports and ports
- Bridges and tunnels

- Hydrography – for surface water feature such as lakes and ponds, streams and rivers, canals, oceans and shorelines.

- Governmental Units – shows the geographic areas of units of government like the entire nation, states, counties, incorporated areas and consolidated cities, functioning and legal minor civil divisions, Federal or state owned American Indian reservations and Alaska Native regional corporations.

- Cadastral Information – specific to property interests such as surveys, legal descriptions reference systems, and parcel-by-parcel surveys and descriptions.

There are many applications for framework data. When seeking private sector companies as targets for increased participation, many different sectors, applications and industries can be represented as shown in the following list.

- Scientific investigations
- Resource management
- Development planning
- Emergency planning and emergency response
- Environmental changes and management and conservation
- Asset and facilities management
- Decision support systems
- Retail management
- Transportation/logistics
- Real estate
- Finance, banking and insurance
- Health care
- Government

- Defense
- Business process improvement consulting/streamlining work flow processes
- Mapping
- Petroleum exploration and distribution
- Health departments
- Forestry products
- Agriculture
- Utilities
- Higher Education, K-12 education
- Law enforcement and Criminal Justice
- Libraries and museums
- Mining
- Telecommunications
- Waste management
- Customer Relationship Management (CRM)
- Enterprise Resource Planning (ERP)
- Providers of infrastructure
  - Databases, database tools
  - Reporting tools
  - Computer hardware
  - Computer software (more than 2000 providers)
  - Computer networking

Over time, as the list of participants grows, the FGDC will be able to ascertain valuable marketing information about different applications and user/provider groups. This information will allow the FGDC to further target new participants, and spend valuable resources where they can have the most impact on current and future participation.

7.3   Markets

According to a study done by the IDC (International Data Corporation) in 1999, this marketplace is named SIM (Strategic Information Management) and has three distinct segments:

- GIS

- Business support systems

- Personal productivity

According to this study, all three segments have used comparable spatial information handling technology. Where they differ is in the use of data, as one might expect. The use of data suggests different user requirements, distribution methods, data and applications.

The IDC report, states the differences to be:

Segment	Key Requirement	Applications	Characteristic
GIS	Handle geographic information well	Spatial data conversion, analysis, modeling and cartographic display	Companies control their accounts and their customer's attention as well as access to their applications and data through API (application programming interfaces)
Business Support Systems	Ability to add spatial data of their own or from their business alliances to their existing systems and databases	Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Online Analytical Processing (OLAP), data mining, decision support systems (DSS)	Spatial information complements what they do but is not the most important information they manage

Personal Productivity	Assemble and communicate information users need in their daily jobs.	Software office suites, palm devices, hand held devices, GPS systems in automobiles and over the Internet	Information is accessed on demand from applications with very simple user interfaces. Data must be current but the degree of accuracy is not as critical. Rapid access is key.

7.4   Private Sector Activities in Support of the NSDI

The private sector has contributed significantly to the development of the NSDI, however, many of the contributions have not been as a direct result of actions taken by the Federal Geographic Data Committee to advance the National Spatial Data Infrastructure (NDSI).

The Open GIS Consortium has developed, and is developing, interface specifications to enable geospatial interoperability. These specifications provide the details of how software packages can work together in processing geographic (or spatial) information and communicating with one another.

Everything OGC does is in some way aimed at developing and sharing this information. Armed with OGC specifications, software developers can build software products that work together, irrespective of brands, computing systems, and networks.

OGC has developed a consensus process to help members work together to build and approve specifications. This formal process brings concept to reality through the following steps:

- Establish a Special Interest Group (SIG), which defines the needs and potential benefits of a new specification.

- With a clear definition, a Working Group (WG) is created to write a public Request for Proposals (RFP) for an "implementation specification."

- Vendors or teams of vendors submit proposed OpenGIS Implementation Specifications, which are refined and in time, approved.

This process was used to develop some of the first specifications including the Simple Features and Coordinate Transformations (projections) specifications.

The specifications that came from that work created a strong infrastructure for the Interoperability Program (IP). These efforts turned the specification program on its head by working almost backwards. With a particular interoperability problem set down by sponsors, vendors modified existing software to come to a solution. These hands-on engineering environments may yield candidate specifications that move into the Specification Program for approval.

The OGC has used two formats for the IP:

- Test-beds, where the emphasis in on research and development

- Pilots, where existing and candidate specifications are put to the test using real world scenarios and data.

The former are a place to experiment, the latter, a place to kick the tires. The IP has thus far provided a revolutionary way to jumpstart or move the development of specifications along. In the Web Mapping Test-beds and Web Mapping Pilots, willing sponsors and participants were able to satisfy the needs of industry, government and education to bring specifications to light in a matter of months, not years. Competing companies saw the benefit of working hand in hand and "coopetition" became a reality. These methods have been refined and now form a proven way to get work done at a rate that can keep up with technological change.

As a result of these kinds of "rapid development" methodologies, the major database companies, Oracle, IBM, Informix, and Sybase have spatially enabled their database products to accommodate georeferenced data.

7.5 Private Sector Perspectives on the NSDI

The 1999 GeoData Policy Forum – "Making Livable Communities a Reality," was sponsored by the Federal Geographic Data Committee, in collaboration with academic, public and private sector organizations, to further the development of the National Spatial Data Infrastructure.

On the second day of the three day forum, seven concurrent sessions or "threads" explored various aspects of the evolution of the NSDI. One of the "threads" entitled, "Pillars of the Community: Framework Data and Product Development," focused on a series of questions:

- Is the Framework meeting community needs?

- What are the barriers to achieving the vision to develop, maintain, and integrate Framework data within a geographic area?

- How can the private sector contribute to benefit from this effort?

The Framework thread examined, through three working examples, how well the purpose and goals of developing a National Digital Geospatial Data Framework were being met.

The format included a series of case studies that traced spatial data sources to Framework data and provided the material for discussion among a panel of experts assembled to critique the case studies and to enter into a dialogue with the thread attendees. One of these case studies is discussed below.

7.6 VantagePoint Network

One of the case studies described VantagePoint Network, an innovative e-commerce product to support the agriculture sector. Vantage Point Network is an online, field-to-food information-management system for advancing engineering in the agricultural and food industries.

VantagePoint Network is an Internet-based, information-sharing network designed to help subscribers create and capture value in the consumer-driven food chain. The VantagePoint Web site provides information and services that enable farmers to keep crop records; track grain storage and sales; and communicate with their advisors to make sound agronomic, management, and marketing decisions.

As early as 1996, John Deere & Company realized the evolution of agriculture as being a more information-intensive business. Deere, a leader in mechanized agriculture, recognized a paradigm shift to a more knowledge-based industry that would utilize data collected from their technology and precision farming tools. The vision soon included partnerships with GROWMARK Inc. and Farmland Industries, providing the retail cooperatives a broader data management tool, and leveraging the existing producer relationships on a local level for the implementation of such Internet technology.

From these partners emerged the VantagePoint Network®, LLC, organized as a partnership on July 28, 1999. VantagePoint was envisioned as a fully Web-enabled channel for information and communication exchange for professional retailers, farm managers, and consultants to extend their services online to their customers. The Online network has since expanded to include all corporate participants throughout the agricultural value chain, enabling information sharing

from input manufacturers through producers, and ultimately, to food/fiber processors.

Trends in the food and agriculture industries demand that agriculture producers keep comprehensive records, including seed varieties, tillage practices, and chemical applications. By keeping production agricultural information in an easily navigable network, producers can share precise data with commodity buyers and other end-customers desiring specific traits or growing conditions. This information, in addition to the crop itself, adds value to the farmer's business operation.

The VantagePoint Network has assembled a team of partners to support the agricultural client fielding a "producer and team" comprised of virtual resources like insurance agents, lenders, landlords, government agents, marketing experts, crop experts and dealers.
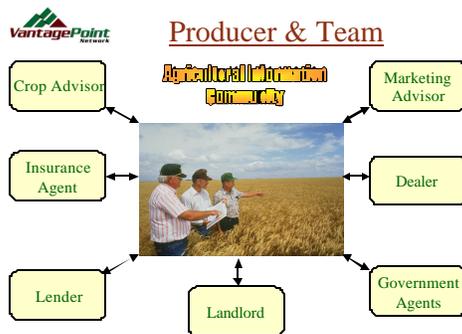
Once the VantagePoint customer is registered, he can make accurate geo-referenced maps of farms and fields, maintain a crop's identity from the seed to sale, keep track of all planting, fertilizing, tillage, crop protection and harvest activities on the field level. He can also maintain farm management reports, document seed and chemical use, generate profitability reports, determine costs per acre or per bushel, and perform break-even analyses.

The VantagePoint Network is a low-cost, easy-to-use information system serving agriculture and the farming community. Traditional record keeping and data management can be accomplished more efficiently, more effectively, and faster than ever before. Farmers and their professional advisers can harvest valuable insights for farm management decisions by using VantagePoint Network, a fully-secured cyberspace storage bin for the vast amount of data generated by their own individual production operations.

The VantagePoint Web site offers weather reports, as well as, easy access to current market reports, both U.S. and foreign. Agricultural news is provided as well as chat rooms and discussion groups to discuss ideas and find out what other people are thinking.   A sophisticated search engine helps find agricultural information on the Web. Reference material on crop protection products help insure proper use and application of farm chemicals.

VantagePoint offers services that include a complete online crop management

system with grain-storage and sales-tracking capability.   VantagePoint enables the creation of field maps and a wide variety of management reports.

As a base, NSDI Framework and other data, as illustrated below, is used to support the VantagePoint service.   Some of the data is developed specifically from the client's farm operation, and some is available from the public domain. By integrating various data sets into a deliverable product, VantagePoint has developed a "total product" designed to meet the needs of the farming community. Further, the product is supported by the VantagePoint team to ensure that the client has access 24 hours per day, 7 days per week, and 365 days per year.

The VantagePoint Product includes four basic components:

- Current information including current commodity market data, news, and weather

- Reference information from the public domain including DOQQ, SSURGO, TIGER, PLSS, and Landsat TM, and Library reference information on seeds, crop protection, equipment and pests

- A web search engine

- e-mail capability.

Farming is Geospatial

Farms/Fields
Soil Tests
Inputs
Yield
Elevation
Soils
PLSS
Transportation
Hydrography
Orthophotography
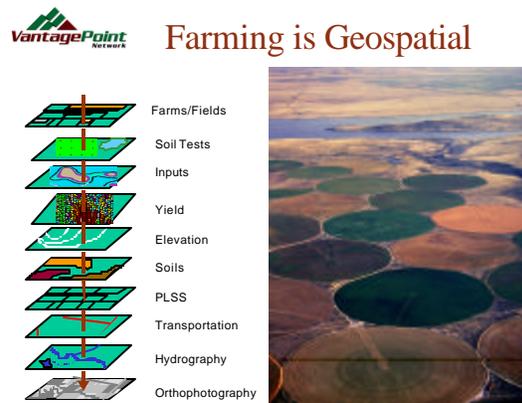
VantagePoint has incorporated digital orthoquads with soils information from the Natural Resources Conservation Service (NRCS). VantagePoint Network's use of these public domain mapping products illustrates a value added product developed and marketed to the agricultural community.

The integration of spatial data into a total agricultural community information product, delivered to the customer over the Internet using World Wide Web technology, illustrates one application that is contributing to that nation's gross domestic product. The need for a "national" spatial data infrastructure is essential to effectively managing and sustaining the U.S. economy in global markets. Achieving the proper "private/public sector" relationships to take full advantage of the U.S. investment in "spatial data" demands new thinking and a review of the federal governments role.

7.7 The Geography Network

The Geography Network is a virtual global network established by and for data providers with the sole purpose of making geographic content more readily available to its visitors. They believe that better data will help companies and individuals make better decisions. The Geography Network provides the exchange infrastructure and data providers, service providers and users provide the content. The site can be found at www.geographynetwork.com

This includes access to digital maps that are free and others that are fee-based from leading map publishers. They also offer a forum where members can exchange their own maps.

Similarly, free or fee-based data resources are available, as well as, a clearinghouse to find and download other data.

The Geography Network is also a forum for services providers to make known their expertise with respect to the use of data. Similarly, knowledge about custom built solutions is also available on the site. They also facilitate the publishing of applications.

ESRI, Inc. and the National Geographic Society are sponsoring a Geography Network Challenge on the site to increase awareness of the site.

The challenge has several categories:

- Government
- Data Sharing
- Education
- Citizen involvement
- Application or GIS solutions on the Web
- Conservation
- Science

The contest will be judged based upon creativity, user interface, documentation and performance.

This site is an excellent example of how private sector providers and users can come together to share information, while also promoting the commerce of provider wares.

8.0 PRIVATE SECTOR ISSUES WITH NSDI AND GENERAL FEDERAL APPROACH

8.1 General NSDI Issues

It is well recognized today that the use of GIS and related technology has expanded to many sectors of society, spanning virtually every function in government and private industry.

For example, the NAPA study, described earlier in this report, concluded that "geographic information (GI) plays a role in about one-half of the economic activities of the United States. Such major economic and industrial sectors as agriculture, transportation, defense, land management, community development, construction, and real estate are dependent, to some degree, on GI," (from NAPA, 1998, p. 11). The market studies and projections described in this report document the penetration of GIS and related technology in the private sector. In addition, these studies are clearly unable to fully document the plethora of mapping applications now available on personal computers and, more recently, through Web-enabled spatial data and mapping tools. Companies of all sizes and missions increasingly utilize these capabilities.

From anecdotal reports, it is believed that private companies may be totally unaware of the term "National Spatial Data Infrastructure" (NSDI). They often initially acquire data and software from another company in the private sector that may or may not provide information about the NSDI. This can be the case with either small or even very large companies, such as utilities, manufacturers, and resource extraction companies. Private sector introduction to the NSDI is often by accident rather than design.

This Section Addresses

- Private sector issues with the NSDI

- Summarizes identified issues

- Identifies drivers to participation

Even if a company decides to contact a government agency directly for data to use with GIS, it may or may not learn about the NSDI as part of this process. This situation exists because various government organizations that are data sources are not necessarily aware of, or a part of, the "NSDI community," particularly local governments or field offices of state and Federal agencies, which many companies contact to acquire data.

For the most part, active NSDI participants seem to primarily be governmental organizations in a spatial data coordination role, such as the FGDC and state government counterparts. There are some positive and noteworthy exceptions in other organizations that also actively participate in the NSDI, for example, by

serving as "clearinghouse nodes," but there are numerous others that are not aware or involved.

8.1.1 Limited Information Availability

Is the NSDI a "product" or a "movement?" If a company does hear of the NSDI, it is usually associated with one of its offerings, such as the clearinghouse or use of the metadata standard. As a result, a company may consider NSDI to be a "product." However, the term "national spatial data infrastructure" originated in the work of the Mapping Sciences Committee (MSC) of the National Academy of Sciences and the Federal Geographic Data Committee during the early 1990s as a vision for a broader system or infrastructure for data sharing and coordination. For example, in a 1993 report the MSC concluded,

> "There is a NSDI in existence. It is an ad hoc affair, because, until very recently, no one has conceived of it or defined it as a coherent entity, and indeed it has not been very coherent or coordinated. It is not the task of the MSC (or anyone else for that matter) to create a NSDI. We want merely to point out its existence, identify its components and characteristics, assess the efficiency and effectiveness with which it functions to meet national needs, (particularly at the Federal level), and make recommendations that might make it more useful, more economical, more effective, better coordinated, and robust. . . .Information flow, particularly in the spatial data infrastructure, should be seen as critical to the maintenance of a competitive position for the United States in an increasingly international economic arena (MSC, 1993, 17)."

This vision clearly suggests that the notion of the NSDI was originally conceived to have value to help increase the efficiency and effectiveness of both the public and private sectors. The MSC broadly defined NSDI-building blocks as "users, policies and procedures, institutional support, people, geographic information, and materials and technology" (MSC, 1993, 16). The FGDC established various programs to address the issues raised at that time. These issues continue today. However, until recently, these initiatives have primarily focused on data issues. For example, as discussed in this report, primary areas of effort have included the establishment of standards, metadata, foundational data known as a "Framework," and a clearinghouse. This focus on data matters may, in part, have caused some confusion about the definition of the NSDI as a movement or a product.

However, significant progress has been made by the FGDC to include other sectors in its deliberations during the last decade, particularly state and local governments. Release of the NAPA study in 1998, and subsequent positive support for several of its policy and institutional recommendations by FGDC Chair and Interior Secretary Bruce Babbitt (as expressed at the June 9, 1999

Congressional hearing described above), seems to have led to increased action by the FGDC to also address non-data components identified in the early vision of the NSDI.

The NAPA report, though five years after the MSC study, identified several problems with the current NSDI approach elaborating on those identified by the MSC, such as:

- excessive overlap and duplication of data, and
- lack of policy direction, oversight and accountability.

In 1999, the FGDC began two efforts to address non-data NSDI issues, including a GeoData Alliance Organizational Initiative and an organizational study to improve internal FGDC effectiveness. These efforts suggest a need to reexamine the notion and requirements to effectuate the NSDI in the 21st Century. This includes a reexamination from a private sector perspective to clarify its mission, goals, objectives and implementation plans in this regard.

8.1.2 Supply and Demand for the NSDI in the Private Sector

As discussed above, the FGDC has largely focused efforts on its suite of data-related offerings to achieve several public sector goals, including supplying data for widespread use. However, a limited focus has been placed on understanding and meeting the demand for data by the public or private sector. For example, the NAPA study identifies several sectors of society and the data requirements needed for each. However, the specific characteristics, requirements, and priorities for these data products and commercial offerings have not been investigated from a demand perspective by the FGDC or otherwise.

This situation has been an issue from both public and private sector perspectives. For example, while efforts have been made to make contact with individual states, and state and local associations working at the national level, very little effort has been made to fully understand the functionality of state and local governments.

A focus on developing and providing access to highly available sources of basic geographic data is certainly an important goal in its own right and can go a long way to address the plethora of redundant data developed in the United States. However, the need remains to understand user needs and requirements to ensure resulting data are used and useful. This focus is essential to achieve the required "buy-in" of any potential user group, and particularly the private sector.

It is even more necessary because the notion of the NSDI includes it be a robust system, including access to current and actively maintained data. Accordingly,

initial investigation of demand must be complemented with a continuing process and relationship with the private sector to ensure supply meets demand on a long-term basis. An understanding of private sector demand can be used to determine the specific characteristics, requirements, and priorities for data products and commercial offerings.

8.1.3 Issues With Policy Direction, Authority, Oversight and Accountability

Much of the NAPA study reviews the issues surrounding the difficulty of establishing the NSDI given the policy and institutional foundation with which it operates. Remarkable progress has been made, but the fact that there is an overall lack of policy direction, authority, oversight and accountability for the FGDC and the NSDI does pose problems in the Federal government in particular, but also in other governments and the private sector. For example, NAPA researchers found (NAPA, 1998, 30, 67,73):

- No efforts have been made to estimate NSDI costs and benefits.

- Each Federal agency has its own set of goals and strategies, only some of which are tied to NSDI policies and programs.

- No national debate has occurred on the merits and challenges of furthering an NSDI, and knowledge of and support for the effort is not widespread.

- Some important scientific and technological challenges have not been surmounted.

- There are significant impediments to and few incentives for the generating of compatible data among government organizations.

- Neither the FGDC, nor any other central body, can require any two or more agencies to work together, much less consolidate or reconcile data activities.

- Federal agencies sometimes ignore requirements to follow FGDC standards.

- No entity is responsible or accountable for defining roles for the NSDI.

These limitations can have a direct impact on the non-Federal spatial data community, because it impacts the overall reliability of the FGDC and NSDI offerings. Regardless of the content or quality of what is offered, potential users can be understandably cautious about relying on a system or data source if important questions exist about whether these offerings will be funded and maintained in the long term. NAPA made several recommendations to address this issue, including the adoption of legislation to create an effective policy base

for the NSDI, cross cutting investigations and increasing attention by central government organizations such as the Office of Management and Budget, and stronger linkages with the broader information policy arena at policy and technical levels.

NAPA also recommended establishment of a National Spatial Data Council to be comprised of representatives of several sectors to help guide the NSDI, including the private sector. It also was recommended that this effort be complemented with the establishment of a Geographic Data Service, within the Federal government, to serve as a locus of activity and to conduct several functions beyond those conducted by the FGDC secretariat. Some of these functions include developing (or sponsoring the development of) synchronized data products and ensuring effective data integration across several data categories. If implemented, these recommendations could help to make the Federal government easier and more reliable for the private sector and broader spatial data community to work with.

8.1.4 Justifying NSDI in the Market Place

While the NAPA study and the market studies reviewed previously clearly indicate that large segments of the U.S. economy depend on spatial data and use GIS and related technology, most FGDC efforts have been on the public sector. The relevance of the NSDI in the market place has not been defined or articulated, nor has the private sector been defined, addressed or solicited to be an important participant in the NSDI.

The lack of clear NSDI definition, mission, and participation requirements and benefits is exemplified in the private sector. While the public sector may adopt and endorse initiatives such as the NSDI that are in the "public good," this attribute does not have a corresponding importance or meaning in the private sector. In addition to the general lack of clarity about the NSDI, its requirements, costs and benefits, a specific business case has not been articulated and made to the private sector to solicit their interest or participation in the NSDI. Such a case is necessary to be brought before corporate decision makers before a decision could be made to endorse an initiative such as the NSDI. This business case must include specific hard costs and other required resources, time requirements and long-term obligations. At the same time, projected benefits need to be defined from both short and long term perspectives. The business case also should define a projected Return on Investment (ROI), including a direct positive impact on the bottom line and corporate profits.   Corporations will also be concerned with protecting their proprietary interests and intellectual property.

To attract interest by, and ultimately, the participation of the private sector, the NSDI needs to be packaged in terms the private sector can understand and

clearly see how they will benefit. Given the NSDI can be a long term commitment, while the objective of corporate profits may be short term, it also would help to provide awareness and educational campaigns about long term benefits. Materials could be targeted and customized for specific industries. Evidence of benefits could be publicized by existing participant-companies to help enlist the participation of other companies. Additional justification, and particularly, incentives, could be provided to the private sector to solicit and maintain their interest and participation.

8.2 Framework Data Purposes Not Well Understood

The "Framework" is one of the FGDC's and the NSDI's leading offerings. Broadly defined by the FGDC and others involved in its design, the Framework is the concept of providing a means to maintain and manage the common information being collected by and for use by the public and private sectors to decrease the costs and inefficiency within individual organizations. In short, the Framework is a continually evolving data resource which,

> ". . . forms the data backbone of the NSDI. It has three aspects: data, procedures and technology for building and using the data, and institutional relationships and business practices that support the environment. The Framework is designed to facilitate production and use of geographic data, to reduce operating costs, and to improve service and decision-making (Somers, 1997, v)."

The Framework has been defined to include seven foundational data themes. These themes provide basic data for use with applications, a base to which users can add or attach geographic details and attributes, a reference source for accurately registering and compiling participants' data, and a reference map for displaying the locations and the results of an analysis of other data. The notion is that Framework data are created and maintained by several organizations, with many contributors from different areas and for various data themes.

While the merits of the Framework are generally accepted by those aware of them, some questions have been raised about the Framework. Questions are still asked about what it is and is not. For example, of the FGDC's offerings, the term "Framework" is the only one without a clearly recognized definition. Alternatively, the terms "clearinghouse," "metadata" and "standards" are clearly understood in the information economy. "Framework" includes the concept of creating and providing access to "foundational" data (the term, in fact, used in the U.S. Department of Defense for analogous activities), but with a broader focus. This broader focus is understandable to help encourage multi-organizational development of common data in the absence of the policy and authority for one entity responsible for accomplishing this objective as described earlier.

However, there are other issues and misconceptions about what the Framework actually is, what it specifically and reliably provides, and what it is not, resulting in several associated topics that do not receive complete attention. For example, there are several issues surrounding data integration and reconciliation:

- Data can be developed by different organizations at different resolutions, resulting in much redundant, but also conflicting, data.

- There is no "authority" to determine which data are accurate or "official."

- Though documentation is provided, it is largely "buyer beware" in terms of what is available.

As a result, many disagreements exist, particularly between agencies and levels of government, as to what data is "the" data representing reality. For example, transportation data are developed by both the U.S. Department of Transportation and its partners, and the U.S. Bureau of the Census and its partners, without reconciliation. The U.S. Geological Survey is building a National Hydro Dataset (NHD), yet correlation of and integration with state-based databases has been trying at best with many associated differences. Much additional data is envisioned to be available through the Framework than through these national level efforts. However, there is no assurance all data are available through this mechanism. As it is well recognized, many local governments and private companies have and will continue to have data not included in the Framework.

Private sector companies could discount the usefulness of their participation in the NSDI on this issue alone. Accuracy of data is critical to organizations in terms of profitability, customer satisfaction, and the limitation of liability.

Issues also have been raised about the definition of the Framework as the seven layers to date. The FGDC, to its credit, included representatives of various non-Federal groups to participate in defining the Framework. Yet, several interested potential participants were not well included, such as local governments and the private sector. In fact, one of the NAPA study recommendations was to "reexamine the FGDC Framework layers in the context of state and local geographic information needs as well as Federal needs (NAPA, 1998, 97)." Questions need to be asked about which data is necessary for which needs, and whether the currently defined Framework data are appropriate to meet common needs, again affirming the need for investigation about demand as well as the strong focus on supply as previously discussed.

For example, if the Framework were defined from a local perspective, and particularly a municipal one, rights of way and addresses would certainly be key foundational data elements. This is appropriate from a local perspective because most local government functions are in direct service to the public, whether it be

utilities, police, fire, or other services, causing demand for highly accurate, current and transactional data.

Moreover, there is no clarity about the definition of the seven data layers. For example, two aspects of cadastral information are included in the Framework. These include cadastral reference systems and publicly administered parcels. This later focus on public real estate is understandable for the Federal and some state governments. However, to local governments and many businesses, information about private land is more crucial in terms of service delivery, and for localities in particular, revenue generation. In fact, the notion of a parcel-based multipurpose information foundation for the country has been advocated during recent decades; most commonly referred to as the Multipurpose Cadastre. Again, advocacy of this notion is based on societal demand for such common data, which seems to be increasing through time.

8.3 Identifiable Issues and Limitations About Data

In addition to the issues discussed above about the current definition and approach to the Framework, there are various identifiable issues and limitations about data in general as it relates to the NSDI. Some of these issues are reviewed below.

8.3.1 Data Content

In order to be useful to a targeted audience, whether it be the private sector or any organization, data content must meet user needs and requirements. The overall quality of the data is an important consideration of whether the data will be of interest and utilized. Important issues include:

- The appropriate <u>resolution</u> to meet user needs, such as Digital Ortho Photos are typically sufficient for planning but not for engineering.

- Data <u>currency,</u> and <u>timeliness</u> and frequency of data updates can be critical, for example in responding to a disaster.

- Data updating methods and tracking are also important for certain users, for example, concerning transactional-based systems.

- <u>Accuracy</u> is another key consideration to help a user determine whether or not to rely on data resources.

- Quality control and accuracy procedures need to be documented to assure users of the reliability of data.

- An important question asked by users is whether the provided data are the best available digital product compared to other data resources? "Truth in

labeling" would suggest information should be provided if other data are available elsewhere.

- Users also require consistent, reliable data with the same quality from place to place, and coverage for all areas of interest.

- A key issue is whether data with these same specifications will be available and supported over time?

8.3.2 Data Access and Use

Data access issues are becoming a leading concern regarding the NSDI. Technical issues include whether, and the degree to which, data are easy and quick to view, understand and use, including if the data are designed and accessible in a "user-friendly" way or are cumbersome and complex. Sufficient query, searching, notification, and investigation tools are needed, as well as, the use of standard formats and customized packaging for specific industries or types of users. It is clear that if data are difficult to use, there will be less interest, and ultimate use of data.

Additional access issues are primarily in a legal context, governed by both Federal and state laws, with state law generally having precedence in most cases regarding state and local data. There are several examples of how state laws and conditions can differ from state to state, and in comparison with that of the Federal government, with direct impact on data access through the NSDI and, in particular, on the private sector.

For example, all 50 states have one or more statutory provisions regarding public access to data; known as "freedom of information acts" (FOIA) similar to the Federal government, or open or public records acts. FOIA statutes are often not the sole determinant of whether documents are subject to public disclosure. All states have some statutory provisions to protect privacy, confidentiality or otherwise limit access to certain information. These provisions often take the form of exemptions to disclosure requirements; however, in many states, specific laws exist for these matters. For example, in addition to a FOIA and Public Records Act, Virginia has a Privacy Act and an Intellectual Property Act. The most common exemptions to disclosure requirements are for:

- Information classified as confidential by state or Federal law

- Law enforcement and investigatory information

- Trade secrets and commercial information

- Preliminary departmental memoranda

- Personal privacy information

- Information relating to litigation against a public body, (Dillehay, 1996, 11).

An important issue related to private sector data access, reflected in many state statutes, is the source and/or motive of information requests, such as whether they are being made by private citizens or by companies or others for commercial purposes. The rationale for the distinction between commercial and non-commercial purposes is that commercial requestors can derive significant monetary benefit from enhanced access, and thus, they should reimburse the public for the money spent on these enhancements. At least eleven states allow agencies to make the distinction between commercial and non-commercial requests (May 1997). Specific issues serving to impact and often limit data access are discussed below.

8.3.2.1 Intellectual Property

Copyrights, patents, and trademarks are increasingly used to protect data rights. The statutes of at least eight states enable some limitations to occur on access to government data that is specifically used with GIS, either as an exemption to the open records act or by otherwise allowing agencies to charge higher fees than for other data. The methodology used to determine these fees is usually not specified by statutes and varies by state. States generally call for fees to be based on recovery of some or all costs, or provide that public authorities are allowed to establish "reasonable" fees, though essentially no guidance is provided about how "reasonableness" is determined.

In some cases, there has been a differentiation between commercial and other users. For example, Tennessee and Kentucky allow agencies to set "reasonable" GIS access fees, but these fees can only be higher for GIS as compared to other data if requested by a commercial concern. North Carolina specifies that GIS databases are public records and access shall be provided by public access terminals or other output devices. Copies in North Carolina shall be provided at reasonable cost, but requestors must agree in writing that the copy will not be resold or otherwise used for trade or commercial purposes (May 1996).

Many state GIS organizations charge some modest fees to recover at least their distribution costs, sometimes to support some operations and maintenance costs, and infrequently to help fund data development costs. For example, Maryland's Department of Natural Resources, which copyrights their data and requires purchasers to sign a license agreement, charges $65 for production of a CD, including the average actual labor time and benefits but not any expenses for data development or maintenance. An important factor is whether the receipts can be retained by the organization providing the data, or whether the money goes to the state general fund as in some cases.

All in all, the desire to recoup costs by charging fees is balanced in most jurisdictions with a desire to encourage GIS use by public agencies, and particularly local governments. Whatever statutory limitations might exist for data within a GIS, state and local data are generally available if the requestor is willing to pay the associated fees of that jurisdiction.

However, open records laws do not apply to privately held utilities though they provide public services, many of which have treated their data as copyrighted. In addition to utilities, some architects, engineers and surveyors are attempting to copyright their work, which can limit public review and scrutiny of their work as well as compromise data availability in the event of an emergency. This situation and approach has caused problems in emergency response and recovery, particularly regarding utilities, and is anticipated to cause increasing problems in the future regarding data access.

For example, Metropolitan Dade County, Florida entered into a $3 million agreement with Florida Power & Light to synthesize data from various departments for its GIS. The agreement provided for the county to turn its records over to the utility company, which in turn, produced a digital compilation of the geographic data. Under the agreement, FL&P retained the copyright. While a member of the public could obtain a copy of the data in its original form from the individual county agencies, copies of the more valuable copyrighted digital compilation were only available from FP&L.

Work was just beginning when Hurricane Andrew occurred. The Florida Department of Natural Resources needed the database owned by FL&P to help in the relief effort, but FL&P wanted the state to sign a license agreement before it would release the data. Despite the urgency of the situation and differing views of the state and the utility, it took three months to negotiate arrangements. FL&P ultimately released the database with strict limitations on DNR's use of the data. It is likely that this situation has existed elsewhere or is likely to do so, with probable costly consequences.

Use of data licensing is a growing trend to address several data access issues in local governments and the private sector, as in the above FL&P example, but new issues are raised in this case. It is clearly used by some utilities and local governments regarding GIS, but also related geographic data. For example, the National Weather Service has almost real time radar data about wind velocity generated every five minutes. However, when Cayuga County, New York was responding to the Labor Day windstorm of 1998, it found these data are typically licensed to companies and may require use of their software. Local governments can't necessarily get quick access to such data during a disaster with these arrangements. When the county did access the radar data, it found it to be extremely useful because the areas with the strongest winds synchronized

exactly to the location of 911 calls, allowing responders to quickly and more efficiently plan and deploy resources than if the data had not been available.

8.3.2.2 Confidentiality

State (and Federal) law provides that information can be withheld if it is considered confidential, and particularly if used in litigation. For example, information about the extent of damage from oil spills can be held confidential in order to simultaneously preserve a legal case against the perpetrator of the damage and prevent third parties from using the data in litigation against state (and Federal) governments. The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and regulations promulgated by the Department of Interior and the Environmental Protection Agency, directly designated state and Federal agencies to design and execute natural resource damage assessment (NRDA) studies. The NRDA regulations emphasize coordination of research to avoid duplication and even encourage the sharing of information with potentially responsible parties.

However, in the case of the Exxon Valdez Oil Spill in 1989, the NRDA studies were held confidential in favor of legal interests, were not made available to the response teams, and thus detracted from the larger goal of evaluating environmental damage and restoring injured resources. Confidentiality of these data also has a negative effect on nongovernmental parties in that they cannot use the information to pursue their claims, such as the fisherman and Native Alaskans in the case of the Exxon Valdez spill (Cummings 1992).

8.3.2.3 "Trade Secrets"

Another exemption to the open records laws limiting access to data is "trade secrets" or comparable business information. More than 30 states have specific statutory language prohibiting the disclosure of "trade secrets" or comparable business information, such as formulas and customer lists provided to a government agency as part of an application or proposal. However, there are exemptions to such prohibitions providing for disclosure of information.

A key example of such an exemption is the Federal Emergency Planning and Community Right-to-Know Act (EPCRA), a freestanding act constituting Title III of the Superfund Amendments and Reauthorization Act (SARA). It mandates companies disclose information about the release of hazardous materials into the environment in order for stakeholders to have access to information to help prepare for chemical emergencies, but also to prevent them.

8.3.2.4 Privacy

Privacy protection is usually provided by states in the form of exemptions to open records laws, in fact it is the most commonly occurring exception to open records laws. However, as of 1996, 21 states have specific privacy laws (Dillehay, 1996). Privacy exemptions in state open records laws usually are similar to the Federal FOIA. Privacy protection is typically provided for police and criminal proceedings records of an acquitted defendant, inmate prison records, identities of welfare recipients, reports filed by employers with state industrial commissions and medical records. Federal law requires states to restrict access to personal information in motor vehicle records.

While distinctions between commercial and noncommercial uses have limited data access in some states, such differences have also been used to protect privacy. In some states, agencies can refuse requests for lists of names, addresses, driver's licenses or other personal information if sought for a commercial purpose. However, with the exception of criminal and medical information, there is little guidance in most states about specifically what information is "private," so there is "uneven and inconsistent release of data" (Dillehay, 1996, p. 12). In any case, the rule of thumb is that privacy is paramount, except when a higher purpose is involved. Privacy interests have been waived in only a few narrowly defined cases in some states, such as to establish and collect child, spousal and medical support.

8.3.2.5 Liability

Many liability questions have not been addressed in legislation or in the courts. Organizations can be found liable for many aspects of data collection, data repackaging and distribution, data manipulation and analysis, and data usage in decision-making. Potentially libelous activities include use of inaccurate data, use of incorrect or incomplete information, or misuse of output from automated systems such as GIS. Attention can focus on the data itself, the individual charged with collecting or otherwise using the data, the software or technology employed in a specific case, or some combination of these factors.

Liability is a growing concern, particularly as data are "blown up," aggregated or combined with otherwise disparate data. Information represented on a map often does not represent reality at a large scale if it was created at a less accurate, smaller scale, as is often the case when originating with state and Federal agencies. Most state and local governments include disclaimer language on or with any products created using GIS in an attempt to minimize liability.

The use of access fees is sometimes considered as serving to increase liability in some cases. Among the most obvious liability cases are those in which inaccurate data essentially causes an accident, such as when a utility line is broken because utility company officials did not acknowledge a line was in the location where it was broken. Liability also is one of the biggest problems

resulting from the inadequate information typically portrayed on the floodplain maps used in the National Flood Insurance Program (NFIP). These maps are often the objects of liability claims because they are often inaccurate or out of date.

Another example is when an area may look appropriate for development and not appear at risk for example from an earthquake, but in reality this may be a real concern and development should not be permitted on this site. If an event were to occur in such a case, one of the map producers or governments might be found liable.

8.3.2.6 Security

This is a growing issue as dependence on information technology increases through time and risks from potential harm through the Internet or terrorist attacks increase. Various approaches are being adopted and recommended, though there appears to be little specific attention to security in state statutes as relates to information access.

8.4   Recent or Potential Enablers of Private Sector Participation

While these issues are increasingly important concerning the NSDI and data access, there are several options and opportunities with which to stimulate interest and encourage data access and use. These can be targeted for specific Framework themes, and/or for specific target markets. Framework themes, however they are defined, can be customized and presented in terms understandable to and designed for target markets. These themes must first be defined by user application, and then by class of user, to include clear explanations of data cost, quality, coverage, resolution, service and benefits.

A particularly important issue is the need for data integration and packaging for channel partners and business partners. Some examples exist of how official direction has been provided by government so data can be packaged and disseminated for specific user requirements.

One of the strongest authorizations for data access is the Federal Emergency Planning and Community Right-to-Know Act (EPCRA), a freestanding act that constitutes Title III of the Superfund Amendments and Reauthorization Act (SARA). It mandates companies disclose information about the release of hazardous materials into the environment in order for stakeholders to have access to information to help prepare for and prevent chemical emergencies. Required information under EPCRA includes details about a company's emergency and hazardous chemical inventory and Material Safety Data Sheets identifying the substances used, their hazardous and physical characteristics, health hazards they pose, and procedures for controlling spills or leaks.

Businesses must file this information with state and local emergency management agencies.

EPCRA also established a toxic release reporting system known as the Toxic Release Inventory (TRI). Companies must report the previous year's releases of each covered toxic chemical into the environment by medium – air, water, land, underground injection or transfer to another facility. State and Federal officials compile this TRI information. Annual compilations are available for most states, and nationally by the EPA and the National Institutes of Health, both of which maintain on-line databases. There are some caveats with TRI because health risks caused by listed emissions are not provided, quantities are often estimated, and changes are difficult to understand from year to year because the relationship between the reported quantity and the volume of production is not indicated. However, the data have been creatively used in many jurisdictions (including with GIS) to reveal potential problems to target and address "hot spots" warranting special attention rather than just responding to complaints. It has also served to reduce risk and prevent pollution and accidents, while fostering some social equity in environmental and emergency planning (Schwab, 1993).

One Call Utility Notification Centers are another example of information packaging authorized by government, in this case now mandated by legislation in each of the 50 states. Typically operating as non-profit organizations, the centers provide an institutional mechanism and information clearinghouse by which excavators must "call before you dig" on public or private land. These statutes also require utility companies to respond to contact by the center and locate lines within a proposed work area within a reasonable time before excavation begins. Moreover, state courts have found utility companies to be liable for damages for their negligence if they do not accurately locate their lines.

A third example is the HAZUS system developed by the U.S. Federal Emergency Management Agency and the National Institute of Building Standards (NIBS). HAZUS is a PC-based, GIS software system and data package including a standardized loss estimation methodology for earthquakes. Private companies using the system can realize several benefits. For example, businesses would be able to understand their potential risk of damage in the event of an earthquake and prepare accordingly with advance contracts with evacuation services, and understand whether their suppliers, and they in turn, are at risk if such an event occurs. While this system and data are offered for free, few businesses have taken advantage of this offering, largely because they are unaware of it, similar to the NSDI.

E-commerce offers additional new opportunities for the NSDI and the private sector. Society is experiencing increasing use and dependence on the Internet and other electronic media to deliver information. For example, more and more

states are legislatively authorizing "enhanced access," such as remote or on-line access to electronic records.

For example, nine states enacted legislation in 1997 enhancing public access to government information (Jackson, 1998). It has been argued such access adds value to the requested record and provides increased convenience to the requestor. A growing number of states have used the provision of enhanced access to permit access fees. Enhanced access provisions in a public records statute allow an agency to charge a fee for the convenience of transmitting information from the agency's modem to the requester's modem. While these options are being developed at the state level for other data, they pose opportunities for the NSDI and the dissemination of spatial data.

8.5 Summary of Issues

This sub-section lists a synopsis of the issues specified in Section 8.0:

Sub-Section	Issue
8.1.1	Lack of local government and private sector awareness of the FGDC or the NSDI
8.1.2	The NSDI does not have a private sector focus in any of its offerings due to the relatively low inclusion of the private sector in the planning for the NSDI.
8.1.3	Lack of policy direction, authority, and accountability of the FGDC or NSDI makes private sector firms hesitant about the long-term viability of the FGDC or NSDI.
8.1.3	The same issue above creates a situation where there is little synchronization amongst data sets.
8.1.4	Lack of understanding about the drivers for private sector participation like revenue, profits, time to market, liability protection and intellectual property protection.
8.2	Confusion about the purpose of the Framework and whether it serves the interests of private sector companies.
8.2	The Framework has no authority to determine which data is the official or accurate version.
8.2	There is a great deal of redundant data in the Framework because different groups create data at different resolutions.
8.2	Data accuracy is very important to private sector companies because of customer satisfaction, liability and revenue issues.
8.2.1	The following issues about NSDI data must be resolved from the private sector's perspective: resolution, currency, timeliness, and accuracy.
8.2.2	Tools must be employed to make the design and accessibility of data more "user friendly."
8.2.2	Federal, state and local laws relative to freedom of information, privacy, disclosure, and intellectual property can hamper data sharing, especially when companies consider their information part of the assets

	or worth of their companies.
8.2.2.1	Fees and licensing for data are difficult to determine in the public sector and will be even more difficult to determine in the private sector where liability issues loom for data that is inaccurate or not used properly.
8.2.2.2	State and Federal law provides that information can be withheld if considered confidential, particularly if used in litigation.
8.2.2.3	More than 30 states have statutory language prohibiting the disclosure of trade secrets or comparable business information.
8.2.2.4	Some 21 states have specific privacy laws but there is little guidance about what is private.
8.2.2.5	Organizations can be found liable for many aspects of data collection, data repackaging and distribution, data manipulation and analysis, and data usage.

8.6 Summary of Recent or Potential Enablers of Private Sector Participation

This sub-section lists a synopsis of the drivers for participation specified in Section 8.0:

Sub-Section	Driver
8.2.3	Define themes by user application, class of user, with respect to the private sector.
8.2.3	Package data for vertical market segments and private sector channel partners that specialize in market niches.
8.2.3	Certain Federal statutes may be models for data sharing like the statue that required companies to report hazardous materials in the case of emergencies.
8.2.3	Call Utility Notification Centers are mandated by legislation and authorized by government to act as a clearinghouse for the location of utility lines. This can serve as an example of other such clearinghouses to be established in the future.
8.2.3	HAZUS is a free package developed by FEMA that is available for business use but is not widely used.
8.2.3	e-commerce and other new access methods can help to remedy data issues in the private sector. Nine states have legislation enhancing public access to government information.

9.0   DEFINING THE MARKET ENVIRONMENT IN THE 21ST CENTURY

9.1   Evolution of the e-Business Market Model

One of our tasks in this Phase I Report, to address the issue of building private sector awareness and participation in the NSDI effort, is to explore the marketing of the NSDI. After identifying the drivers of participation and usage of the NSDI, we can begin to focus on the processes and programs to support increased private sector participation in the NSDI. One of these programs will be how to market the NSDI to the private sector.

There are a number of elements that are critical to success in the "marketplace." Marketplaces are dynamic and with the commercialization of the Internet and the speed with which technology changes, markets and channels of distribution are transforming themselves in "Internet time." The product, and understanding the "whole product', is important to positioning in the marketplace.

One key to successful marketing is adequate financing for marketing activities. Financing and mechanisms to provide capital for investment in infrastructure, be it bricks and mortar or information, must be considered. The FGDC has addressed financing of the NSDI in the recent report by Urban Logic, Inc., "Financing the NSDI: National Spatial Data Infrastructure – Aligning Federal and Non-Federal Investment in Spatial Data, Decision Support and Information Resources."

This Section Addresses

- E-Business Market Model

- Market and channel segmentation – differentiating between different markets and ways to reach those markets

- Market trends from several market studies

Mr. Bruce Cahan, in his insightful work, "Financing the Spatial Data Infrastructure," states, "Other than the citations herein, research has not uncovered a thorough circa-Digital Economy study (post 1998) of the market size, players and customers for Spatial Data (as distinct from Spatial Technology, hardware, software and services) supply and demand, and of the direct and indirect value of Spatial Data as part of Gross Domestic Product or other measure of the Digital Economy."

For the NSDI to achieve its goals for private sector participation, it is essential to account for the current geospatial market and the evolution of the electronic business market model. Cahan identifies this topic as well, "Contexts for programs change all the time, but once significant private sector change is recognized, it requires an adaptive shift in emphasis and adding new mechanisms to achieve Federal goals. Recognizing and exploiting these changes in the IT landscape will accelerate development of the NSDI vision."

The commercial remote sensing industry is having to adapt to the changing e-commerce business model. At the same time, industry participants are seeking ways to lower the up front cost for new market entrants. The need for partnering is driven in part because the spatial technologies market is highly fragmented into separate vertical markets.

To develop new markets and ultimately to capture new market share, applications and products must be offered for these individual markets. One size does not fit all. Markets as diverse as natural resources extraction, transportation, insurance, utilities, and telecommunications all require individual approaches to these vertical markets, and are typically supported by value added resellers with knowledge of the particular needs of the specific market.

Traditional Market Model	E-Commerce Market Model
Product: Data	Product: Information
Satellite data only	Multiple data sources
Isolated	Partnerships
Limited pricing & access	Flexible pricing & access policies
Knows data only	Customer oriented
Only collects, processes, & disseminates data	Integrated into broader GT/IT marketplace

It is essential to understand the change that is occurring in the commercial spatial technologies industry market in particular and the broader e-commerce market in general. Markets and sales drive the private sector, and the private sector will only participate where if it is in its financial interest to do so. Thus, it is incumbent upon the architects of the NSDI, given the expressed desire to have private sector participation, to understand the private sectors' drivers of participation and to motivate private sector participation within the private sector's terms of reference.

In addition to the significant growth in the geospatial technologies industry, as reported in the "State of the Space Industry" Report by the International Space Business Council, the U.S. and world economies are being transformed by the growth in the Internet. This transformation is not only monetary, and in fact, we have now seen that markets actually behave in the same old profit-seeking manner as they always have. The transformation is in the way that companies communicate with employees, customers, suppliers, distribution channels, and the media. Some of this transformation is monetary in nature. In other words, commerce over the Internet is a reality. But commerce is a small part of this transformation, and Internet commerce is really just another channel of distribution.

The number of Internet configured computers grew from 1.3 million in 1993 to

more than 93 million in 2000. The number of Americans online has grown from some 90,000 people to 137 million people today. Predictions indicate that in five years some 91 percent of the U.S. population will be online.

This online economy and community has spawned business to consumer (B2C) and business to business (B2B) e-commerce, activities, information sources, and forums. Some market research indicates B2C e-commerce could reach between $75 billion and $144 billion in 2003 and B2B e-commerce could reach $3.9 trillion by 2003. By 2003, some 80 percent of all business to business transactions could occur online. Many businesses and the government are using online methods to provide information and services to businesses, consumers and citizens.

The Council for Excellence in Government recently published the results of a 14-month effort for achieving a fully electronic government in the United States. The report recommended institutional leadership changes in the Federal government's information technology management and a strategic investment fund appropriated by Congress over a five-year period. The fund would augment the existing annual appropriations of approximately $40 billion annually to address e-government service delivery and program management.

While growth in the delivery of information and services is ongoing and increasing, so is the growth in GIS and related markets. The following Table summarizes the growth in the GPS, remote sensing, and GIS markets. The International Space Business Council projects revenue growth in excess of 20% annually increasing from $9.6 billion in 2000 to over $19 billion in 2004.

Industry Trends – Revenue Forecast (2000 – 2004)

	2002	*2001*	*2002*	*2003*	*2004*
GPS Equipment & Services	$7,340	$9,159	$11,139	$13,320	$14,642
Remote Sensing & Value Added Resellers	602	1,047	1,427	2,063	2,314
GIS Software, Hardware and Services	1,659	1,808	1,971	2,168	2,385
Totals	$9,601	$12,015	$14,537	$17,551	$19,341
CAGR		25.14%	20.99%	20.74%	10.20%

The growth in the spatial technologies industry, more than doubling over a four-year period, creates enormous demand for data. The Federal government is a major source for public domain data, and under the leadership of the Federal Geographic Data Committee (FGDC), has championed, largely through partnerships with public domain spatial data producers, the National Spatial Data Infrastructure.

Bringing the focus to the geospatial industry, a significant realization is the need to provide applications to the end-user market at low cost. To do this, many companies are rolling out integrated service offerings based on a service bureau model. One remote sensing company uses the marketing phrase " information without the infrastructure." Thus, the paradigm shift is from the end-user having to own the hardware, software, and source the data to support enterprise requirements to a service concept being implemented through the development of application service provider (ASP) offerings. Another trend is toward Internet exchanges or portals where the infrastructure is provided, and some content is provided, but it is enriched for the visiting community through usage. The Geography Network and the VantagePoint Network are examples of this new model.

More and more companies such, as VantagePoint Network, are bundling public domain data with other commercial data and applications and providing the customer with a service solution delivered over the Internet.

We believe the NSDI, to gain private sector support, must be able to communicate a market rationale for participation in the NSDI. This can be accomplished by segmenting the end-user market into target markets – such as service providers to the agriculture sector, as in the case of VantagePoint Network. Other markets include utilities, banking, direct marketing, facility and fleet management, insurance, minerals exploration including oil and gas, redistricting services, and telecommunications to identify a few. Then, specific offerings must be tailored to meet these vertical markets.

Early adopters of technology are able to delve into broad technologies and customize them for their needs. These are the large private sector companies. The next level of company, where more companies exist, require more specialized solutions, at a lower cost of integration, in order to make their technology and data investments.

These specialized solutions require different distribution methods from the broad solutions. Integrators must take the pieces and parts of many systems, technologies and data sets to form specialized solutions. The "resell" all of these solutions and their value to their clients is in the assumption of the cost of integration. This is why they are called "value-added" resellers or VARs. These companies should be a clear target for increased private sector participation initiatives as they themselves are the catalysts for increased participation.

9.2   Merrill Lynch Study – Global Satellite Marketplace Example Vertical Market

Merrill Lynch, in its Global Satellite Marketplace '98 Industry Outlook projected the commercial satellite industry to grow from $39 billion in 1997 to $171 billion in the year 2007. This 17% overall industry annual growth rate includes remote sensing imaging growth of 34.6% over the same period increasing from $400 million in 1997 to $6.5 billion in 2007.

With the passage of the Land Remote Sensing Policy Act of 1992 and the Presidential Decision Directive 23, the U.S. commercial remote sensing industry was created. The legislation, PDD-23 and the regulations implementing the Act and PDD-23 are intended to facilitate the development of the U.S. commercial remote sensing industry and promote the collection of widespread availability of Earth remote sensing data.

Merrill Lynch estimated the 2003 addressable market for satellite imaging to be $2.5 billion an increase of $900 million from 1996. This market includes:

- Agriculture/Forestry/Fishing

- Education/Media/Entertainment

- Consumer

- Crisis Management

- Military Intelligence

- Land-Use Mapping.

Year 2003

Addressable Market for Satellite Imaging

Legend: Agriculture, Education, Consumer, Crisis, Military, Land-Use
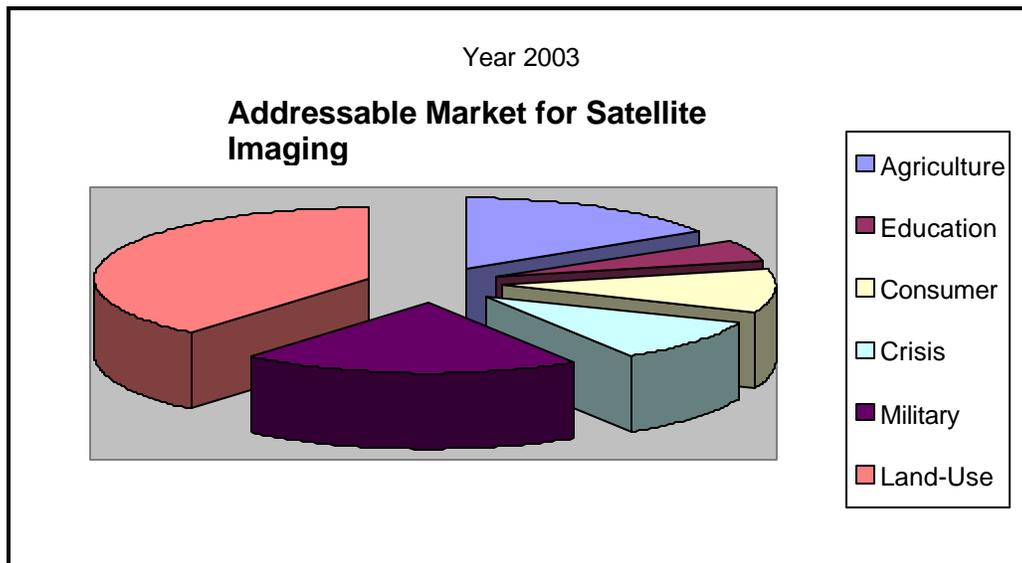
9.3   General Market Segmentation – Vertical Markets

The end-user vertical markets are the demand generators for public and private sector data, applications, hardware, systems integrators, software developers, hardware manufacturers, service providers, resellers and valued added resellers, GIS hardware, software and services companies, GPS equipment and services, remote sensing and VARS.

The Spatial Technologies Industry Association sees opportunities for the public sector to provide access to, and facilitate the use of, public domain spatial data to enable economic development, regional planning, and emergency management.

By better understanding the spatial data industry, and in particular, the end-users (vertical markets dependent on spatial data derived, in part from the public sector), the NSDI can be positioned to address its "customers' needs" in the Federal, state & local governments, and the private sector. This customer driven approach will position the FGDC to promote the NSDI to its customers, thus increasing awareness and increasing private sector participation in developing framework themes, producing and contributing metadata, and participating in the clearinghouse process.

Productivity gains from the "new economy" are benefiting the Nation by:

- Keeping inflation and interest rates low

- Producing new employment opportunities

- Enabling unprecedented economic growth that has significantly reduced the Federal budget deficit and its drag on our economy.

Many old business practices are being abandoned in every industry sector - auto manufacturing, transportation, retailing, oil and minerals exploration. Productivity gains are being realized as companies in these industries harness technology and information.

New distribution channels are being created. New business-to-business (B2B) relationships are being established, dependent upon *e*-commerce technologies, and new retailing methods are serving consumers directly. These emerging business processes are applicable to the public sector and offer the prospect of significant productivity gains in the administration and conduct of public sector functions.

Data is an essential element of the new *e*-commerce economy and spatial data is an increasingly key data element for decision support systems in all sectors of the economy.

This is where the public sector plays such a significant role. The public sector is a major producer and user of spatial data; thus it is a significant stakeholder with an important role ensuring that the marketplace functions efficiently. The Federal Geographic Data Committee (FGDC) recognized early-on, the duplication of data collection among Federal departments and agencies costing millions of dollars, is a case of the right hand not knowing what the left hand is doing.

Ideally, data must be made available quickly (real-time preferably) and it must be easily accessible. Where the public sector owns the data, it is responsible for its timely and efficient distribution.

The convergence of communications technologies, data and information availability from both private and public sources, and systems and applications capable of assimilating this information for decision making, demands the public sector redefine its information technology systems to support Congressionally legislated Federal agency missions.

Just as the Department of Defense deploys the latest "smart weapons" for our nation's defense, Federal civilian agencies must deploy *e*-commerce technologies to its programs. Agencies involved in major public purposes include:

- Property rights - Department of the Interior, Bureau of Land Management

- Voting rights - Department of Justice, State Legislatures

- Revenues from property ownership - BLM, Department of Agriculture, U.S. Forest Service

- Transportation, Navigation, and Commerce - Department of Transportation, U.S. Army Corps of Engineers, Department of Commerce, National Ocean Service

- Public Land, Minerals, and Marine Sanctuary Management – Department of the Interior

- Agriculture and Natural Resource Development – Department of Agriculture

- Environmental Protection and Ecosystem Management - Environmental Protection Agency

- Community and Economic Development - Department of Housing and Urban Development, Veterans Administration, Small Business Administration and the Department of Energy

- Emergency Management - FEMA

- Public Safety

- Public Information - Department of Labor (employment statistics, Department of Commerce (trade statistics)

Federal agencies must be capable of delivering data, information, and knowledge within the technological framework of the 21st century's "communication age." Spatial information collected and used by 17 Federal departments and agencies is essential to the public purposes and decision support systems significantly impacting literally thousands of activities contributing to the Nation's economic growth.

9.4   Channels Segmentation

As the spatial technologies markets have both grown in size and segmented into smaller vertical markets, core spatial technologies companies have tended to leverage their resources through partnerships with application developers, values added resellers, systems integrators, and hardware vendors. The spatial technologies markets can be segmented many ways along end-user demands. Of importance to our effort with regard to the NSDI is to understand the evolving channels strategies the spatial technologies companies are adopting to reach vertical markets.

There are a number of distribution channels applicable to the spatial technologies market including:

- **Direct Sales** – A direct sales channel is typically national in scope and focused on calling on major accounts, this consists of a dedicated sales force directly employed by the vendor. This channel strategy fits for high-end products requiring specific knowledge of the customer and is characterized by longer sales cycles selling high-cost solutions.

- **Retail Sales** – Retail sales channels are typified by a two-tiered distribution channel consisting of master distributors supplying retail outlets that deal directly with end-users.

- **Industrial Distributors** – This typically is the channel for commodity industrial component parts to the semiconductor industry and other computer related equipment suppliers. These distributors are large in size and have very low margins.

- **VARSs** (value added resellers) – The VAR channel is typically a two-tiered channel, where VARs source hardware and software and other solution components, including proprietary software, into a complete, application specific product or solution for the customer.

- **OEMs** (Original Equipment Manufacturers) – This channel structure includes direct sales selling to manufacturers who integrate the purchased product into their own systems and sell the systems on to the customer.

- **Systems Integrators** – While SI's tend to develop specialized solutions for an end-user, often these custom solutions can be replicated to other vertical markets.

9.5 "Marketing 101"

Clearly, all of the above channels have applicability to the NSDI however, the VAR channel may well offer the greatest opportunities to promote awareness of the NSDI and increase participation by private sector companies.

Two threads characterize all of these channels. The first is that they are all selling products and/or services. The second is that they all can benefit from electronic means of supply chain automation. Both of these threads are important to consider when setting marketing strategies for increased participation.   These marketing strategies must:

- Suggest that participation helps these companies generate revenue.

- Show that working with the NSDI is modern, easy, and a facilitator to time-to-market issues.

We also know that many other issues are of concern to private sector companies. For this reason, marketing materials, campaigns, and strategies must be able to address the following topics:

- Data integrity or accuracy

- Data security and the protection of intellectual property

- Data resolution options

- Reduced costs or increased profitability through participation in the NSDI

Marketing campaigns or initiatives do not have to be flashy or of high cost. As long as the right message can be delivered to the right audience, with the products or services to back up the messaging, any marketing program, now matter how expensive or inexpensive, can be effective.

Trade shows have grown to be increasingly ineffective. Companies spend a significant amount of their marketing budgets with very little return with respect to sales or increased brand awareness.

Advertising is a great vehicle to increase brand awareness, but it is often misused as a tool. For advertising to work, the message must be presented frequently and consistently over a period of time.   Most advertising campaigns focus more on the message and how "trendy" it is and forget to budget for the frequency of the message. Frequency, the most important factor in advertising success, is expensive.

Direct mail often fails for two reasons. Firstly, companies send direct mail to purchased lists of companies, that may or may not have an interest in their wares. These lists are often outdated, especially if only purchased or leased once per year. Most lists lose 15% of their accuracy each month. Secondly, direct mail is used so often now as to be rendered ineffective. So many pieces hit the desks of executives and consumers each day as to be difficult to differentiate. Most direct mail pieces end up in trash bins before they are read. There are two exceptions to these trends. When lists are "pre-screened" for accuracy, and targeted to go to the right people in the right companies, they are more effective. Also, when direct mail is coupled by telephone follow-up campaigns, it can be very effective.

Another new method is the email campaign. The term "permission-based marketing" suggests that email campaigns require a great deal of research before the email messages can be sent. As with direct mail, the email lists must be pre-screened for accuracy and the appropriate targets. They are also more effective with telephone follow-up. But a significant distinction exists. Email should only be sent to those who have provided permission for advertisers and marketers to use their email accounts as a vehicle for message delivery. This requires a secondary level of pre-screening for success.

Other marketing tools are essential for the delivery of a complex message that is contained in the NSDI. Some of these tools are:

- Success stories by vertical market including ROI or return on investment analyses.

- White papers describing the applications of information and technologies.

- Seminar programs to describe, in detail, the use of and issues surrounding data and technology.

- Articles, placed in appropriate journals, touting the successful use of NSDI components.

- Participation in industry associations and forums.

- Lobbying efforts to increase awareness for legislation and funding. Lobbying efforts can be to governmental bodies or funding sources.

- The use of industry luminaries to spread the word through speeches, articles, books, interviews, press conferences, and press tours.

As we build suggestions to increase awareness, we will incorporate many of these marketing concepts.

10.0 INDUSTRY PROFILING, SELECTION CRITERIA, PRIORITIZATION

10.1 North American Industry Classification System (NAICS)

As discussed in the previous section on marketing strategies, one of the best ways to approach such a broad endeavor as the NSDI is to segment the breadth of potential industries into more discreet targets. Before defining these industry targets to profile, we needed to choose a common naming and classification structure for the chosen industries.

We have chosen the North American Industry Classification System, or the NAICS. We have chosen this classification system because it is the successor to the SIC (Standard Industry Classification) system used by marketing departments in most private industry firms. The NAPA study also defines industries, but these definitions are more from a public sector need standpoint.

This Section Addresses

- Industry Classification Schema

- Identifying private sector drivers

- Targets likely targets and applications

- Private Sector Participation Defined

- **Recommendations**

The SIC system was last updated by the OMB in 1987. In 1992, the OMB charged the ECPC (Economic Classification Policy Committee) with the task of building a new, more complete, classification system. The system was to take many more industry classifications, particularly those in technology and computing, into account. The information technology area had been significantly underserved by the SIC system.

 In fact, special attention is given to new and emerging industries as well. The resultant system is the NAICS. Within the NAICS, producing units using identical or similar production processes are grouped together. The NAICS uses a 6-digit code (SIC used 4-digits) to classify companies as follows:

- XX   Industry sector
- XXX   Industry sub-sector
- XXXX   Industry group
- XXXXX   Industry
- XXXXXX   US, Canadian or Mexican National Specific

The NAICS defines 20 high level sectors:

- Agriculture, forestry, fishing and hunting
- Mining
- Utilities
- Construction

- Manufacturing
- Wholesale trade
- Retail trade
- Transportation and warehousing
- Information
- Finance and insurance
- Real estate and rental and leasing
- Professional, scientific and technical services
- Management of companies and enterprises
- Administrative and support and waste management and remediation services
- Education services
- Health care and social assistance
- Arts, entertainment and recreation
- Accommodation and food services
- Other services
- Public administration

We will choose the target industry names and NAICS codes from this list. Within each major, high level industry classification are hundreds of sub-classifications.

These NAICS codes map to the NAPA industries as follows:

NAPA	NAICS
Property and Voting Rights	Public administration
Revenues from property	Real estate, rental and leasing
Transportation, navigation and commerce	Transportation and warehousing, Wholesale trade, Retail Trade
Public land and marine sanctuary management	Public administration
Agricultural and natural resource development	Agriculture, forestry, fishing and hunting
Environmental protection and ecosystem management	Public administration
Community and economic development including utilities, housing and public works	Utilities, Construction, Public administration,
Emergency management	Public administration
NAPA	*NAICS*
Public service delivery including health, education, social and criminal justice	Education services, Health care and social assistance, Public administration

| National defense | Manufacturing, Other services, Public administration |
| Earth system sciences and GI technologies | Information, Public administration |

10.2 Target Markets Defined

10.2.1 Potential Driver/Advocates for Each Target Market – Phase II

In Phase II of this effort, when defining the private sector drivers for each target market, we will consider several factors:

- Ability for this company to influence other companies

- Size of the company

- Number of customers

- Number of alliances or business partnerships

- Current or potential use of NSDI offerings

- Ability to contribute new content to the NSDI

We will create a ranking system for each industry and choose ten to fifteen potential industry drivers for each industry. After comparing them based on the criteria listed above, we will rank these potential drivers. Then, we will contact the top five companies in each industry to discuss their participation. Our goal is to solicit at least one driver for each industry.

In order to win participation at high levels, we will have to show the benefits of NSDI participation to these companies. These benefits must be presented from the perspective of the private sector firm, in a competitive environment, with liability issues, the need to maintain proprietary and intellectual property rights, and needs for short-term profits.

We will work with the NSDI to build a marketing "messaging" document outlining these benefits now and as planned.

10.2.2 Criteria for the Selection of Market Drivers – Phase II

As mentioned in the previous section, our criteria for choosing market drivers are a list of six factors. We will assign each factor a percentage with all six factors adding up to a total of 100%. Each company will be assigned a score for each factor in the range of one to ten. The score multiplied by the percentage will equal the factor score. The total ranking score for each company will be calculated by adding together the six factor scores.   The total ranking scores for each industry will then be listed in order from highest to lowest.

10.2.3 List of Most Likely Markets and Applications

Some of the most likely markets to focus on in Phase II are listed below. Some examples of how the NSDI could benefit these companies or how they use geodata today are provided.

10.2.3.1 Telecommunications

The telecommunications industry sector includes companies offering telecommunications equipment, satellite equipment, wireless services and equipment, fiber optics, switching equipment, and microwave equipment. It is also populated with companies offering telecommunications services like local and long-distance telephone access, cable access, satellite television, DSL and other high-speed Internet access links.

As we all know, this industry is working very hard to keep up with consumer and commercial demand for services and equipment. This industry is growing at a rapid rate. The following chart, prepared by Multimedia Telecommunications Forecast (2000), shows this growth:
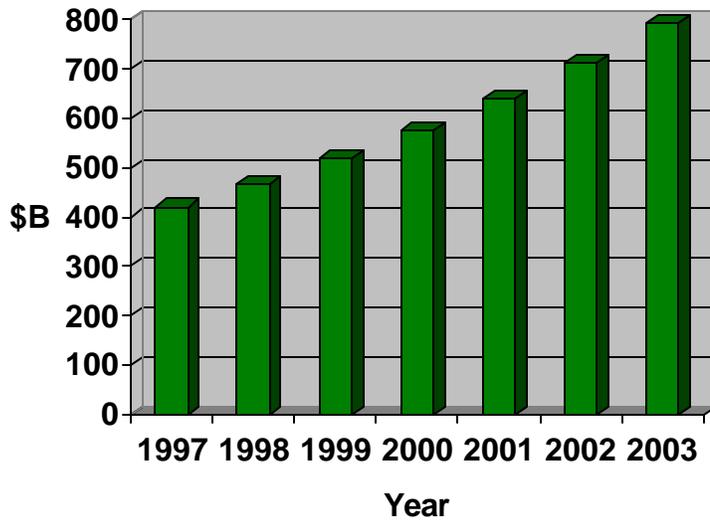
This represents Corporate Aggregate Growth (CAGR) of 11% from 1997 through 2003.

Companies in this space range from very small Internet service providers (ISPs) and competitive local exchange carriers (CLECs) to large telephone corporations. These industries are involved in the following activities (The Asaba Group, 2000).

Industry Player Types	Marketplace Drivers
Component and Technology Providers	Focusing on core technologies for data transfer with broad industry applications like Optoelectronics, wave division multiplexing (WDM),

	etc.
Equipment Manufacturers	Developing end-to-end solutions for voice and data applications like switching and transmission platforms. These companies are driving innovation for data-packet switching equipment to increase bandwidth capabilities and integrate core technologies for enhanced data networking.
Long Distance Carriers (IXCs)	Expanding scale and scope of product and service offerings to enhance positions in long distance, enter new markets (local and broadband), and develop embedded applications for data and voice needs.
ILECs/RBOCs	Consolidating and building scale, unbundling key assets like wireless, and developing new products like enhanced local services, broadband, etc.
CLECs	Focusing on most profitable segments in local markets like small to mid-sized businesses and industrial parks.
Cable	Focusing on leveraging residential customer base to add broadband and local telephone services.

A great deal of consolidation is going on in this industry in the form of mergers, acquisitions, and companies going out of business. As a result, many of the larger firms' needs for GIS have increased as they combine operations and the need to service customers in new geographies and with new services.

Another positive factor relative to the consolidation is that there will be a smaller number of large potential contributors or participants for the NSDI.

Because much of the equipment required to fuel our telecommunications engine is installed outside, and perhaps, underground, spatial data is critical to these companies. Many have built or are building their own spatial databases to help them more accurately plan for and build more capacity for individuals and businesses.

Pacific Bell, for example, has developed the Pacific Bell Enterprise Spatial Database to provide a company-wide spatial technology database. This database has been built using ESRI and Oracle technology.

Consider the cost to maintain this data for Pac Bell considering the amount of change the data undergoes due to urban sprawl, commercialization of rural

areas, etc. and due to the consolidation of telecommunications companies described above. Because a great deal of equipment is located above or below ground, or will be transmitted above ground, data that includes height information is critical.

In the past, survey teams in the field built this data. Today, aerial photographs can capture this information into a GIS to use for planning and design of networks, RF engineering, wave propagation modeling for cellular and PCS networks, site selection and the planning and design of tower sites for public impact analyses.

These companies are building new infrastructural components daily, and maintaining their existing equipment. The MMTA, TAG analysis of 2000 shows the dollars these firms will spend on Network Infrastructure Support Services:
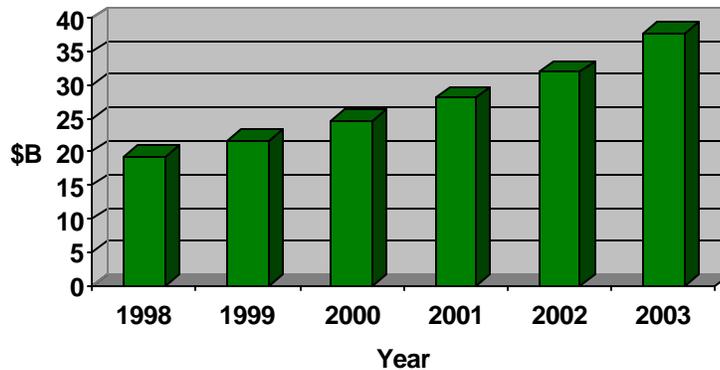
This represents CAGR of 14.3 % between 1998 and 2003.

10.2.3.2 Agriculture

Agriculture falls under the Food, Beverage and Tobacco industry sector. This sector includes food manufacturers, farms and other food producers, agricultural services companies, beverage makers, and tobacco companies.

Technology helped to transform our economy from an agrarian one to first a manufacturing economy and now a services economy. A very small portion of the U.S. population is involved in farming. Large producer conglomerates have also replaced many small family owned farms. As the amount of farmland has decreased, the need to maximize the output of farmland has increased, especially for large public farming firms that must answer to stockholders. Small farms, seeking to compete with the larger firms and coops, must also employ technology to help them survive.

Mergers and acquisitions activity has increased in this industry segment. Unilever acquired Best Foods in June, 2000. Philip Morris bought out Nabisco in the same time frame. General Mills agreed to purchase Diageo, a unit of Pillsbury in July of 2000. Pepsi purchased Quaker Oats in December of 2000.

Some of the top agricultural competitors include:

- Phillip Morris Companies

- British American Tobacco

- Weyerhaeuser Company

- Deere& Company

- Archer-Daniels-Midland

- R.J. Reynolds Tobacco

- Ag-Chem Equipment Company

- Agribrands International

- Gencor Industries

- Georgia-Pacific

- Delta and Pine Land Company

The average yearly growth of this industry is 2.5% according to Business Week at www.businessweek.com, 3/16/01.

Output has grown from $271.0 Billion in 1997 to $305.4 Billion in 2001. Productivity per employee in this industry has risen from $74.7 thousand/employee in 1997 to $81.4 thousand/employee in 2001. (www.businessweek.com, 3/16/01)

United States farm sales have grown as shown in the following chart from the U.S. Department of Commerce/U.S Department of Agriculture:

U.S. Farm Sales
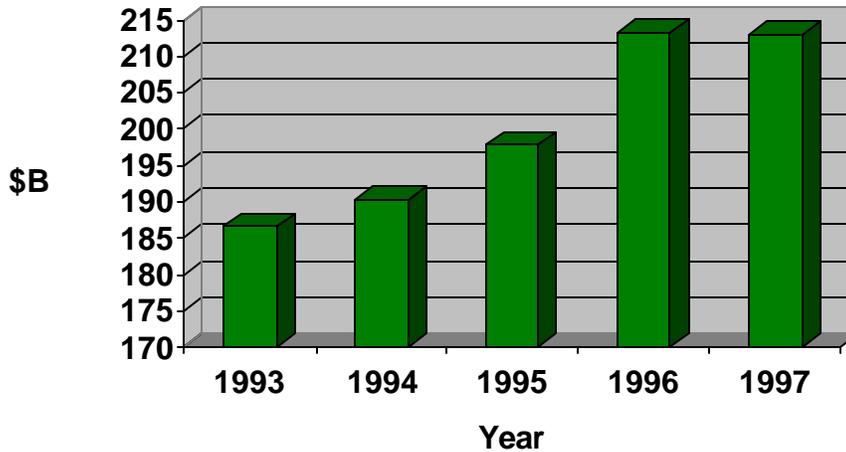
Spatial data can be used in many different applications in the agricultural sector. For example, there is a concept called "precision agriculture." Precision agriculture is used to apply land resources, such as fertilizers, across a field as required by the crop. Because the needs of a crop may vary from point –to-point across the field, the need to store information with these points is critical. In addition to precision farming, the tracking of pesticides and fertilizers might become a necessity as counties try to minimize pollution due to run off.

Another application might be the assessment of crop damage due to flooding, temperature, fire, etc. In general, farmers may use GIS to monitor crops for nutrient and water deficiencies, nitrogen, crop maturity, weeds, and disease. For these purposes, spatial data, combined with spectral re presentations and analyses provide farmers with valuable information.

The VantagePoint Network is an excellent example of the combination of infrastructure, data, and expertise to improve the abilities of large and small farmers to succeed.

Other B2B or Digital Farm companies have emerged as shown below in this Business.com Research report, March 31, 2000:

Company	Launch Date	Registered Members
XSAG.com	1/99	50,000
Farms.com/eHarvest.com	1/95	3,500
DirectAg.com	8/99	20,000
Farnbid.com	7/99	90,000
Gofish.com	9/99	N/a

10.2.3.3 Transportation and Logistics

This sector includes airlines, air couriers, trucking companies, railroads, shipping companies, bus companies and companies that provide logistics and other transportation services.

Some of the largest companies in this industry are:

- UPS
- Federal Express
- DHL Airways
- Union Pacific
- Burlington Northern/Santa Fe
- Budget Group
- Knightsbridge Tankers
- RailAmerica
- Conrad Industries
- RailWorks
- Interpool

This industry will experience 2.6% average growth in revenues in 2001. Productivity per employee will rise 0.8% in 2001. (www.businessweek.com, 3/16/01)

More than 8 million containers exist in the world. They all have to be tracked. Because of this, Global Systems for Mobile Communications or GSM satellites and radio tags are being employed to track cargo. Transportation simulators are also being employed to improve transportation productivity.

Within this industry, spatial data can play a large role in determining trip forecasts. Today, forecasting or trip planning involves a method that assumes that factors do not change like:

- The spatial topology
- Spatial pattern
- Population
- Traffic patterns
- And other factors

This is obviously not the case, especially in formerly rural areas now covered with strip malls and tract homes.

The use of GIS solves this problem. Now transportation forecasters can predict travel demand on geographical areas. Those responsible for trip logistics for entire fleets can better determine trip routes and times to more effectively use their equipment. With rising energy and fuel costs, more effective routes can save large companies millions in expenses each year.

In addition to these routing tools, GIS and spatial data can be used for navigational purposes once a vehicle is on the ground and en route. Dispatchers can assist drivers who experience issues while driving like congestion, construction, and other delays.

10.2.3.4 Manufacturing

The sector called manufacturing encompasses many different sub-sectors like machinery (light to heavy), hardware, machine tools, metal fabrication, flow control equipment, packaging makers, rubber and plastic parts manufacturing, glass manufacturing, and electrical equipment and product manufacturing. In addition to the manufacture of goods, this category can also contain the distribution of these goods.

Although it may not be obvious that this sector would use spatial data, there is a place for its application, particularly in the decision-making process.

These organizations are faced with decisions about capacity, cost reduction, quality management and logistical support for their enterprises each day. Add to these concerns the need to assess the acquisition of another company or the disposition of a current division, and the uses of spatial data become clearer.

A manufacturing company many decide to downsize or move operations to a lower cost region or country to improve profitability. Spatial data, and the use of GIS, will help this company evaluate other locations to determine those where operations can be set up more cost effectively. These systems can also help them decide between the merits of several existing facilities as they consider consolidation or the intrinsic value of their assets for valuation purposes.

Those companies that deal with the distribution of goods may use spatial data and GIS to evaluate the logistical merits of several distribution channels or distribution hubs – to see which better serves their strategic plans and profit goals. For example, one distribution channel may have locations all over the country, serving local retail outlets. Another may have far fewer depots across the country serving just as many retail outlets. The logistics of supporting the depots versus more local warehousing could make the decision of which distributor to use a moot point from a cost standpoint.

10.2.3.5 Forestry

The Forestry industry falls within the Materials and Construction sector. This sector includes companies making construction materials, growing and

harvesting timber, milling lumber, extracting stone and producing concrete, builders of manufactured housing, architectural and engineering firms, heavy construction companies (not residential construction companies), industrial maintenance companies, and management and recycling.

According to the US Business Reporter, October 29, 2000, the forestry industry will continue to consolidate. This is a highly competitive industry. Gaining competitive advantage through the use of technology is critical.

The top competitors in the Market are depicted below. These would be excellent targets for the Phase II activities:

Top Producers of Folding Cartons - 2000

International Paper
13%

Jefferson Smurfit
29%

Shorewood
15%

Rock-Tenn
16%

Fort James
27%
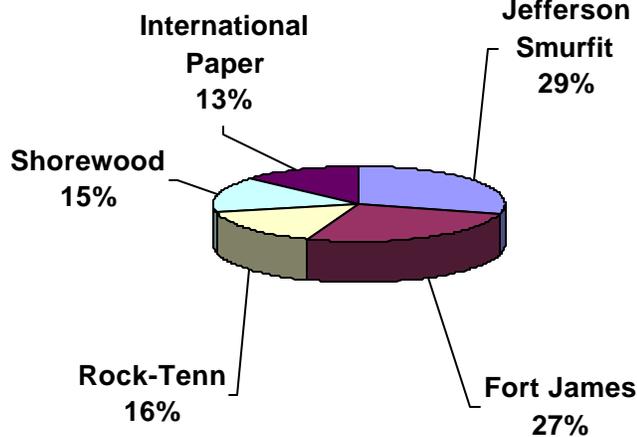
Top Coated Groundwood Paper - 2000

Bowater
18%

Cone Paper
30%

International Paper
24%

Champion International
28%
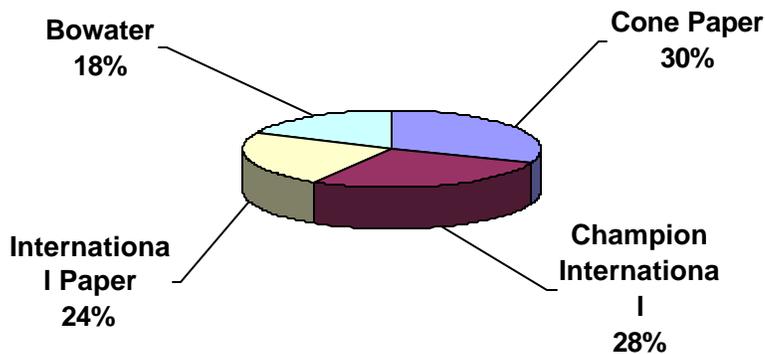
Top Tissue Paper Producers - 2000

Georgia Pacific 11%
Fort James 41%
Procter & Gamble 18%
Kimberly Clark 30%

For the forestry sub-sector, many uses of spatial data are apparent. The spatial data, coupled with a GIS, can help catalog and inventory a timber company's "inventory" of timber acreage. This inventory can carry characteristics about the land itself, the trees, the general environment, as well as, the routes to and from the forests, the effects of environmental events on the forests (fire, heavy rains, etc.), forest density, forest maturity, and weather characteristics of the forest through out a twelve-month period.

By using spatial data, forest management can reduce waste, thus improving our use of a precious national resource. Forest managers can more responsibly manage their existing r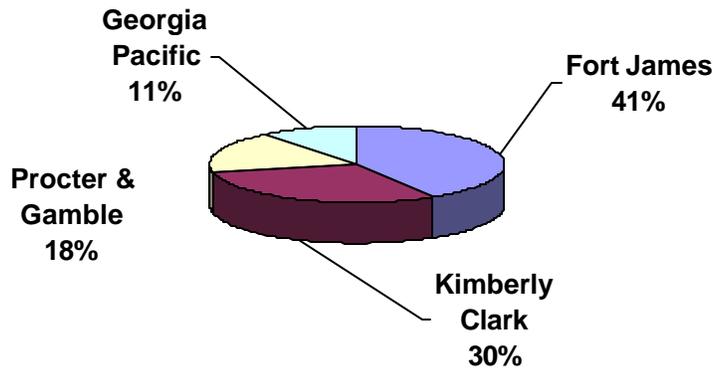eserves for the long term, reducing their need to continually acquire and decimate new forests. They can use this information to help them build reforestation plans into their cost structures for growth planning purposes. They can also use this information to determine the responsible ways to harvest with respect to the effects on habitat. Some large users of forestry products, like The Home Depot, will only use timber products from well-managed forests. Using GIS, in this case, can also help a forestry company market their products and win new customers.

The use of spatial data and GIS in forestry is expected to yield definite benefits in terms of productivity and quality increases, product enhancements as forest managers understand more about their crops, and the ability to share this information with company partners and regulatory agencies, all at a lower cost.

A potential partner site for Phase II is www.forestindustry.com, providing e-business solutions for the forestry industry. This site is a portal with excellent community content and a products exchange.

10.3   Summary

While many more vertical markets exist, these would be excellent initial targets to pursue for Phase II of this project, where we begin to implement many of the suggestions in this Phase I report.

11.0 DATABASE OF PRIVATE SECTOR COMPANIES

11.1 Introduction

A significant part of any good marketing effort is understanding the audience. This task develops over the course of any product or service launch. It begins when the effort is initially defined. In a broad sense, the audience is defined at this stage to understand its overall size, scope and technical and business needs.

As launch efforts progress, the view of the audience is refined to include specific demographic characteristics and priorities. Finally, the information is expanded to include specific user names, contacts, and propensity to use or buy an offering. At this point, the information is in the form of a contact database, used for one-to-one marketing efforts to expand or deepen the use of the product or service.

In general, for the NSDI, many would define the user community in different ways. Usership has also evolved over time. But in general, very little is known, in the aggregate, about private sector usage, needs, budgets, and issues. Part of this initial effort has been determining just how far back in the launch chain we have to go to build an understanding of this private sector marketplace.

> **This Section Addresses**
>
> - Knowing the customer
>
> - Designing a database
>
> - Designing a database for the NSDI

We have determined this effort is extensive, not just due to the shear size of the private sector, but also because of the proliferation of applications, number of industries, existing data sets, market drivers and the pace of technological change.

As a result, we feel our efforts in this area, in future phases, will seek to define the user community, in greater detail, and prioritize vertical markets and key players. Finally, a database of the key players, in selected markets, will be built in subsequent phases to use for promotional and one-to-one marketing efforts designed to improve private sector participation.

11.2 First, Choose Target Industries

Although we discussed the application of spatial data and GIS in several different industries in Section 10, many more industries have uses for spatial data. It will be important, in any effort to increase private sector participation, not to exclude industries, but to focus initial efforts on certain industries and data providers

where the largest benefit of participation can be realized in the shortest time frame.

Part of the Phase II effort will be to choose these specific industries for focus, but include in the private sector database, the ability to catalog potential participants from all industries.

We will want the private sector database to be searchable by industry and NAICS code to help use determine participation by sector. Over time, we may find that a particular focus industry has the potential for greater participation, but other smaller industry sectors actually participate more because of more organized efforts or more critical needs. Using the database to track this by industry will be important.

One factor to consider when building a prioritized list of industries and users is the need for, and availability of, the offering. Typically, when introducing a new product or service, key industries would have been defined before any product or service was developed. In this case, we have to examine currently available and emerging data, applications and infrastructure, pick the best ones, and determine a program to capitalize on existing efforts. Then, we can define future targets.

By prioritizing these existing data, applications and infrastructures, we will, in effect, define some as areas not worthy of current efforts. As we define the "user community" in detail, in future phases, we will use several tools.

First, we have to define a "big picture" view of the marketplace by listing industries. We will begin with the industries explored in Section 10.

In Phase II, we will take each of these industries and define a matrix showing the economic sector, users, content and application providers and infrastructure providers:

Example: Agriculture

Industry	Users	Content and Application Providers	Infrastructure Providers
Agriculture	Farmers and Food Producers	Vantage Point Network/NSDI, XSAG.com, Farms.com, DirectAG.com, etc.	Hardware, operating systems, networks, databases such as Sun, IBM, Microsoft, Oracle, Novell, Cisco and middlewear vendors.

Once we have created lists like this for each economic sector, we will use another matrix to rank the players in each sector:

Company	Sector	NAICS Code	Annual Revenues	Number of Employees	Uses of Data	Contributions of Data	Rank

We will do this for each industry sector, and then roll up the rankings for all sectors. This will allow us to rank sectors and companies. Our goal is to prioritize both sectors and companies in the private sector to show where our focus should lie in terms of increasing participation.

11.3   Software Applications and Technical Providers

Just as we track the participant database by industry, we should also track it by application and content. We should also note which participants are providers of spatial data and which are users of spatial data.

We may find over time that certain applications have more active participants due to the severity or urgency of their need to share spatial data. Profit motives will, of course, also drive participation within application areas.

Certain infrastructure providers may participate more readily due to their size or due to their profit motives. We will want to track this and see if we can determine the characteristics of a full or active participant. Then, we can seek other participants with similar profiles to target for full or active participation. Better yet, if we can pair those industries or application users with a great need with infrastructure providers that are not as active, we can increase participation further.

We do not mean to trivialize the effort required to track participation within the private sector database. This will be a significant effort to maintain and analyze a database. But, this effort is necessary to increase participation. Just as spatial data helps companies manage better, the use and management of a database of participation will help increase participation.

11.4   End Users (Emerging Operations Users)

The largest community to track in the database will be the end user community. This group is not a cohesive, organized group. This is why the efforts to drive

participation have not been successful. Building a database of these users will not, in and of itself, drive participation. The use of this database to contact and sell these end users on participation is what is essential. Maintaining the database of these users is critical. Most "mailing lists" that can be purchased commercially become at least 15% inaccurate within one month.

Keeping our participation database current will be essential to building a cohesive community.

The classification of end users by industry, application, etc. will be critical in the database to help match participants to providers – a key benefit for both parties. The database becomes not just a body of information but a problem-solving resource for end users.

11.5   Findings from Other Databases

During the process of investigating participation, and through our experience working with databases for clients from many different applications, one thing is clear. Databases lose accuracy, and therefore, effectiveness, if they are not maintained.

There are surely other findings like database compatibility issues, although most systems can at least send delimited text data back and forth. But, the single most important finding from any database used is its accuracy. Most purchased lists are inaccurate when delivered. The effort to maintain databases is directly proportional to the number of critical fields of data contained in the database. The effort to maintain databases is hugely manual, although direct feed, and other automated methods are being utilized increasingly for the more quantitative fields in a participation database such as annual revenues, numbers of employees, and numbers of locations.

The more subjective information about usage and need are maintained through manual means. This requires a staff of researchers, telephone interviewers, and database entry personnel, as well as some IT staff, to maintain.

Proper maintenance also requires a methodology for maintenance and an infrastructure that promotes quality of the data and consistency in the way it is developed.

Security of the data is paramount to preserve the investment in the database and to preserve the privacy of participants. Participants will be more likely to participate if they know the data will be used to foster participation and help them either solve problems or grow revenues, than if the data will be sold to list brokers for direct mail purposes.

Access to the database, while controlled from a security point of view, must be made simple and inexpensive. Participants should be able to take advantage of the latest Web browser technologies to facilitate their usage of the participation database. If participants have to understand the technical nature of database management and manipulation to use the database, they will not be likely to use it often.

The database must have information that is useful to the community it serves. Other information, while perhaps easy to obtain and maintain, should be foregone to limit the database to the most useful information.

One other common theme we heard from others who have attempted to build participation databases, is that the effort must be well funded.

Surveys have, for the most part, been unsuccessful, because the recipients of surveys have no motivation to fill out the survey. Survey efforts are most effective when followed up with "selling" efforts to promote participation in the building of the database. This kind of effort will require an investment in manpower to interview companies and then transform their information into the database.

11.6 Database Design Description and Criteria Used for Selection

- The design of the database must be flexible, secure, and optimized for performance.

- The potential for this participation database to grow to very large proportions is great. The number of potential participants from the end user, application, technical integrators and provider communities is very large.

- The user interface must facilitate participation in terms of accessibility and the means to manipulate data for reporting.

- The database must be maintainable.

When we add participants to the database, we should do so relative to a set of criteria that will increase the integrity of the database, not so much in terms of accuracy, but in terms of the value of the data we are adding to the effort. The criteria should focus on some kind of prioritization of participants. This prioritization may shift over time but it will help focus the efforts of the organizations assigned to using the database to grow participation.

The specific fields in the database must be designed to create an efficient body of information, but an informative one.

When designing the database to be used for eventual one-to-one marketing to the private sector, we must keep three factors in mind:

- Usability and ease of updating

- Meaningful data

- Accuracy and maintainability

The data must be usable from the perspective of search and query, data download, data upload and updates, and report generation.

The database will be generated in a SQL-compliant format due to the ease of download and upload and the proliferation of this format in many industries and on many Web sites. We will create a user interface, eliminating the need to understand database design for queries, reports and data entry.

The data must be meaningful. If it is not, no one will use it or keep it up to date. Meaningful data will help users understand the size, business needs, and potential contributions of the profiled company.

The data must be accurate. When we define the database profile, we will embark upon a primary and secondary research approach where companies are contacted as they are being entered into the database. The contact information and general company information will be accurate as the data is delivered. We will also use a quality control to make sure the data entered meets our research, data analysis and data entry standards.

11.7 Database Record: Form and Purpose Descriptions

Each database record will include the following information, if available:

Company Name

Address 1:	*124 Duncan Street*
Address 2:	*Suite 100*
City:	*MacPherson*
State:	*KY*
Zip Code:	*12345*

Telephone:	773-555-1212

Fax:	773-555-1212

Web Site:	www.companywebsite.com

Contact First Name: John	
Contact Last Name: Doe	
Contact Title: Vice President	
Contact Department: Product Marketing	
Contact Address1: (if different from company)	
Contact Address 2: (if different from company)	
Contact City: (if different from company)	
Contact State: (if different from company)	
Contact Zip Code: (if different from company)	
Contact Phone: (if different from company)	
Contact Fax: (if different from company)	
Contact email: john.doe@companywebsite.com	

* Repeat for each company contact found.

Stock Symbol: ABCD	
Stock Exchange: NASDAQ	

Fiscal Year End: Month	
Revenues: $XXX.X million	
Revenue Growth: xx.x%	
Net Income: $xx.x million	
Net Income Growth: xx.x%	

Founded Date: 1973	
Employees: xxxxxxxx	

Ownership: Public or Private, Non-profit, etc. **Key Stockholders:** *Overview of the Company:* Several paragraphs

Solutions offered/Products: List of products with a one-paragraph description for each

Services: List of services with a one-paragraph description for each

Software Formats Supported/Available: DXF, TIFF, etc.

Economic Sector or Industry:

NAICS Code: code showing standard industry classification (replaces SIC codes)

GI Products Used:

Key Technologies Employed: Listing of technologies like Java, HTML, AutoCAD drawings, etc.

Key Alliances/Partnerships: Listing of alliance partner companies

Competition: Listing of this firm's competitors

Key Messaging:
- Key quotes from their literature, web site   - Messages from advertisements   - Messages from press releases

Locations and Subsidiaries: Listing of cities, states, countries

Strategic Direction or Business Issues: Paragraph on their strategic direction

Answers to Questionnaire: a series of questions to be determined about NSDI participation (past and future)

11.8 Participant Universe

As we begin to collect companies for this database, they will be placed in a Web-enabled database, accessible to those specified by the STIA and the USGS. This access may be broadened at any time after we all agree that the makeup of the participant universe of companies is correct.

11.9 Participant Database Verification and Maintenance

Throughout this report, we have identified the maintenance of a database as a critical component of its usefulness over time. Within one month, a database can be aged to the point that the use of the database will cause unnecessary expense in the form of returned mailings, wrong phone numbers, and bounced email messages.

As soon as the participant database is built, we should embark upon a maintenance process to mitigate the loss of accuracy in this database.

12.0   Specific Steps to Increase Private Sector Participation

12.1 Seeking Participation By Using the Participant Database

The new database of potential participants should now be treated as a marketing database. We should devote some time to discussions with participants to determine their needs and interests in joining an effort to build participation and help us further complete the database profiles on each company. This will involve higher-level discussions to the titles most likely to be interested in the NSDI within these companies, based on a discussion guide we will develop.

As we find interested parties, we will turn these interested parties over to trained recruiters to win acceptance of their participation in the NSDI. This process of recruiting interested parties will be refined as we shift from industry to industry and from technology providers to content providers to end-users.

Recruitment or marketing materials will be created to use within this process to further explain the benefits of participation.

12.2   Promotional Campaigns

In conjunction with recruitment calls to potential participants, we will also design a comprehensive and complimentary marketing campaign. This campaign will be designed to build awareness of and name recognition for the NSDI, as well as, to provide a basis for follow-up recruitment communications.

All direct marketing will use the database of potential, target NSDI participant companies in the private sector.

This Section Addresses

- How the NSDI database is used

- Promotional campaigns to increase NSDI awareness in the private sector

- Other promotional initiative and programs

The marketing campaign is built to span twelve months of one-to-one marketing contact with these private sector companies. We will contact the prospects in a variety of ways during this period. During this initiative, we will use different direct marketing methods including:

- Letters

- Email

- Telephone calls

- Postcards

- Personalized information pieces

- Fax-back mailers/letters

The proposed campaign timing is meant to touch the potential private sector participant frequently and consistently. This is a proven methodology designed to build awareness and name recognition along with a call to action.

All associated writing, creative services, printing and mailing will be managed by the STIA. The STIA will work with the FGDC to approve all content and format prior to each contact. This collaboration ensures all materials reflect the personality and goals of the FGDC and the NSDI. This plan is built on our recommendation to contact an average of two to four contacts, within each of the identified companies, over a twelve-month period.

12.3 Higher Level Initiatives and Programs

We recommend other specific initiatives and programs to resolve issues found in Phase I. Our approach will be to build an advisory group to build solutions to these issues. For example, the issues of security, licensing and the accuracy of data are complex and significant enough to warrant an advisory group.

Each advisory group will be given a mission and a timeframe for a recommendation on actions to take to resolve their issues. We will establish a budget for their recommendation and they, in turn, will recommend a budget to the FGDC to execute their plan. This budget will also include their recommendations for a timeline for the implementation of their recommendation. The recommended course of action then, would have to be funded and staffed by the FGDC, hopefully, with the assistance or guidance of this private sector advisory board.

The STIA is uniquely qualified to head this advisory group methodology since it represents many private sector companies, dealing with the issues outlined in this report on a daily basis. The efforts to solve the problems identified should be led, to a great extent, not by government officials, but by private sector companies, if they are to be successful. Government officials must participate in this effort.

The private sector, in solving these issues, will disengage if the efforts become bogged down in bureaucracy. They will also lose interest in solutions that take too long to implement. The issues that can most likely be driven by the private sector are:

Sub-Section	Issue
8.1.3	The same issue above creates a situation where there is little synchronization amongst data sets.
8.1.4	Lack of understanding about the drivers for private sector participation like revenue, profits, time to market, liability protection and intellectual property protection.
8.2	Confusion about the purpose of the Framework and whether it serves the interests of private sector companies.
8.2	The Framework has no authority to determine which data is the official or accurate version.
8.2	There is a great deal of redundant data in the Framework because different groups create data at different resolutions.
8.2	Data accuracy is very important to private sector companies because of customer satisfaction, liability and revenue issues.
8.2.1	The following issues about NSDI data must be resolved from the private sector's perspective: resolution, currency, timeliness, and accuracy.

Sub-Section	Issue
8.2.2	Tools must be employed to make the design and accessibility of data more "user friendly."
8.2.2.1	Fees and licensing for data are difficult to determine in the public sector and will be even more difficult to determine in the private sector where liability issues loom for data that is inaccurate or not used properly.
8.2.2.5	Organizations can be found liable for many aspects of data collection, data repackaging and distribution, data manipulation and analysis, and data usage.

Some of the issues cannot be resolved by the private sector. Our legislative bodies and government officials must resolve them. The private sector can address these issues and participate in the educational process to bring about change. Some of these issues are:

Sub-Section	Issue
8.1.2	The NSDI does not have a private sector focus in any of its offerings due to the relatively low inclusion of the private sector in the planning for the NSDI.
8.1.3	Lack of policy direction, authority, and accountability of the FGDC or NSDI makes private sector firms hesitant about the long-term viability of the FGDC or NSDI.
8.1.3	The same issue above creates a situation where there is little synchronization amongst data sets.
8.2	The Framework has no authority to determine which data is the official or accurate version.
8.2	There is a great deal of redundant data in the Framework because different groups create data at different resolutions.
8.2.2	Federal, state and local laws relative to freedom of information, privacy, disclosure, and intellectual property can hamper data sharing, especially when companies consider their information part of the assets or worth of their companies.
8.2.2.2	State and Federal law provides that information can be withheld if considered confidential, particularly if used in litigation.
8.2.2.3	More than 30 states have statutory language prohibiting the disclosure of trade secrets or comparable business information.
8.2.2.4	Some 21 states have specific privacy laws but there is little guidance about what is private.

13.0   Conclusions

The NSDI, under the auspices of the FGDC, holds out the promise through its policies, standards, and activities, to establish more comprehensive, integrated, and available geospatial data than has ever existed. The NSDI is a national resource capable of leveraging economic activity well beyond what the NSDI framers ever envisioned. The private sector is an important stakeholder in this national initiative, and should be both an important contributor as well as a significant beneficiary.

This report attempts to better understand private sector drivers (motivators), and puts forth a strategy to address the present perception of low private sector participation in the NSDI initiative. Further, the report identifies concerns of the private sector with the NSDI that limit private sector participation.

The evolution of satellite navigation systems developed and deployed for national defense have been made available for civilian purposes. Remote sensing technologies, long the domain of the U.S. defense intelligence community, have been developed for commercial purposes since the early 1990's. And, geographic information systems have evolved with information technology, database technology, display technology, and IT architecture advances.

Early on, it was recognized that data to support the evolution of geographical information systems (GIS) accounted for as much as 80% to 90% of the cost of developing and deploying geospatial technologies for decision support. It was no surprise that spatial databases were expensive to create and, equally or more so, expensive to maintain.

The Federal sector recognized the need in the early 1990's to coordinate spatial data development and usage. The realization that significant benefits, and cost savings, could be realized though a national effort to address the need to coordinate and share spatial data lead to the creation of the National Spatial Data Infrastructure (NSDI).

President Clinton, in 1994, directed the Executive Branch of the Federal government to develop, in cooperation with state, local, tribal governments, and the private sector, a coordinated national spatial data infrastructure.

Since the NSDI's inception, private sector consultation and advice has been sought to aid in the development and implementation of the objectives of the President's order.

In the Fall of 1999, the Spatial Technologies Industry Association (STIA) proposed to the FGDC to examine the level of private sector cooperation in the development of the NSDI.

As a private sector trade association, STIA was interested in exploring why private industry was reluctant to participate in the development of the NSDI. Was it because of lack of awareness of the program? Was it due to a lack of understanding of the benefits that would accrue to private sector participating companies? Or was it due to other factors such as industry input into the NSDI process or the differences between private sector economic drivers and public sector policy drivers?

In this Phase I Project and Report, we have examined 1) the expectations of the Executive Branch for private sector participation in the NSDI, 2) economic and business factors that drive private sector business decisions, and 3) potential actions or suggestions to increase private sector awareness and participation in the NSDI.

The STIA is excited about the opportunities that will evolve and believes that the NSDI is potentially a critical national enabler that could assist with significant economic expansion over the next decade. A robust and successful NSDI, focused on the needs of both the public and private sectors, could accelerate this economic expansion. For these reasons, the STIA is pleased to be able to contribute to this important national program.

In summary, the drivers of private sector participation and the conclusions put forth in this report are:

Drivers of Private Sector Participation in the NSDI
• *Private sector participation in the NSDI must consider firms private sector drivers*
• *Economic: increased revenues and profits; decreased costs*
• *Competitive Advantage: uniqueness, security, and privacy*
• *Time-to-market: completeness, availability, ease of use*
• *Quality: accuracy and completeness*
• *Cultural: Expectations of geospatial providers and end-users*

Conclusions
• *NSDI must address private sector interests and accommodate the private sector's role*
• *NSDI must complement the private sector's activities*
• *NSDI lacks a business plan focused on action not process*
• *Multiple NSDI and NSDI related activities at the Federal level confuse the private sector marketplace*
• *Knowledge of NSDI offerings and advantages to the private sector are*

lacking
• *The NSDI must address demand factors in the marketplace – both public sector and private sector*
• *Security and availability of information needs to be improved*
• *NSDI must address scale and accuracy of data*

Recommendations
• *Redefine the NSDI articulating public sector responsibilities and the private sector's role*
• *Evaluate the existing NSDI framework program and develop a plan for building and maintaining the framework layers*
• *Examine OMB oversight role to ensure federal programs sponsored by federal agencies do not overlap with the NSDI initiative*
• *FGDC needs to better understand private sector needs and how the public and private sectors can become complementary*
• *FGDC should refocus its efforts on coordinating federal spatial data activities with expanded liaison with the private sector*
• *Convene a private sector advisory group to tackle the higher level issues outlined in section 12.3*
• *Seek private sector consultations and input on NSDI initiatives such as the GeoData Alliance, Aurora Partnership, and the I Teams Initiative*
• *Develop outreach to private sector targeted toward specific industry sectors*
• *Establish a NSDI Private Sector Advocate*
• *Build and maintain a database of companies that make up the spatial technologies industry and end-user community to better understand their needs from the NSDI*
• *Use this database for marketing activities designed to increase awareness and participation*

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15.0   ATTACHMENTS