WORKFORCE INFORMATION SYSTEM TECHNOLOGY REVIEW

Final Report

11/9/2009

radha
CONSULTING REDEFINED

EXECUTIVE SUMMARY

Currently each state's Labor Market Information (LMI) office disseminates and provides labor market information to a variety of customers, including workforce professionals, job seekers, students, educators, businesses, economic developers and policy makers. Since the mid-1990s, the types of customers served by the LMI community have expanded significantly with the emphasis on web-based delivery, and on customer access and education. Products have also changed in content and format with the introduction of newer tools and technologies for delivering information. These new technologies, along with recent economic conditions, have created additional demands from traditional customer groups including real-time access and visual representation of data, data across geographies, and easy-to-use products. Although most of the states deliver labor market information via the web, there are additional products and technologies that are available today to enhance this delivery process. Also, as younger customers start accessing the LMI system, it will be imperative that the system's infrastructure and technology level match and satisfy the needs and demands of that computer-savvy generation. For these reasons, the Workforce Information Council (WIC) state representatives requested a review of the technologies available today for delivering information. This report provides the findings from that review.

The following executive summary outlines some of the key market changes and information delivery technologies that should be considered while implementing or enhancing a state's Labor Market Information delivery system. *Additional information on these products and technologies are detailed in Sections 5 thru 11.*

a. MARKET LANDSCAPE FOR DELIVERING LABOR MARKET INFORMATION HAS CHANGED
   - Delivery of labor market information needs to change due to privatization of data and competing data delivery products at the local level
   - Workforce Information survey clearly indicates that LMI delivery systems are not keeping up with current technologies
   - There is a clear user need for visual representations of data

b. MULTITUDE OF NEW PRODUCTS CAN ENHANCE EXISTING DELIVERY SYSTEMS
   - Several off-the-shelf products such as Virtual LMI, Workforce Informer, Strategic Compass, EMSI and many more should be considered as viable or supplemental products in delivering labor market information

c. OTHER PRODUCTS CAN SUPPLEMENT EXISTING LMI SYSTEMS TO EXPOSE AND VISUALIZE DATA TO A LARGER AUDIENCE
   - Google graphing provides a free and immediate solution for display LMI in an advanced graphical format.
   - SQL Server thru web services provides a new mechanism of displaying state data and exposing it for public consumption as a web service. This method provides a means for branding or syndicating state LMI to a whole new customer group, in addition to sharing data with other states

d. WEB 2.0 HAS CHANGED THE DYNAMIC OF THE CUSTOMER EXPERIENCE WITH WEBSITES
   - Keyword Search, RSS feeds and Web services are must components of any LMI delivery site
   - Existing and future customers are demanding a more interactive information delivery website
   - Selective Web 2.0 technologies such as social media should be considered as an alternative means of delivering information.

e. WEB SERVICES ARE PROVIDING APPLICATIONS A DIFFERENT WAY TO PUSH AND SYNDICATE DATA
   - Web Services is the only viable means of data sharing across states
   - Provides the ability to extract data from multiple sources as well as provide data that can be seamlessly consumed by any third party source

f. LMI CUSTOMERS ARE READY FOR NEW MEANS OF INFORMATION DELIVERY
   - Focus groups conducted at the local level show a clear need for graphical, intuitive and localized data
   - Customers also indicate interest in subscribing to data feeds, advanced querying, automatic data update notifications and keyword based search functionality

g. SEVERAL STATES ARE ALREADY AHEAD OF THE CURVE WITH BEST PRACTICES
   - Indiana and Oregon already use several Web 2.0 technologies to deliver LMI including the use of RSS feeds, podcasts and Web services
   - Utilizing traditional as well as alternative means of delivering labor market information.

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PROJECT METHODOLOGY

The project methodology centered on assessing existing workforce systems along with evaluating newer technologies and products for enhancing LMI delivery systems. This assessment included analyzing existing and established LMI products as well as emerging products, trends and solutions. A general survey was also used to assess the current delivery systems from each state's Labor Market Information office, which varied from vendor products to in-house solutions. Finally, focus groups were conducted with select customers at the local level to ascertain the type of technologies that are being used at the local level. This process not only identified best practices and systems from each state but also identified key gaps in their current delivery systems. This provided a view of the gap between the state's current delivery systems and future products and technologies.

KEY ASSUMPTIONS

- The focus of this assessment centered specifically on user-defined analytical capabilities, graphing, mapping, and extraction and usage of data from multiple data sources.
- High level assessments were performed in evaluating key products and technologies. The scope of this report does not include detailed analysis of each product including identification of every business function.
- The tools and products evaluated in this report are not intended to identify all tools and products. While there are other tools, these are some of the leading-edge products available for graphing, mapping and business intelligence needs for most customers.
- The views provided in this report are those of Radha Consulting staff and have not been influenced by any single product or vendor.
- Additional project collateral including the full survey results will be provided to the WIC upon project closure.

SURVEY OVERVIEW

A general survey was conducted among all 50 states to assess the current delivery systems from each state's Labor Market Information office and identify gaps in their current systems. There were 43 responses from the 50 states, an 86 percent response. The survey was divided into five key sections: Contact Information; Current Delivery System Information; LMI Data; States' Best Practices; and Other General Information. The format of the survey ranged from yes/no answers to open-ended responses. Survey responses also varied from very little information to very detailed information. These survey responses were then validated by talking to individual states as well as independently verifying information via their websites. The survey questions as well as the results and key conclusions are listed below:

Sections	Question
Section #3: Delivery System Information	• What is your current LMI Delivery System? • What is the current technology framework that your LMI delivery system uses? • What type of database does your LMI delivery system use? • What type of capability does your system have for users to access data via user-defined queries? • Does your system have the capability to dynamically graph data on the fly? • Does your system allow the users to create their own geographic areas? • Does your system incorporate data from other states into your WID database and do you display it along with your state data? Also, do your customers frequently ask for this data?

	• What type of mapping capabilities does your system have? • Are there any other tools or technologies that your state uses to display labor market information? Examples could include Web services, RSS feeds, Facebook, Twitter, etc. Additionally are there tools or technologies that your customers are asking for that you don't deliver? • Are there any planned upgrades to the system? • Enter any other comments here that you may think are useful to this section.
Section #4: Labor Market Information Content	• Does your current delivery system use only the Workforce Information Database (WID) database or does it extract data from multiple data sources? If yes, what data sources and data have been added? • Who are your top three customer groups? Examples include Workforce Services, Economic Development, Researchers, etc. What kind of data do your major customers typically want? • What is the typical size of data that a customer wants? Do they want data in small feeds, download or entire tables? • What publications are you still doing in print? If any, why have they not been converted to an electronic version? • Do you create custom reports for customers upon request? Examples could include providing specific datasets for customer groups. If you do, do you only use the WID database or data stored in other databases? Also what type of product or technology do you use for accessing this data?
Section #5: Best Practices	• List any best practices you feel that your state or system uses in delivering LMI.
Section #6: Next Steps	• Please list any other comments that you think would be useful for this survey. Examples could include describing unmet needs for information or delivery of information.

The graphs displayed below highlight some of the key survey results and indicators. These specific survey questions and results correlate directly to the original business drivers behind the WIC's Request for Proposals (RFP) and the focus of this project assessment.

Figure 1: Current LMI Delivery System

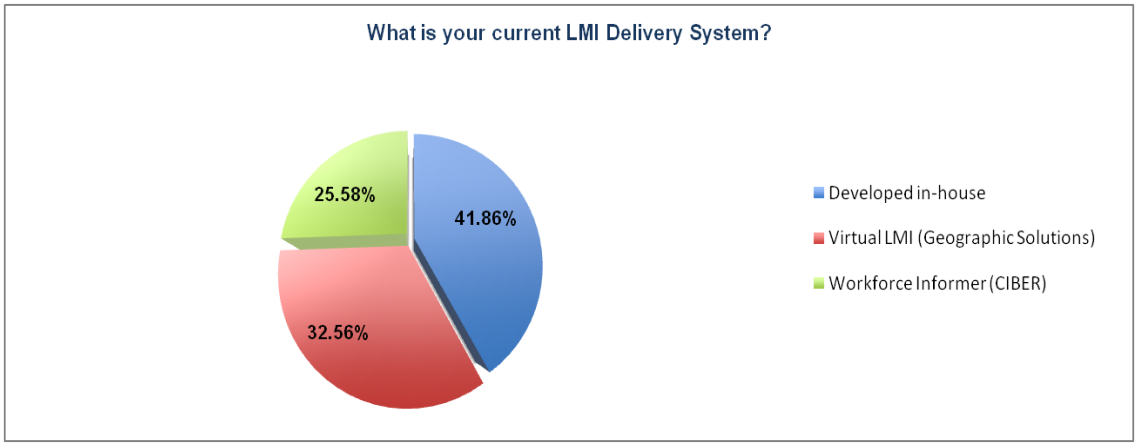


Figure 2: Current Technology Framework

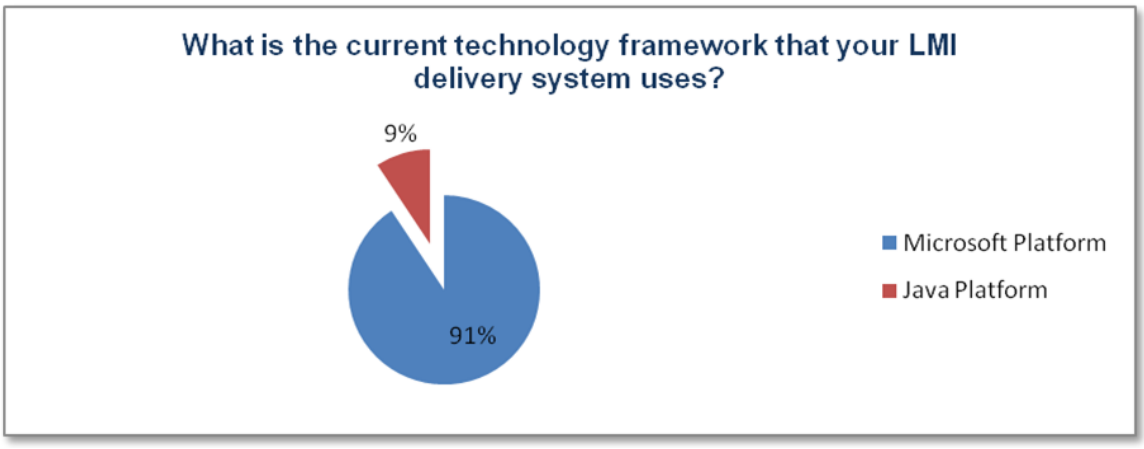


Figure 3: LMI Database Technology

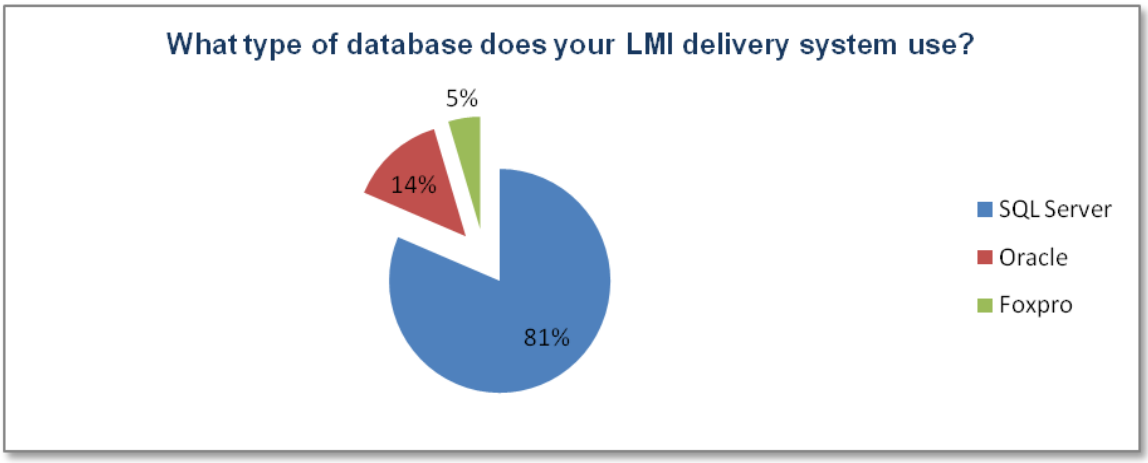


Figure 4: User Defined Queries

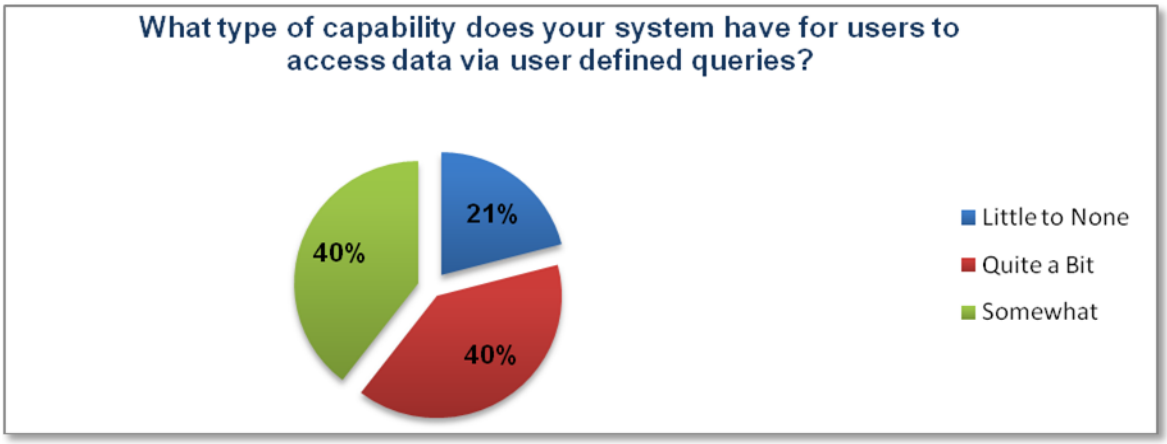


Figure 5: System Capability to dynamically graph data

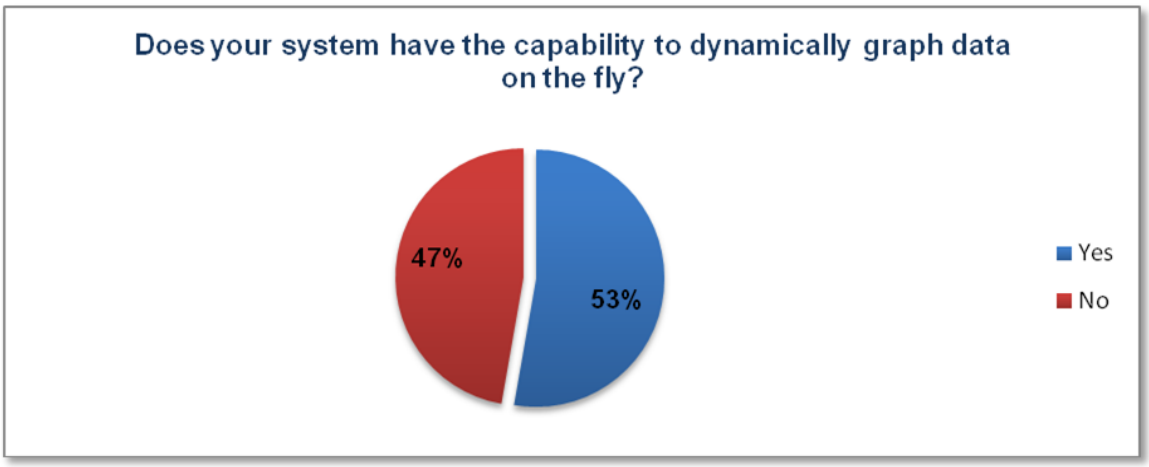


Figure 6: Ability to create user defined geographic areas

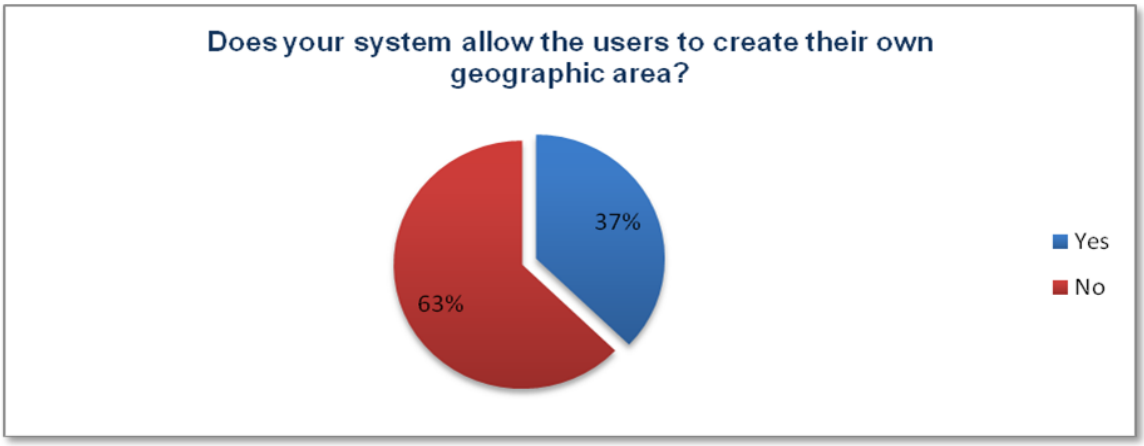


Figure 7: Mapping capabilities of system

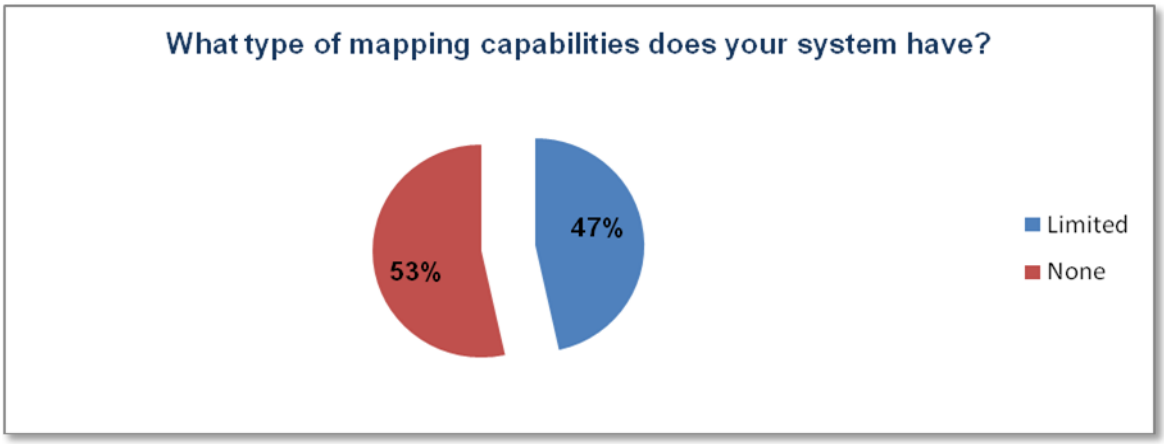


Figure 8: Utilization of new technologies to display data

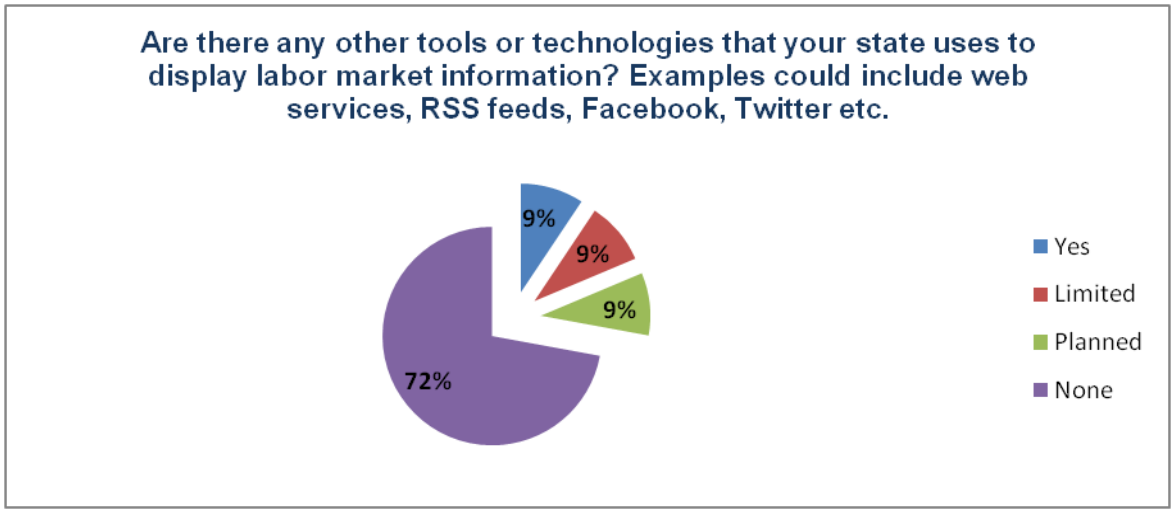
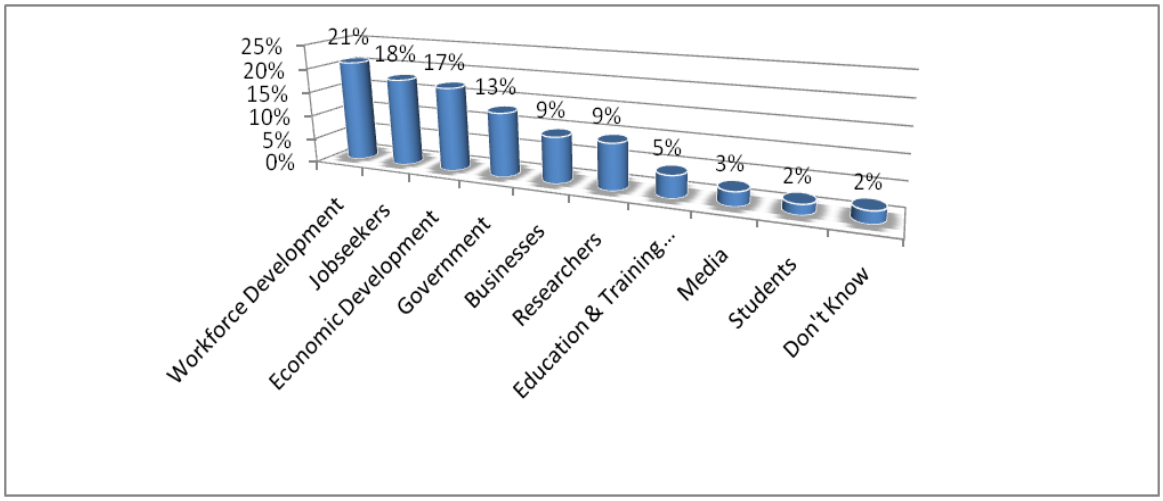


Figure 9: Top Customer Groups of LMI



KEY CONCLUSIONS

- Almost 60% of responding states are utilizing a vendor-based product for delivering labor market information. The two dominant players are CIBER and Geographic Solutions, who both operate a Microsoft-based application. Most states have implemented these products as out-of-the-box solutions, although a few states have modified it extensively to suit their needs. Most states are also on a maintenance contract with these vendors which will make modification of code or integration of new features vendor dependent to some degree.
- Almost 42% of responding states are using a system that was developed in-house. While some states may have cost constraints in purchasing a new product, a major reason for in-house development seems to be a need for customization and perceived inadequacies in both current vendor products. However, with the exception of Indiana, Massachusetts and a few other states, most in-house developed LMI systems lack key functionality. Most of these sites are also integrated with their workforce development agencies to some degree.
- Over 80% of the labor market delivery systems seem to have user-defined querying capability in some form. This result does not reflect the robustness of the system or the data that the user is able to query - only that the system does possess some querying capability.
- Over 53% of labor-market delivery systems seem to have the capability to dynamically graph data, although most of them don't seem to have the capability of a robust graphing system. They normally include a graph or two without the ability to modify or display different types of graphs.
- Over 39% of the customers visiting labor market sites are workforce related and job seekers. This could be indicative of the recent economic trends and high unemployment rates.
- Over 72% of all systems do not use Web 2.0 technologies. Approximately18% use Web 2.0 to some degree, while 9% of states are in some form of planning to implement some Web 2.0 technologies, although it is not clear on how exactly they will be used.
- The overall outcome of the survey shows clear gaps in the current delivery systems which include dynamic graphing or mapping, access to multiple databases, user-defined querying capabilities and the option to view data across multiple states and platforms. The survey results match up to the key business drivers and problem statement that was identified in the original RFP and the need for this project assessment.
- Most participants in the survey expressed a requirement for customer-controlled delivery systems, visual presentation of data, simple easy-to-use systems (one/two-click options), Web services, better mapping and graphing interfaces, better methods for downloading information, and simple dashboards to display county/industry information. There was also some interest in owning or building a government/state-run system and not being vendor dependent.

FULL SOLUTION LMI PRODUCTS FOR STATES CONSIDERING NEW IMPLEMENTATIONS

The two major labor market information products that have nearly 60% of the total market share are CIBER's Workforce Informer and Geographic Solutions Virtual LMI products. Both of these products provide an end-to-end solution for delivering LMI including utilizing the ALMIS (America's Labor Market Information System, now called the Workforce Information Database) database. Both vendors have a stable history of developing and maintaining labor market information solutions, although Geographic Solutions also offers more comprehensive tools for integrating labor market information with other workforce development solutions.

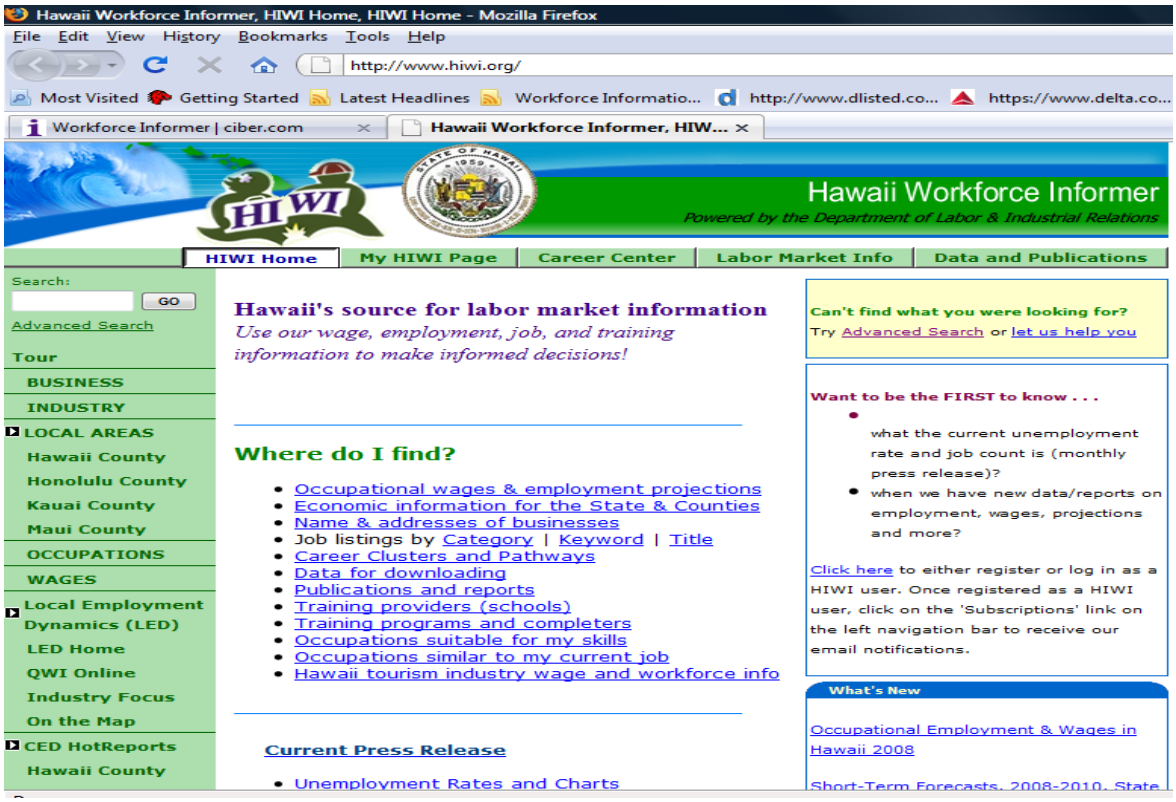
CIBER's Workforce Informer (http://www.ciber.com/state-local-government/workforce-informer/) solution is a leading LMI delivery solution in the United States. This product was an outgrowth of the ALMIS consortium effort of the mid-1990s to develop a prototype Web product for the states. It currently uses

Microsoft-based technology and industry-standard programming to provide a completely Web-based, searchable, ADA-compliant solution. CIBER's goal with Workforce Informer is to deliver a low cost of ownership by combining ease of deployment and management scalability with high-performance features. The features they specify are listed below along with an example from one of its state products.

Table 1: WI Product Features

• Multimedia presentations	• Career center and skills matching for students and job seekers
• Customizable reporting and graphing	• Job Central National Labor Exchange and America's Job Exchange and state job bank integration
• Categorized and ranked search results	• Industry and Occupational Profiles
• Site and Data Search capabilities	• Local area profiling and comparisons
• Occupational querying and reporting	• Data downloads
• Integration of O*NET data	• Based on WID database (previously ALMIS)

Figure 10: Hawaii WI Product (www.hiwi.org)



Virtual LMI (http://www.geographicsolutions.com/solutions_lmi.asp) is described by Geographic Solutions as a comprehensive, online system that offers a full range of services to all users. Virtual LMI uses the Workforce Information Database (WID) structure and is integrated directly into systems such as O*NET. The key features identified by Geographic Solutions include the following:

- Provides labor market information to individuals seeking jobs, training, and program information.
- Assists employers looking to recruit talent and assess the labor market.
- Helps providers to successfully promote their programs; and
- Allows LMI professionals to automate their work and more efficiently assist their clients.

Figure 11: Virtual LMI (http://www.wvlmi.com/)

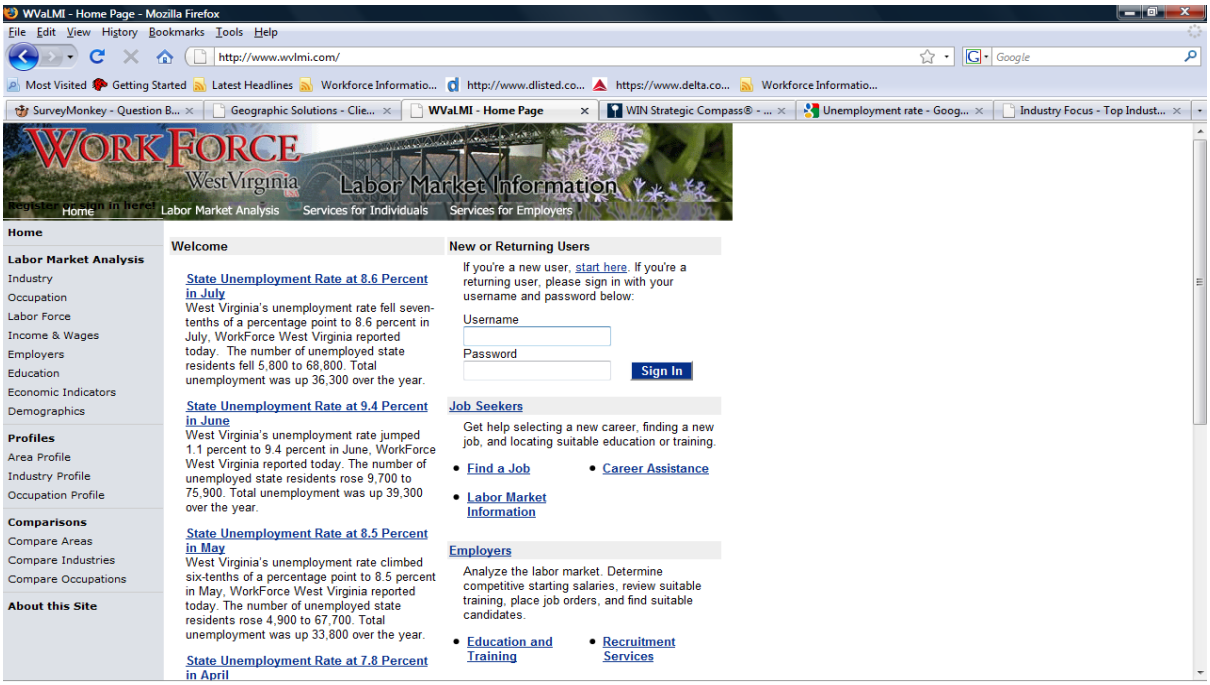


Table 2: Comparative Analysis of both products

Key Features/Business Drivers	Virtual LMI	Workforce Informer
Ability for users to create customized geographies	Yes	No
Mapping Capabilities. Thematic Maps	No	No
Graphing Capabilities	Limited	Limited to a few datasets
Customization of Graphs	No	No
Ability to retrieve data from multiple sources	Yes. Web services are used to retrieve job openings	Single data source. Web Services used to retrieve job openings
User-defined queries	Yes	Yes
Alternative means of receiving/downloading data	Excel downloads	Web Newsletters, text and excel downloads
Capability to access out of state data	No	No
Technology	Microsoft Platform	Microsoft Platform
Utilization of Web 2.0 Technologies	No	No
Other Tools	Uses ALMIS database, Proprietary Website Management and Data Management Services. Advanced Job Search Tool	Uses ALMIS database, Proprietary Content Management System and Data Management Services.
Costs	Product License + installation fees + maintenance costs	Product License + installation fees + maintenance costs

Notes: *While both products provide comparable features, Virtual LMI has made recent enhancements that provide significant new capabilities. They include the ability to access cross state data, a national job database with corresponding LMI and advanced graphing and mapping.*

EMERGING PRODUCTS FOR SUPPLEMENTING LMI DELIVERY SYSTEMS

The following products provide partial or supplemental solutions for labor market information delivery. While these products vary in capability, they should be viewed as additional means of delivering labor market information.

EMSI (Economic Modeling Specialists Inc) has a suite of products that provides workforce data as well as economic forecasts. The suite of products is very modular and can be integrated easily. Their LMI product, Strategic Advantage (http://www.economicmodeling.com/webtools/), is a Web-based analysis platform for regional workforce and economic research. EMSI states that Strategic Advantage integrates data from over 90 data sources to help make informed decisions to influence the positive growth and development of a region

Key Features Cited by EMSI:

- Sources carefully selected for users' needs
- 90+ official state and federal databases and growing
- Based on official, published data from BLS, BEA, Census, and other agencies
- Sophisticated data processing algorithms harmonize data sources, remove suppressions, and enhance geographic detail
- Easy integration for custom geographies
- Multiple data crosswalks allow advanced analysis

Strategic Advantage, which is an EMSI labor market product, consists of the following modules:

- Economic Forecaster - Industry, occupation, and demographic analysis by state, county, ZIP or MSA
- Economic Impact - Input-output modeling, economic base, gap analysis, and cluster analysis
- Career Pathways - O*NET job skills analysis, career transitions, dislocated worker strategy, and regional human capital analysis
- Educational Analyst - Region's postsecondary educational offerings in relation to labor market demand
- GIS - Custom mapping system to visualize labor market analysis on a map

Figure 12: EMSI Strategic Planner

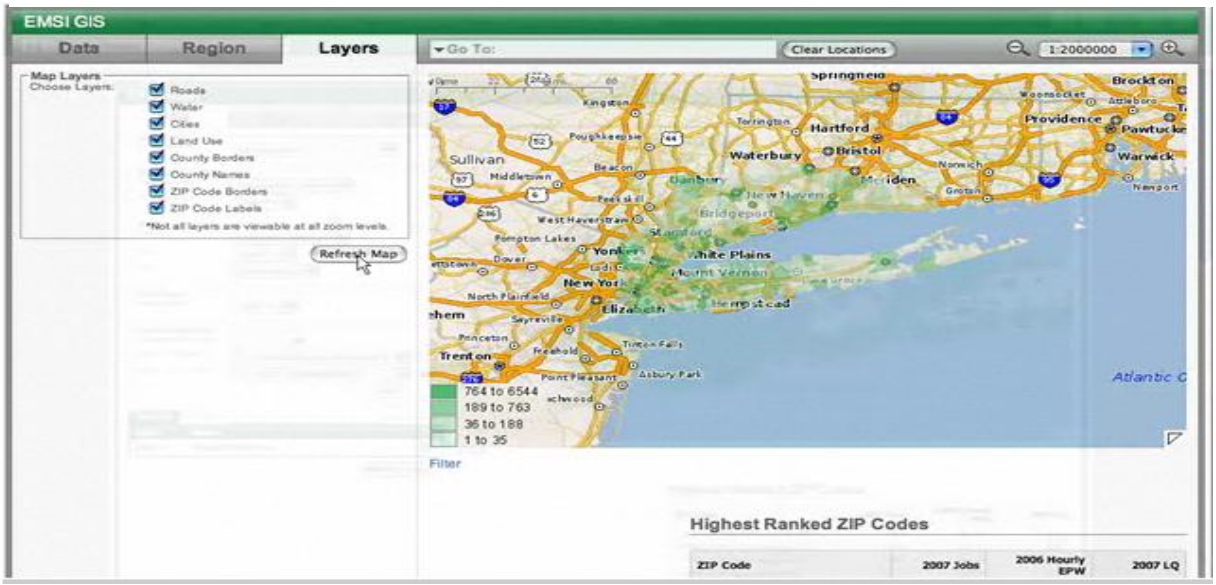


Table 3: EMSI Strategic Advantage Key Features List

Key Features/Business Drivers	EMSI
Ability for users to create customized geographies	Yes - Ability to create MSA regions and other custom areas – Comparison from state to state
Mapping Capabilities. Thematic Maps	Custom GIS system
Graphing Capabilities	Extensive Graphs
Customization of Graphs	Yes
Ability to retrieve data from multiple sources	Yes
User-defined queries	Yes
Alternative means of receiving/downloading data	Word, Excel, pdf, PowerPoint
Capability to access out-of-state data	Yes - Incorporates 90 publicly available state and federal data sources - Provides automatic update of data
Technology	PHP/My SQL
Utilization of Web 2.0 Technologies	No
Other Tools	GIS - Does not use the WID database
Costs	Licensing by user/seat -Current model does not allow for state-wide licensing

Notes: Strategic Advantage utilizes a handful of publicly available data, displayed in graphical format with summary-level reporting. While the product is widely used at the local level, some states have raised questions regarding the accuracy of the data and the usage of such a product at the state level. However this product could be viewed as a supplemental means of delivering data.

DataWeb (http://dataferrett.census.gov/index.html), which has been developed by the Census Bureau, brings together, under one umbrella system, demographic, economic, environmental, health and other datasets that are usually separated by geography and/or organization. The Census Bureau markets DataFerrett as a unique data mining and extraction tool. DataFerrett allows you to select a data basket full of variables and then recode those variables as needed. Tables can then be developed and customized. Selecting results in table allows a chart or graph to be created for a visual presentation into an html page. DataFerrett is JAVA-based software that ferrets out data from The DataWeb. The following report is being displayed using the Data Ferret to extract multiple sources of data and display it via a Web interface.

Figure 13: Hot Reports from Census

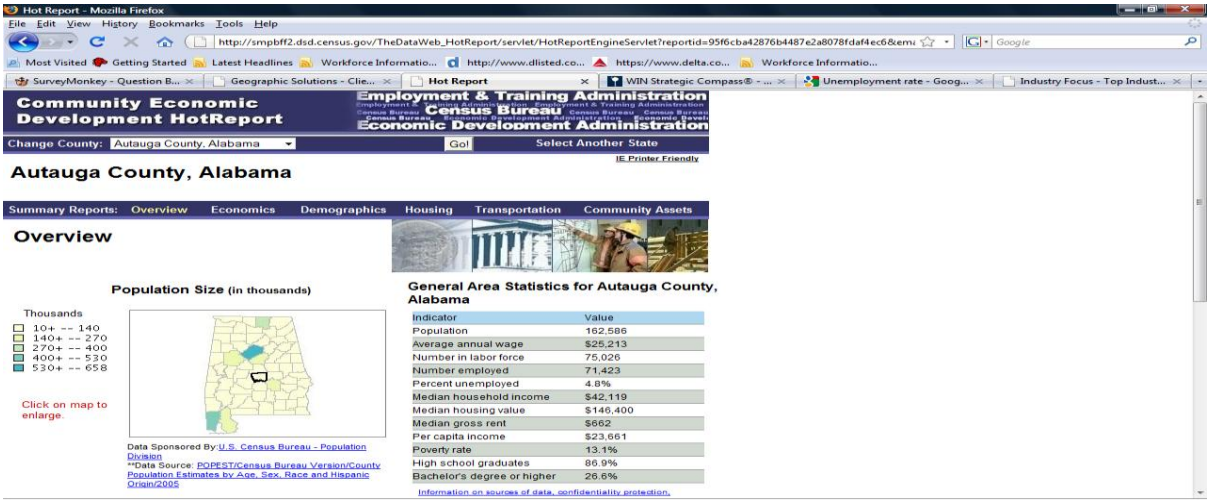


Table 4: Census (Hot Reports) Feature List

Key Features/Business Drivers	Census (Hot Reports)
Ability for users to create customized geographies	Yes - Only counties and WIRED regions possible
Mapping Capabilities. Thematic Maps	Yes - Thematic maps available
Graphing Capabilities	Yes - Extensive Graphing
Customization of Graphs	Limited Customization
Ability to retrieve data from multiple sources	Multiple data sources using Web services
User-defined queries	No
Alternative means of receiving/downloading data	No
Capability to access out-of-state data	Yes - Has nationwide data at county level and WIRED regions
Technology	The Data Web Server is made up of a set of Web services. The Web services are designed to work with all operating systems, and with all or nearly all databases and GIS servers
Utilization of Web 2.0 Technologies	Yes
Other Tools	Extensive use of Web services - Does not use the WID database but can
Costs	Free

Notes: Hot Reports provides an excellent example of using Web services for extracting demographic, economic and other datasets. While this can be used as the framework for developing a LMI system, the actual product in its current form is not an LMI product. The Web services framework and technology can be used as the basis for building a state LMI system.

Strategic Compass is a web-based tool developed by Worldwide Interactive Network (WIN) for assessing and aligning workforce indicators with state and regional economic trends by providing one-stop access to economic trend data, education and workforce data, and gap analyses between workforce supply and demand. Strategic Compass provides a comprehensive look at the characteristics, skill requirements, and current and projected supply and demand for occupations at the state and sub-state levels. WIN Strategic Compass identifies the current and future gaps between the skills of the incumbent/emerging workforce and the skills demanded by the regional industries to analyze what the skill needs are in the short term as well as to prepare for the future. The key features promoted by WIN include the following:

- An on-line service that can be accessed by multiple stakeholders interested in the economic well-being of a specific geographic region
- Assists workforce development boards with education and skills-gap analysis
- Helps to guide the integration of economic indicators, policies, programs, and related resources with a state or region's economic priorities through WIN Solution for Economic Development program
- Integrates indicator dashboards, economic analyses, strategic plans, and resource allocations aimed at improving the economy
- Dashboard and economic sections that provide graphic visualizations of wages, employment, labor inventory and industry-occupational info
- Education and career counseling sections help identify educational pathways that lead to employment opportunities including the following types of career planning analytics: career and occupation pathways, career ladders, college and career readiness, skills gaps
- Provides analytics and uses fusion charts
- Has information on green clusters and jobs in those clusters
- Uses Census Bureau, BLS, BEA and, GDP data; and private data sources such as Dun and Bradstreet, and economy.com

Table 5: WIN Strategic Compass Features List

Key Features/Business Drivers	WIN Strategic Compass
Ability for users to create customized geographies	No
Mapping Capabilities; Thematic Maps	No
Graphing Capabilities	Yes
Customization of Graphs	Very customizable
Ability to retrieve data from multiple sources	Yes - Uses US Census, BLS, BEA, GDP data; and private data sources for Dun and Bradstreet, economy.com
User-defined queries	No
Alternative means of receiving/downloading data	n/a
Capability to access out-of-state data	No
Technology	Java/Sun
Utilization of Web 2.0 Technologies	No
Other Tools	n/a - This product does not use the WID database.
Costs	Licensing by user/seat

Notes: WIN Strategic Compass utilizes publicly available data. As with the EMSI product, this can be used as a supplemental product in delivering occupational and career information.

Decision Data Resources markets itself as a leading provider of business and market intelligence solutions through the Web-based GIS application Decision Data. Decision Data is a research solution designed to assist policymakers, economic development planners, workforce analysts, and other regional stakeholders in the assessment of their region's innovation capacity, and to benchmark that capacity against those of other regions in the United States. The main features they note are listed below:

- LMI aggregated from county data
- Customizable maps and graphs
- Capability to use WIRED (Workforce Information for Regional Economic Development) regions
- Users can build custom reports with many variables
- Comparison of areas and benchmarking of counties data using NAICS (North American Industrial Classification System) data

Table 6: DDR Decision Data Features List

Key Features/Business Drivers	Decision Data Resources
Ability for users to create customized geographies	Yes
Mapping Capabilities; Thematic Maps	Yes - Customizable Thematic Maps
Graphing Capabilities	Yes
Customization of Graphs	Very customizable
Ability to retrieve data from multiple sources	Yes - All data resides on their servers since the software is Web based.
User-defined queries	Yes, to some degree
Alternative means of receiving/downloading data	n/a
Capability to access out-of-state data	No
Technology	Proprietary software developed by DDR and its partners - All data resides on DDR servers
Utilization of Web 2.0 Technologies	No
Other Tools	n/a - This product does not use the WID database
Costs	Licensing by user/seat

Notes: DDR has advanced mapping at the county or lower level. Additionally it utilizes WIRED regions. However, this product can only be used as a mapping tool for delivering labor market information.

Perspective is an OLAP (Online analytical processing) solution suite developed by Beyond 20/20 Inc. that utilizes Microsoft technologies for Web-based analysis and visualization of data. Perspective integrates browser, OLAP and relational elements, and offers a one-stop OLAP solution.

Perspective enables users to access and analyze multi-dimensional data on the Web using an intuitive, zero-footprint browser. Little training is required to navigate data using hierarchies, textual searches, and dimension selections.

Beyond 20/20 promotes the following features of its product:

- Predefined and ad-hoc reporting
- Tabular and graphic displays
- Ad-hoc calculations
- Sorting, ranking, filtering, and exception highlighting
- Nest and drag-and-drop data manipulation
- Intuitive drilldown and drill through
- Extensive descriptive metadata, including footnotes and summaries
- Download to XLS, XML, CSV, and CUB
- Multi-level security access

Figure 14: Beyond 20/20 Perspective Product: Vermont Dept of Public Safety

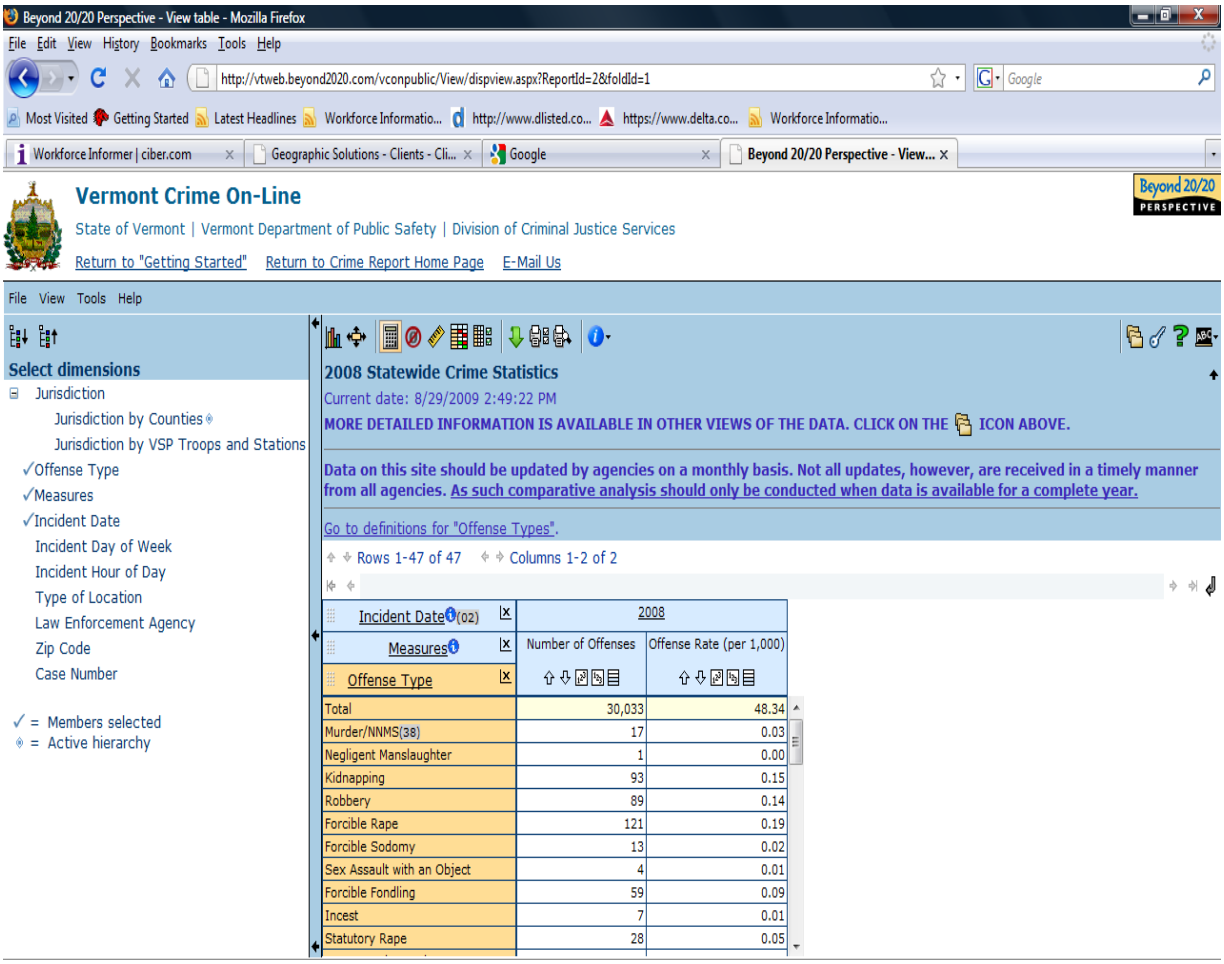


Table 7: Beyond 20/20 Perspective Features List

Key Features/Business Drivers	Perspective
Ability for users to create customized geographies	No
Mapping Capabilities; Thematic Maps	Unclear at this time
Graphing Capabilities	Yes
Customization of Graphs	Customize layouts of charts and tables by using drag-and-drop
Ability to retrieve data from multiple sources	Yes, can talk to relational database (Oracle, SQL server), or flat files
User-defined queries	Yes, extensive ad-hoc reporting and analysis
Alternative means of receiving/downloading data	Download to XLS, XML, CSV, and CUB
Capability to access out-of-state data	No
Technology	Microsoft SQL Server, Analysis services, IIS, Windows Servers
Utilization of Web 2.0 Technologies	No
Other Tools	Online Analytical Processing tools
Costs	Licensing by user/seat

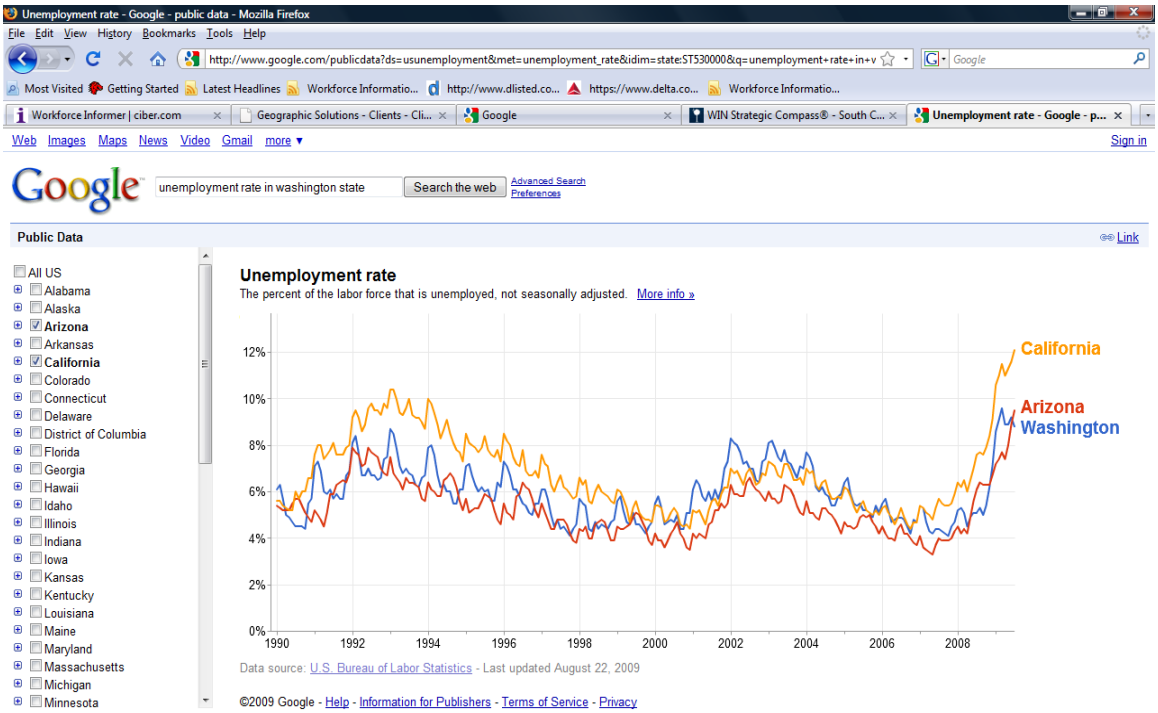
Notes: The Perspective product can take any dataset and display it on the Web. The product is not specific to LMI; however it can function as a back office data warehouse tool. The product sits on top of SQL Server and could provide ad-hoc reporting to data that may be used for special requests reports.

STANDALONE PRODUCTS SUCH AS GOOGLE GRAPHING AND SQL SERVER WEB SERVICES CAN EXPOSE AND VISUALIZE DATA TO A LARGER AUDIENCE

Google graphing using Google Chart API and the Google Visualization API and SQL Server using Web services provides a free and robust solution for accessing and displaying LMI over the Web for public consumption. In simple terms, these are solutions that can be implemented in the short-term for displaying complex data with complex charts on the LMI website.

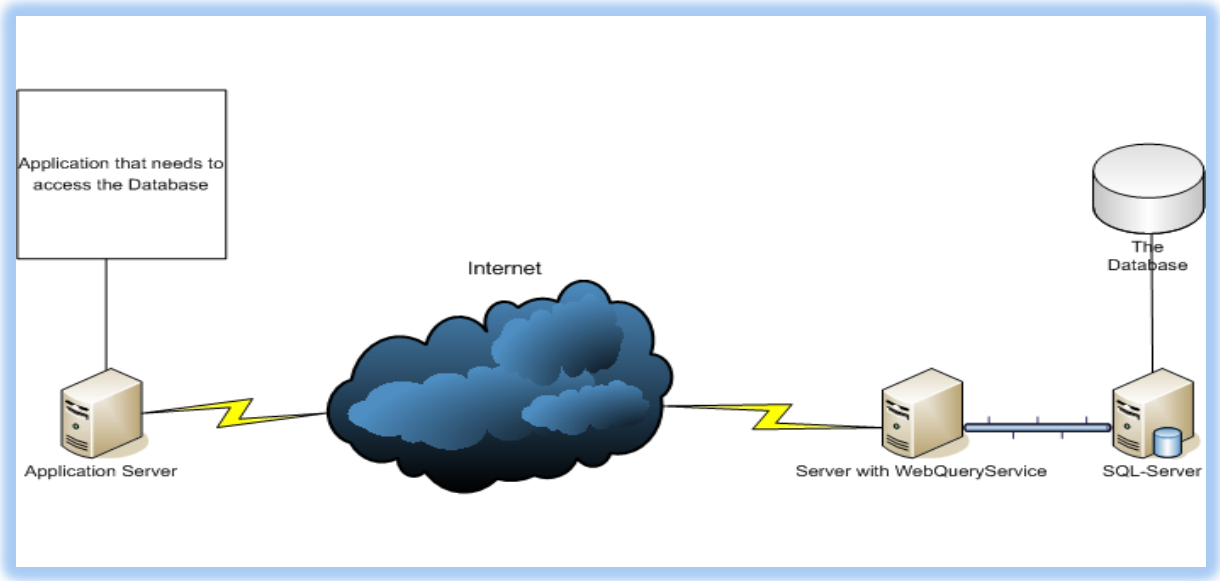
The Google product provides the ability to access multiple sources of structured data that can be displayed by choosing from a large selection of graphs. Google enables you to expose your own data, stored on any data-store that is connected to the Web. Thus you can create reports and dashboards as well as analyze and display data. It also allows you create graphical dashboards and distribute it to a large audience over the Web. For example, a state LMI delivery system could use the labor force or unemployment data and display it in graphical format on the state website or elsewhere using the Google product.

Figure 15: National Unemployment Rate using Google Graphing



SQL Server with Web services now enables LMI to be shared and be utilized as a service by a wide audience. With the utilization of SQL Server Web services, the user is exposed to the data directly. This means that LMI shops own the data as opposed to managing the format of the data. With Web services a local newspaper can pick up labor force data as a Web service and manage the format and display of the data. Since most of the LMI is already in SQL Server, this is a low cost solution for sharing data with other states as well as a wide variety of consumers. This method provides an alternative means of delivering data that may not necessarily be published on the LMI website.

Figure 16: SQL Web Services



WEB 2.0 HAS CHANGED THE DYNAMIC OF THE CUSTOMER EXPERIENCE WITH THE WEBSITE

Web 2.0 technologies in essence have defined the second generation of Web development and Web design. Additionally, Web 2.0 applications facilitate communication, information sharing, interoperability, user-centered design and collaboration. These functions are very applicable to the delivery of labor market information across multiple geographies, datasets and platforms. Web 2.0 technologies not only enable extraction and syndication of data, but also drive a new means of interaction between users and Websites. As new customers come into the LMI system with more experience with Web-based technology, it will become imperative that the system as a whole be reinvented to meet that challenge. Web 2.0 is a combination of conceptual and a few implementable solutions. The following table lists some key Web 2.0 technologies and its applicability to a LMI delivery system.

Table 8: Web 2.0 Technologies and LMI Functionality

Web 2.0 Technology	Description	Implementation Considerations

Keyword Search	• Ability to search a site thru keywords	• Utilization of Google's Search Engine
		  ○ With **Google Site Search,** you can create a search engine for your organization's websites and customize the look and feel
		  ○ With **Google Custom Search,** you can create a search engine for a single LMI website or a collection of LMI and other federal websites. This provides a means of sharing and extracting cross state data

RSS/XML	• RSS (most commonly translated as "Really Simple Syndication" but sometimes "Rich Site Summary") is a family of Web feed formats used to publish frequently updated works—such as blog entries, news, data headlines, audio, and video—in a standardized format. RSS Feeds has gained widespread usage in the last few years and as an accepted form of delivering data for most information delivery websites including newspapers.	• Low cost solution that can be implemented immediately. This also provides a viable means of expanding the LMI brand by syndicating the data to a wide variety of consumers. RSS feeds are a very practical way of sending data as it becomes available as opposed to responding to the same type of data request. Examples of data that can be send as RSS Feeds include:
		  ○ Jobs
		  ○ Unemployment
		  ○ Population
		  ○ Wage and Income
		  ○ Publications
		  ○ Occupational Data
		  ○ Industry Data
		  ○ Demographics
		  ○ Customized Feeds

Blogs and Podcasts	• A blog is simply a website maintained thru an individual or company with regular entries on news on a particular subject or commentary. A blog is a combination to text, images and other content. • Podcasts are content generally delivered over the web in audio format. Organizations often use podcasts to supplement their means of delivering information.	• Organizational and Corporate Blogs are used to enhance communication on a specific product. In the case of LMI, blogs need to be viewed strictly as a communication device. Since there are no editorials of data, blogs may not be relevant to the typical end user. However blog and blog related technology should be reviewed on state by state level. Podcasts are a more viable option than blogs for supplementing delivery of information. Again bandwidth, content and other items need to be taken into consideration before implementing a podcast solution

Web 2.0 Technology	Description	Implementation Considerations
WAP/PDA	• WAP which stands for wireless application protocol is another medium of delivering data. In essence this is content that is received on a cell phone instead of a computer. The format of the content needs to be managed due to the size of the device. Most large retail organizations use WAP to provide regular updates on new products and services including the use of text messaging.	• Delivering information via a phone or PDA device again may not be suitable for the typical consumer of LMI. However as the delivery system tries to attract future customers, delivering data via this method should be considered. The same information that is being delivered via RSS feeds can be delivered in this mode as well. Most of this data has to be summary level information which will guide the user to the primary LMI website for additional information

Social Media (Facebook/Twitter)	• Social Media is a buzz word which can be interpreted in several means. In simple terms social media is content that is user or consumer generated. This content can be in form of a blog, image, video or other means. The two most popular social media website are Facebook and Twitter, both of which promote communication between users and a group of users.	• Facebook has limited usability for delivering LMI information unless the goal is create a fee for service model. Several companies have done this by delivering information thru a Facebook specific application. The primary goal of a Facebook application is to build brand, which again may not be applicable to LMI delivery.
		• Twitter on the other hand is an advanced version of a RSS feed. There are practical uses for Twitter, specifically for delivering information that is repetitive and is being constantly updated. Specifics uses for LMI are:
		  • Monthly employment rate
		  • Jobs

WEB SERVICES: PROVIDING LMI APPLICATIONS A DIFFERENT WAY TO PUSH AND PULL DATA

Web Services simply provides a means of extracting and publishing data without dependence on vendor software, language or location of the data. Web services are self-describing, requiring no prior knowledge on the part of the users. Web Services allows the data providers to focus on the data quality and content and places less emphasis on the format and delivery of the data. It also provides a means via the Web to expose your data regardless of technology to a wide variety of consumers and users including other states. Web Services and Web services protocol originated in 2003, although there is more acceptance and usage today. Web Services also allows loosely coupled applications that can scale and evolve together as needed. The following table lists some key datasets and corresponding customers for using Web services.

Data	Customer Base	Web Service Description
CPI	• State and Local Workforce Agencies	• Monthly CPI data with comparisons to previous month and year can be shared at national and regional levels. The State and Local agencies can consume this data and render it as tables or graphs on the LMI web sites or put them up as RSS feeds.
Unemployment Rate	• State and Local Workforce Agencies • Media • Employers	• Web Service could include current unemployment rates for national, states and historical highs/lows, Over-the-month change and over-the-year change in unemployment rates for states
Occupational Wages, Occupational info	• Job Seekers • State and Local Workforce • Economic Developers • Employment Counselors	• State and Regional Wage information for occupations can be shared by the state/BLS as Web services • Popular occupation/career info such as wages (including high wage occupations), employment projections (including fastest growing occupations), In-demand occupations, green jobs, industries of employment by occupation are examples data that can shared using Web services
Industry and Employment	• Workforce Development Professionals • Businesses • State and Local workforce agencies Analysts and Researchers	• QCEW data such as State and County average employment, total wages, average wages, and business establishments by industries can be shared as Web services. Additional datasets can include Industry employment projections (including fastest growing industries) by state and regional levels

LMI CUSTOMERS ARE READY FOR A NEW MEANS OF INFORMATION DELIVERY

In addition to surveying LMI systems select customers were also identified to determine types of data and technologies that are being used at the local level. Two states were randomly selected to participate in this focus group along with a sample cross-section of typical LMI customers. The following section summarizes the results of the focus groups:

- The groups surveyed have similar customers to the state labor information office. They also carry a large customer base of job seekers. The customers the Workforce boards identified include employed and underemployed workers, dislocated workers, local and established businesses, youth and low income families.
- The groups surveyed are also using the state's labor market information product as a primary means of accessing workforce information. However, they supplement this information with a wide variety of products ranging from public sources such as BLS and BEA to private data sources such as Dun and Bradstreet, EMSI and ESRI.

- The data or datasets that seem to be commonly used are employment, unemployment and occupational data. Again, these topics have probably received even more emphasis during recent economic conditions.
- The groups surveyed not only consume workforce data but also manipulate and pass it on to their customers via newsletters, reports, websites and partners.
- Survey results indicate a real interest in technology enhancements to the current method of workforce information delivery including subscribing to data feeds, advanced querying, automatic data update notifications, advanced search functions and PDA-based applications for job seekers.
- Survey results indicate a need for real improvement in the current workforce delivery systems including creating trending data (data that tells a story instead of raw data), more interactivity, visualization of data, consolidation of granular data and simple intuitive, easy-to-use tools.

STATES' BEST PRACTICES IN DELIVERING LABOR MARKET INFORMATION

Several states including Indiana, Oregon and Washington have incorporated Web 2.0 technologies and other cutting-edge technologies to deliver and supplement their traditional means of information delivery. The following section cites some best practices in the delivery of labor market information across the country.

Table 9: States' Best Practices for Delivering Information

State	Best Practices
Indiana	• **RSS Feeds** used for demographics, income and wages and industry data • Podcasts/ITunes – Career Guides, Hot Jobs, County Highlights • **Use of Podcasts:** Indiana Career Guides 2007: Skill Pathways for the Future • **Use of Video** – Strategic Skills Initiative • Considerable graphing with county profile – limited customization of graphs • URL: http://www.hoosierdata.in.gov/
Oregon	• **Blogs, RSS, Flex, Share** for delivery workforce and economic information (http://oregonemployment.blogspot.com/) • **Dynamic generation of graphs** for Industry, employment, earnings and firm's data. Limited capability to customize graphs
Washington	• Utilizes **Web services** to access job orders and share wage and projections data to state workforce board • County **Dashboard** – Customized application dashboard of core data in graphs representations with time series (https://fortress.wa.gov/esd/lmea/countydashboard/)
Others	• Montana Dept of Labor and Industry – **Podcasts** to deliver monthly LMI stats • Nebraska Workforce Development – Planning on using **Twitter** to announce LMI releases

APPENDIX A: THIRD-PARTY SOFTWARE SPECIFICATIONS

The following lists third-party software that can be utilized by states as add-on tools to their existing systems. These products are intended to supplement existing systems for business intelligence, graphing, mapping, and extracting data. While there are other tools, these are some of the leading-edge products available for graphing, mapping and business intelligence needs for most customers.

GRAPHING TOOLS

Three of the primary graphing tools are Corda's PopChart, Google Visualization and Infragistics. The following sections and table provide a brief description of each product and comparative analysis by feature.

Table 10: Graphing Tools

Vendor	Tool	Description
Corda	• PopChart	• PopChart is a solution for server-based charting and graphing. PopChart is a scalable data visualization solution designed to securely deploy interactive charts and graphs to high-demand enterprise Websites for analysis and decision support. Corda offers two versions, PopChart and PopChart Enterprise.
Google	• Visualization API (Application Programming Interface)	• The Google Visualization API accesses multiple sources of structured data that can be display, choosing from a large selection of visualizations. Google Visualization API exposes customer data, stored on any data-store that is connected to the Web, as a Visualization compliant data source. The Google Visualization API also provides a platform that can be used to create, share and reuse visualizations written by the developer community at large.
Infragistics	• WebChart from NetAdvantage	• The WebChart control from Infragistics NetAdvanatge for Microsoft ASP.NET is a solution for data visualization, to create and customize various chart types such as line, bar, area or pie charts. The WebChart provides a custom wizard to design composite charts with simple or advanced graphics.

Table 11: Graphing Tools Comparison

Criteria/Product	Corda Popchart	Google Visualization API	Infragistics
Main features	✓ Platform Independent, FLASH animations ✓ Works with most of the Web application servers ✓ Output in PDF and EPS for clean, crisp printed reports ✓ 508 compliant, customizable charts and graphs	✓ Platform Independent ✓ Embed visualizations directly into customer's website ✓ Create dashboards and reports ✓ The API can access any compliant server-side data source	✓ Easily create and customize 2D and 3D charts ✓ .NET integration only ✓ Flexible controls for developers ✓ Custom wizard for design ✓ Use advanced Graphics for high quality visualizations

Criteria/Product	Corda Popchart	Google Visualization API	Infragistics
Easiness to integrate	Integrates into Web browser solutions No need for proprietary plug-ins. Uses ActiveX controls or java applets. Easy installation with convenient interfaces for all formats	Might need considerable development work to produce graph and dashboard reports	Will need development work to produce graph and dashboard reports
Dashboard ready	No	No	No
Platform Independence	Platform Independent, no proprietary browser plug-in required	Platform Independent	Microsoft
Connect to any data source	Connects to virtually any data source, from databases to spreadsheets	Microsoft SQL Server, any ODBC data source	Microsoft SQL Server. No specific mention of data sources
Scalability	Highly scalable, server-based product Clustering support for high-demand environments and optimum uptime	No particular information on scalability	Build Web-based user experiences with stability, performance and robustness.
Charting	Interactive, customizable charts, graphs	Composite Charting and graphing abilities	Composite Charting, Advanced Graphics
URL	http://corda.com/graph-and-chart-software-comparison.php	http://code.google.com/apis/visualization/	http://store.infragistics.com/Default.aspx?Category=NetAdvantage+for+.NET+%2b+WPF
Licensing	Single CPU pricing and Enterprise	Not necessary	Developer License, comes with priority support also
Pricing	Single CPU pricing PopChart $2,495 PopChart Enterprise $6,495	No cost/free	NetAdvantage for Web Client 2009 Volume 1 w/Priority Support $1,490.00
Tech Specs	Windows JSP Servers Apache .NET ColdFusion	Java-script based so can work with any Web application server	Microsoft® Windows® Vista, XP, 2000, Server 2008, Server 2003
Additional Notes	Works with virtually any Web application server Web services ready with XML SSL technology for security Clustering support for high-demand environments and optimum uptime	Can Analyze and display data through many available visualization applications.	508 compliant with the accessibility rules
Existing clients sample	✓ Oregon, Washington, Ohio, WI States	✓ Commercial Clients	✓ Washington

DATA ANALYSIS/BUSINESS INTELLIGENCE TOOLS

Three of the primary graphing tools are Corda's CenterView, Tableau Software and SQL Server Reporting Services. The following sections and table provide a brief description of each product and comparative analysis by feature.

Table 12: Data Analysis Tools

Vendor	Tool	Description
Corda	• CenterView	• Corda Centerview is Performance dashboard and visualization software with built-in business intelligence that can talk to a variety of data sources and enterprise standards such as Java, J2EE, .NET, XML and Web services. CenterView's design tools help with prototyping, cloning and deployment through a variety of standard maps, charts and gauges. It is scalable with centralized administration, security and management.
Tableau Software	• Tableau Desktop and Server	• Tableau Server is Business Intelligence software that can share live, interactive data visualizations such as dashboards and reports over the Web and can scale to large data sets. Tableau views can be embedded in Web apps such as SharePoint with just the URL.
Microsoft SQL Server	• Reporting Services	• Microsoft SQL Server Reporting Services is a server-based enterprise reporting environment, managed through Web services, that delivers a variety of interactive and printed reports. It comes with a SQL Server Business Intelligence development studio that can talk to multiple data sources. It supports ad-hoc reporting with the Report Builder that uses a user-friendly business query model.

Table 13: Data Analysis / Business Intelligence Tools Comparison

Criteria/Product	Corda CenterView	Tableau Software	SQL Services Reporting Services
Main features	✓ Can Build Powerful performance dashboard and visualization software with built-in Visual business intelligence ✓ Collects data from virtually any data source ✓ Presentation in Web-based browsers or mobile devices. ✓ CenterView 3.0 is JSR168 Compliant. CenterView content can be integrated as a Microsoft® SharePoint™ Web Part	✓ Business intelligence software that provides browser-based analytics ✓ Publish interactive and dashboard visualizations to the Web, including SharePoint ✓ Combine different databases into a single view. ✓ Drag and drop features for analyzing data quickly and easily	✓ Enterprise Reporting: ✓ SQL Server Business Intelligence development studio for designing reports ✓ Familiar design tools. ✓ Support for multiple data sources Personalization ✓ Ad-hoc Reporting using Report Builder ✓ Embedded Reporting
Easy to integrate	Integrates into Web browser and mobile devices	Easy deployment and maintenance	User friendly design tools for developers

Criteria/Product	Corda CenterView	Tableau Software	SQL Services Reporting Services
Dashboard ready	Yes	Yes	No
Platform Independence	Platform Independent	Microsoft® Windows® Vista, XP, 2000, Server 2008, Server 2003	Microsoft
Connect to any data source	Connects to virtually any data source, from databases to spreadsheets	No mention of it	Microsoft SQL Server as well as multiple data sources
Scalability	Highly scalable, server-based product Clustering support for high-demand environments and optimum uptime	Scales to large data sets	Highly Scalable
Business Intelligence/ Analysis tools	Built-in visual business intelligence tools for example to help an organization's performance management	Business intelligence software that can represent multidimensional data, explore, segment, pivot data, and provide browser-based analytics	SQL Server Business Intelligence development studio, Ad-Hoc Reporting using user friendly Report Builder
Charting	Interactive charts, customizable graphs and maps, performance mgt tool, easy-to-use dashboard	provides interactive data visualizations such as charts and graphs, dashboards, reports and workbooks	Through Web services, delivers a variety of interactive and printed reports
URL	http://corda.com/centerview-faqs.php http://www.corda.com/corda-executive-software-pricing.php	http://www.tableausoftware.com/products/server	http://msdn.microsoft.com/sqlserver
Licensing	Enterprise	Desktop and Server editions - Also Interactor licenses to people who want to interact and customize the views and viewer licenses to people who just want to view and monitor	Enterprise, Standard editions.
Price	Need to contact company	Desktop Professional Edition $1800 per named user Tableau Server – need to contact company	Enterprise Edition: Processor Pricing Retail $24,999 Server Plus CAL Pricing Retail $13,969 with 25 CALs Standard Edition Processor Pricing Retail $5,999 Server Plus CAL Pricing Retail $1,849 with 5 CALs http://www.microsoft.com/sqlserver/2008/en/us/pricing.aspx
Tech Specs	Windows Mac UNIX or Linux compatible systems JDBC or ODBC drivers for database connectivity	Microsoft® Windows® Vista, XP, 2000, Server 2008, Server 2003	Microsoft Windows Platform
Existing Clients sample	✓ Monster, Arizona State University and other commercial clients	✓ City of Charlotte, Jacksonville State University	✓ Large # of commercial and public sector clients

MAPPING TOOLS

Two of the primary mapping products are Corda's OptiMap and ArcInfo. The following sections and table provide a brief description of each product and comparative analysis by feature.

Table 14: Mapping Tools

Vendor	Tool	Description
Corda	• OptiMap	• Corda OptiMap, a server based mapping solution, can be used to create geographical maps and visualizations to your dashboard. It also supports spatial formats. Since the maps are database-driven, they are up-to-date as the database. It can talk to multiple data sources and can be supported by most Web application servers
ESRI	• ArcInfo Desktop, ArcGIS Server	• ESRI ArcInfo comprises of ArcView that is Desktop GIS software for visualizing, managing, creating, and analyzing geographic data. It has map templates for consistency. It helps build process models, scripts, and workflows to visualize and analyze your data. It reads, imports and manages data from multiple data types and formats demographics, Web services. It performs GIS data analysis, modeling and spatial analysis • ESRI ArcGIS Server is a solution to publish real-time maps over the Web. It centrally manages geographic data, providing better data security and integrity, while simplifying access to large volume of image resources. It extends GIS to mobile workforce. It supports a variety of data sources such as IBM DB2, IBM Informix, Oracle, Microsoft Access, SQL Server

Table 15: Mapping Products

Criteria/Product	Corda OptiMap	ArcInfo
Main features	✓ Server-based mapping solution that displays data in maps or spatial formats. ✓ Easy to use interface for creating maps. ✓ Visualize data that applies to an area or geographic region or map. ✓ Represent shapes within your dashboards. ✓ Predefined maps for U.S. states, U.S. counties Purchase additional maps such as U.S. zip code maps.	ArcInfo: Desktop GIS solution ✓ Perform GIS data analysis and modeling, spatial query ✓ Publish and convert data in many formats ✓ Generate high quality, customizable publication-ready maps ✓ Ready-to-Use Datasets and kits ✓ Use predefined map templates ArcGIS Server ✓ Publish fast, intuitive Web maps

Criteria/Product	Corda OptiMap	ArcInfo
		✓ Centrally manage geographic data; providing better data security and integrity ✓ Supports a variety of data sources such as IBM DB2, IBM Informix, Oracle, Microsoft Access, Microsoft SQL Server ✓ Access to large volumes of imagery resources; reduces storage costs and data processing overhead ✓ Extend GIS to your mobile workforce ✓ Supports Web services
Platform Independence	Platform Independent	Microsoft
Scalability	Powerful server-based mapping solution	Highly scalable
URL	http://www.corda.com/optimap-system-requirements.php	http://www.esri.com/software/arcgis/arcview/key_features.html http://www.esri.com/library/brochures/pdfs/arcgis93-functionality-matrix-list.pdf ArcGIS Online http://www.esri.com/software/arcgis/arcgisonline/arcgis_online_pricing_sheet.pdf http://nces.ed.gov/surveys/sdds/ed/index.asp?st=WA uses Online.
Licensing	Single CPU and Enterprise	Single-Use License and Concurrent-Use License A concurrent-use license allows multiple users to operate the software concurrently through a shared pool of licenses administered by a central license manager
Price	OptiMap Single CPU $2495 Enterprise $6495+ Compare OptiMap and OptiMap Enterprise	Single-Use License $1,500.00 Concurrent Use
Tech Specs	**Hardware** Processor - Equivalent of a Pentium 4 or higher Memory - Minimum 128MB dedicated to your Java Virtual Machine, 512MB recommended Hard Drive - 200MB free disk space **Operating System** Windows Mac UNIX or Linux compatible systems	Windows Vista (Ultimate, Enterprise, Business, Home Premium), Windows 2000, or Windows XP (Home Edition and Professional) Memory 1 GB RAM Processor 1.6 GHz
Existing Clients Sample	✓ Amazon, US Army etc	✓ Florida, Georgia, Minnesota, Virtual LMI Product

APPENDIX B: ADDITIONAL RESOURCES/REFERENCES ON DATA DELIVERY SYSTEMS AND IMPROVEMENTS OF DATA USAGE

Table 16: Additional Resource Websites

Source	Website
• American Sociological Association	• www.asanet.org
• Census Development and Dissemination of Data Products	• http://www.census.gov/ipc/www/catalog.htm
• ESRI GIS Software	• www.esri.com
• Geolytics	• www.geolytics.com
• Improving Access to Government through Better Use of the Web	• http://www.w3.org/TR/egov-improving/
• Instant Demographics	• www.buydemographics.com
• National Academies Press, Computers and Information Technology	• http://www.nap.edu/topics.php?topic=279
• New Data Center , Strategies for Today and Tomorrow	• www.searchdatacenter.com
• Nielsen Claritas and Nielsen Demographics 2009	• www.claritas.com and www.nielsen.com
• Office of Management and Budget, Statistical Policy Directives # 3 and 4	• http://www.whitehouse.gov/omb/inforeg_statpolicy/
• Policy Map	• www.policymap.com
• Role of demographic data in the operation of public policy, Springer Link	• http://www.springerlink.com/content/pp77325081h66830/
• Using Data to Improve Program Performance	• http://www.childwelfare.gov/systemwide/info_systems/program_improvement.cfm
• US Patent # 6477704, Method of gathering and utilizing from request-based media delivery system (see Patent Storm Web site)	• http://www.patentstorm.us/patents/6477704/claims.html