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Cover Sheet**

Title: War Room Team-Based Analysis

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Abstract

War Room Team-Based Analysis provides a new analytical paradigm for rapidly discerning trends and detecting anomalies thus leading to knowledge discovery. It furnishes a quick and low cost capability to “connect the dots”. This is achieved through the custom integration of “off the shelf” tools that are configured to mirror the analytical process and facilitate the flow of information. War Room Team-Based Analysis is based on two premises. The first is that collaborative teams of domain subject matter analysts working in conjunction with information technologists can often best accomplish complex analytical tasks. Tool experts focus on the collection, processing and formatting of the data. Powerful tools, which the typical analyst does not have the IT skill set to utilize, can thus be incorporated. The analysts on the team are able to focus more on the actual analysis and less on the collection and filtering of information. Through iterative interactions of analysis and IT an optimized tool suite can be quickly developed and fielded. The second premise is that in a team-based setting, not one tool or technology will satisfy all the analytical needs. Complex analytical processes or decisions require multiple tools to facilitate information flow. So the IT component of the team works closely with the analysts to configure and integrate the optimal tool suite to support the analytical effort. Effective collaboration includes the mix of people, tools and process. This approach has produced dramatic results for both government and commercial applications including intelligence, counterintelligence, counter terrorism, competitive intelligence, and market research and investment decision-making.

Text

Failure to Connect the Dots

After the horrendous events of 9/11, there has been a great deal of investigation and introspection as to why numerous agencies with myriads of databases did not provide enough forewarning of the tragic events to come. One commentator indicated that, “When the government collects monumental amounts of information, it may not be able to find anything it needs.... The problem they had (before Sept. 11) wasn’t in finding information, it was in analyzing information, and if they have more information they’ll have more analytic problems.”¹ It should be noted that there are a number of other recent major analytical failures in both government and industry. Some other failures to “connect the dots” include: not solving the anthrax case, the inability of investors to foresee the dot.com crash, and the failure by the scores of financial analysts, auditors, and business journalists to provide advance warning of the collapse of Enron.

The arrival of the information age, coupled with a rapidly changing environment, significantly increases the challenge to the government and corporations in analyzing disparate and unstructured data. There are a number of things that make this so. The first part of the challenge is due to the sheer volume of data potentially available through various sources, most notably the World Wide Web. The paradigm for most analytical activity (whether it is in the world of commerce or government) is based on the research activities of individual analysts. Typically, an analyst establishes a hypothesis, goes on the Web using a favorite search engine, or searches through an Open Source or proprietary database, either substantiating or detracting from the original premise. The more adept researcher may use a spreadsheet or other available tool to record and plot data. The reality is the analyst often spends much more time collecting, sorting, and filtering data than actually “thinking” and analyzing. Moreover, even a very efficient analyst will access only a fraction of the available information and may never see a key indicator.

In larger efforts, analysts may be part of an overall team or task force assigned to maintain awareness of an issue or region, or develop specific information to support decisionmaking. The team may meet to share findings and ideas, but most of the information has been developed through individual analytical efforts. This model of analysis is proving to be inefficient, particularly in critical, time-sensitive environments. Finally, the information age provides search, data management, and analysis tools with previously unimagined power. As such, current approaches to implementing these tools all too often fall far short of expectations.

There have been a number of initiatives by various governmental agencies and corporations to address these problems. The government has issued several requests for proposals (RFPs) and has awarded contracts to various research firms and academic institutions to develop turnkey

¹ Manjoo, Farhad; “Do Dots Connect to Police State?” Wired News; June 07,2002;
<http://www.wired.com/news/politics/0,1283,53037,00.html>

solutions that will provide enhanced analytical capabilities such as that derived from the “Total Information Awareness” and “Novel Intelligence from Massive Data” programs. These are typically high-risk, high-payoff research opportunities that could result in dramatically increased capabilities to “connect the dots” (i.e. discern trends and identify anomalies among various disparate databases). Such efforts often take several years before a useful technology is mature enough to be integrated within a “real-world” operational setting. The costs associated with this research are often quite expensive. Software developed through these programs may be developed by organizations that are more research focused and do not have the infrastructure or experience to maintain and support such tools for the long term. There is a litany of specialty-built analytical tools that have been tried out but then neglected by analysts due to their difficulty of use or the lack of technical support.

In the commercial arena there are a number of firms which specialize in providing customized and built business applications. The client is dependent on the one solution provider to provide the end-to-end capability. If the environment and the client’s need changes, or if better tools or techniques emerge, the system cannot readily adapt without major costs and restructuring. There are important needs which can be met, and contributions that can be made by both the R&D and customized business applications approaches. However, in order to meet the urgent needs of today, in both a timely and cost effective manner, we are promoting the War Room Team-Based Analytical approach as one viable option in helping analysts to connect the dots.

Analytical Transformation

We have been active in developing an approach to meeting these challenges that integrates high-end commercial software tools, modern hardware, and a new analytical paradigm. This paradigm is predicated on close collaboration between analysts and information technologists supported by current, off-the-shelf technology to provide real operational capability within a short time period. This rapid prototyping approach yields real results quickly, with the ability to provide increased capability and fidelity over time.

The Team-Based War Room Analytical approach is based on the premise that information technologists working in tandem with domain subject-matter experts can together develop a highly effective system within a rapid prototyping environment. Success in the team-based approach involves having information technology experts as part of the team who focus on the collection, processing, and formatting of the data. Thus, powerful tools, which the typical analyst does not have the IT skill set to master, can be utilized. Real-world analytical practicality can also be instilled with the IT staff by the subject matter analysts. This ongoing iterative process of IT and analytical team members working in concert helps to ensure a pragmatic and time-effective solution. A great body of research into collaboration has shown that the benefit of a sum total derived from an analytical team working together far outweighs the outcome derived from analysts working separately.

Typically in the team-based setting, not one tool or technology will satisfy all the analysts’ needs. Complex processes or decisions require multiple tools to facilitate information flow. As such, the IT component of the team works closely with the analysts to configure and integrate the optimal tool suite to support the analytical effort. Effective collaboration includes the mix of

people, tools, and process. There is also an iterative process between analysis and engineering. Improvements in one impact the other, and like the “Yin” and “Yang” must be managed in concert.

The War Room approach is to rapidly provide a seamless-as-possible flow of information between tools. These tools are off-the-shelf and commercially available so that a plug-and-play capability is achieved. The War Rooms will not become obsolete if technology evolves or the client’s requirements change. New tools can be added and exchanged. The War Room can also incorporate current analytical tools in use by a client.

The Team-Based War Room approach provides transformation in analysis so that analysts ultimately spend a lot less time on the collection and processing of information, and devote much more time to the actual analysis.

Current War Room Activity

Evidence Based Research, Inc. (EBR) is active in supporting several clients in War Room Team-Based Analysis. Current War Room applications include technology assessments and forecasting, competitive intelligence/market research, counterintelligence, and counter terrorism.

One War Room project enables analysts to effectively track, monitor, and forecast the market dynamics within a key technology sector. Knowledge of the key players, by both product and geographical segmentation, is essential to accomplish this task. The client’s analysts also need to be able to determine who may dramatically alter and shape the future environment. Discerning emerging technologies, and being able to identify who the first movers and early adopters are is also critical to performing this effort.

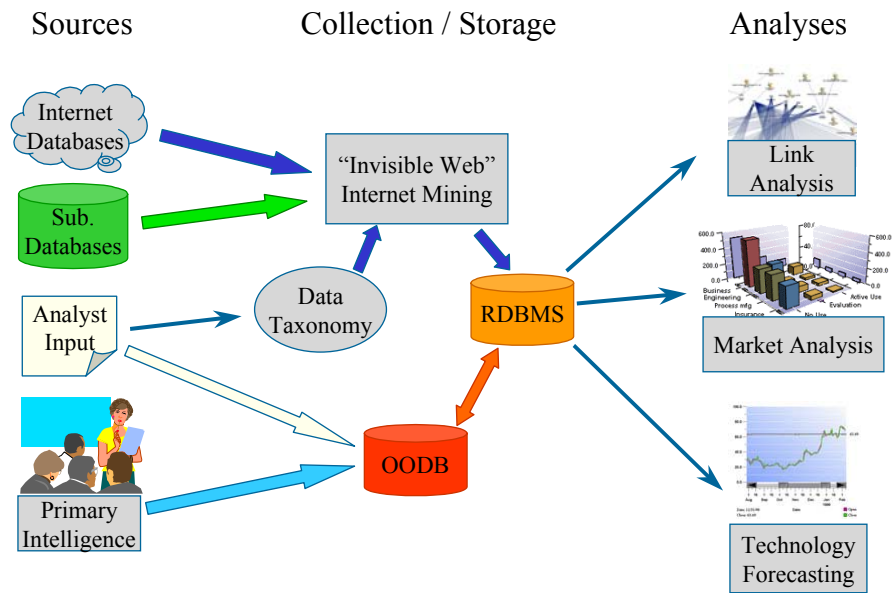
The project consisted of a series of sequential tasks in which the output of the proceeding task served as input into the subsequent task. The first task involved the development of generic market space characteristics, attributes, and metrics that could be used to measure and evaluate activity in all the relevant market sectors. This required the ability to identify and describe the key industry market characteristics. These characteristics comprise the activity and dynamics shaping and influencing the industry for which the analysts need to know in order to support the key decisions within the organization. This involves not only the determination of the market characteristics but also the associated metrics which enable an analyst to determine, weigh, and evaluate the status and situation of the given characteristic within the market place.

The second task involved determining the flow of information that would ultimately address the relevant market space characteristics and attributes and then “feed” the metrics in order to evaluate market activity. This involves identifying the types of collection activity including the use of search engines, intelligent agents, surveys and associated techniques, as well as the identification of informational sources that could be used to mine information that would “feed” the analytical tools used to address the metrics.

The third task consisted of the infusion of information technology. This involved the selection of specific tools, hardware, and software which transformed the information flow captured on paper into a digital format. The system needed to be able to perform the following basic functions:

1. Capture and collect data from varying sources;
2. Exploit information only available in what is being called the “Invisible Web”;
3. Structure and store the data so it is useful to analysis tools; and
4. Port the data seamlessly to various analysis and visualization tools.

This basic “modular” approach used off-the-shelf software tools that are then integrated together using an open architecture. This allowed the selection of specific tools that are needed as well as the ability to upgrade or change these tools as the state of the art advances. A top-level block diagram of system is shown in the figure below.



Top-level block diagram for Technology Market Analysis War Room

The fourth task involved the actual collection and processing of information on the market utilizing the tool suite. The fifth and last task involved an evaluation of the War Room's capability and utility. Several test case studies on real-world open source "live" data were conducted to determine whether the system could provide unique insight and enhancements over traditional modes of analysis.



View of War Room showing multiple displays of various collection and analytical tools.

Beyond approaching the project with certain technologies, it is important to create an environment in which team-based collaboration is easily fostered. The EBR team used a medium-sized room, in which several work stations were placed on one central table in the middle of the room. At the far end of the room, multiple screens were used to simultaneously display data and information. By using multiple screens, analysts were able to use several tools at one time, and simultaneously see the results in front of them. Other analysts in the room often joined the discussion, which provided added benefit for everyone on the team. Likewise, with several people working in one room, it was easy to ask questions or to listen to other problems in the room, and to learn from others quickly. Analysts working alone in a separate office all day are somewhat compartmentalized from this type of group-discovery, and are not able to benefit from a "circular" learning environment.

Using the War Room team-based method, we were able to come to some relatively quick decisions on market space, key players, and where the market was headed in a particular country. Our analysts had no previous knowledge of the subject going into the study, thus the team started at "zero" and had to learn quickly as they went along. In many ways, the team was successful because the analysts were using integrated tools. While one particular tool can be powerful for giving an analyst insight into a particular problem, it often only solves part of the real problem that's at hand. For this project, we used data extraction tools to pull the data that was relevant. This parsed data went into customized databases that our team developers created in-house. By having a relevant sub-set of information, we were able to create an organization and alliance database that was focused to the particular needs of our client.

Once the customized data was collected, we employed other off-the-shelf tools to perform link analysis and to display financial information data within a three-dimensional model. Single tools are often powerful, but are more useful when used in conjunction with other programs, to essentially create a “larger picture” of the situation. For this project, our developer created a Web interface on which all the data was stored. Information could quickly be found about a particular organization, allowing the analyst to drill down to specific types of information quickly. From this same interface, the analyst was able to launch the other analytical tools to continue to work on the problem in a more focused environment.

Using this approach, the time of which it takes an analyst to “get smart” on a topic is drastically reduced. Open source Web research is very broad, and it is often difficult to find a lot of relevant information quickly. By providing an interface with data that is specific to the problem at hand, analysts for our client were more successful at drawing conclusions and making relationships, while drastically cutting the time at which it took them to do so. In one instance, we gave them a case study with all of the relevant information. Even after being presented with many of the details, the client’s analyst was not able to replicate our results simply by searching on the open Web.

Case Study 1 – Knowledge Discovery

A number of Excel spreadsheets containing market share data on one technology product area were entered into the War Room database. This included market share by vendor, as well as sorted data by geographical area and time period. Using a visualization tool, which was able to provide 3-D circular images depicting market share size by vendor in geographical areas, our analysts were quickly able to spot an anomaly. One company had a small market share of about 5 % in all geographical areas except one area in which it had more than a 20 % share. This anomaly was detected within minutes. Eyeballing the data on the original spreadsheets would have taken an experienced analyst many hours to find.

This led our analysts to question why this company had such a large market share in this one geographical area. What was their strategy? Using the interface tool, the analysts ran queries on this company. The system already contained numerous articles and relevant data that had been automatically collected from the Internet from numerous open sources. This data had been previously binned, sorted, and stored for future use. The analysts discovered that this company had originally been funded as a start-up with seed money from a university located in the geographical area with the large market share. The company’s founders migrated to the Silicon Valley area and networked with other alumni from that university, who were now active in the technology venture capitalist arena. Successive rounds of financing enabled this company to quickly ramp up, allowing it to attract even larger capital. The company was able to return to its country of origin with a major operations activity, and a guaranteed market.

What the War Room Team-Analysis discovered was a business model that has been used for a number of key technologies. By following this business model, companies were able to leverage their ties to expertise and capital, in order to position themselves for quick market share in key geographical areas. What was amazing was that the time involved from the original discovery of the anomaly to detecting a business model was approximately two hours. The client's analysts using traditional data collection and analytical tools and techniques were not able to replicate these findings. They could determine the validity of the information by examining the sources of information, but they were unable to make the linkages and understand the dynamics (i.e. connect the dots) using their traditional approaches.

Case Study 2 – Relationship Linkage

A client had the urgent need to better understand the dynamics associated with a major infrastructure-rebuilding project. The infrastructure activity included replacing old materials and structures, and building completely new systems. In order to do all the work needed, many different contractors could potentially be used. Our task was to narrow down who the most likely players would be, determine who their key alliance partners were, and document their product lines. We were to determine which organizations could be feasible for certain segments of the infrastructure.

In order to figure out which companies had the capabilities to potentially be responsible for certain segments of the revitalization, we performed in-depth analysis of the companies' capabilities, technologies and products, current alliances and clients, corporate officers and board members, as well as current contracts. Many of the companies that we considered for the revitalization efforts were large conglomerates that encompassed many capabilities. Utilizing the War Room Analytic approach, it soon became clear which companies were the real players within a market segment and which companies were only "testing the waters" of that segment or had not yet developed a solid reputation or marketing capability for that particular technology.

Separate databases were established to house particular types of information. By doing so, we were able to farm particular pieces of data that were relevant, without including extraneous information that was not germane to our task. All of our information came from open source information, most of which was freely available on the Web. Key players were determined by their technology capabilities, gleaned from market study data and by news reports from various sources. We collected news articles, press releases, and other types of information from online sources that contained relevant information. The articles were downloaded and put into a customized database, which then essentially acted as a personalized search engine.

Utilizing a link analysis visualization tool we were able to quickly link prospective companies with their current alliance partners, as well as determine who might be viable partners. This enabled us to present to our client a good understanding as to the current landscape as well as providing a foundation of "what if" analyses in which to game possible scenarios.

Lessons Learned and the Way Forward

Our experiences as revealed in these case studies highlight that a War Room is not just simply the tools and technology that exist within its confines. It is the people, their interactions, and the total process, which is core to its character and attributes. War Room design is an art and science, and we learn more from each development and implementation. Truly effective War Rooms provide a structured and disciplined approach to analysis and decisionmaking. It is the team-based approach which generates the real success for the War Room.

There were some important lessons learned from these case studies, that should be incorporated when thinking about the design and planning of future War Rooms.

- The War Room is process driven. Understanding the client's needs and then capturing and mapping the analytical process and logic flow is key to its success. Selection of tools and hardware come after the process is clearly understood.
- The War Room is not a one-person tool or operation. Its real utility is as a facility to enable team-based thinking and decisionmaking. Much of its benefit is serving as a means for others to quickly gain comprehension and to develop a common frame of reference. It can also serve as an effective tool for team brainstorming.
- Establishing a team comprised of both domain subject matter analysts and information technologists is key to War Room effectiveness. The IT experts integrate custom-built databases with cutting edge software that aid the automation of data collection and processing. This leaves the analysts with more time to focus on data integration and analysis.
- A high degree of information density and lots of dimensionality are incorporated in the War Room utilizing advanced visualization techniques. These also include link analysis capabilities showing key relationships and interactions.

As we move into the future we are developing additional analytical capabilities, such as enabling visualization of aggregate data, showing activity over a period of time. The capabilities would also include a "drill down" functionality to enable the analyst to see details of individual events or view only a subset of the overall data to discern different patterns and trends. We are also incorporating predictive modeling tools and capabilities, some of which require human analytical "eyeballing", but other tools which will automatically detect anomalies and pattern shifts, and then alert analysts to these findings.

The War Room does not in itself guarantee success of a project, program, or activity. It is, however, a highly effective tool for team based collaboration, in which people can use to control and act on information.