

# The New Generation EIS System

## Introduction:

Our economy has been through some challenging times in the last two years. The key to survival has been to streamline workflow through the effective and efficient use of Information Systems. In his article titled "Data Warehouses: they aren't just for the big guys anymore," Bruce Johnson points out that "most healthcare and social service organizations have long since automated their 'mission critical' applications. However, we are finding that knowledge workers and executive management still need more and better information to be effective." The problem isn't about having enough data, but making sense of the volumes of raw data that is collected. The first step in finding the solution to this problem has been to create databases or data warehouses that extract, transform, aggregate, summarize, organize and store data in a format that is more conducive to reporting and analysis. The raw transaction data is transformed and organized by subject matter, which may span multiple departments and/or functions. The benefits of implementing a data warehouse are many, but the bottom line is that they have the 'potential' to turn raw data into valuable information that can be used for daily decision-making as well as long-range strategic planning.

In order to realize this potential, raw data has to be enhanced via analyses and transformed into information and knowledge. The 90's have seen exotic tools that aid such refined analysis. However, such refined analyses usually need refined SQL statements, an ability often lacked by the key strategists in an organization. On the other hand, there exist tools that are very easy-to-use, but that lack the ability and flexibility to analyze all data. Everyone realizes that it is critical for organizations to treat information that can be obtained from this data as assets, which create value that can become a part of the organization's knowledgebase. That is one of the primary reasons why organizations are moving towards Knowledge Management. As the line between Business Process Re-engineering and Knowledge Management becomes thinner, executives and decision-makers in an organization need a solution that will facilitate the analysis of data with ease-of-use, so that users can make sense of it all. The easier the process of getting to the relevant information, the faster the business decision can be made to adjust to the ever-changing conditions. However, in his article titled "Business Intelligence: Relevant Information for Decision-Making Purposes," Jonathan Wu argues that most organizations struggle with the ability to provide decision-makers with the important information that they need in a timely manner. These organizations are confronted with this information struggle because they either do not understand what relevant information is needed and/or they do not know how to obtain it with efficiency.

Fortunately, for the healthcare industry, there exists a new generation of Executive Information Systems (EIS), which offer the power and flexibility needed to help management steer their facilities through a broad spectrum of clinical and financial issues.

## What is EIS?

Executive Information Systems (EIS) were first introduced in the mid-80's and were the easy-to-use, show-me-the-numbers applications directed towards senior management. Unfortunately, those tools lacked the flexibility and ability to perform in-depth analyses that are needed in today's competitive markets. An EIS exists today as an interactive digital dashboard, which summarizes all the relevant information as needed by ANY knowledge worker and executive. While a Data Warehouse helps in integrating, categorizing, codifying and arranging the data from all parts of an enterprise, the new generation Executive Information Systems help in analyzing that data to derive information, insight, and knowledge, without the need of technical expertise. It is the Data Warehouse and an EIS framework, which serve as the foundation for enterprise-wide decision support. They outline the process through which an enterprise solves the problem of information overload.

In his article titled "What is Business Intelligence?" Jonathan Wu says, "During the last 10 years, the names of information systems have changed from executive information systems (EIS) to decision support systems (DSS) and now to business intelligence (BI) systems. But, more has happened than just a name change. The technology has significantly evolved from internally developed graphical user interfaces (GUI) to packaged applications that provide users with easy access to data for analysis." Effective use of Data Warehouses and Executive Information Systems leads to the development of knowledge, which provides the basis for efficient decision-making. From a data analysis perspective, the new generation EIS system aids in the process of gathering high-quality and meaningful information about the subject matter being researched that will help the individual, analyzing the information, draw conclusions or make assumptions. From an information systems perspective, the new generation EIS provides users with analytical processing and data analysis to answer business questions and identify significant trends or patterns in the information that is being examined. These applications also provide decision-makers with the ability to easily extract data from one or more different sources and subject matters. In addition, they provide knowledge workers with the capability of multidimensional analysis as demonstrated in an example below.

But perhaps the most significant ability of the new generation EIS is its intelligence. It is something that requires you to 'ask the question,' so that it can provide you with an abundance of answers. Whatever your pains are, whatever you're interested in exploring and improving, that's what the system can be used for. This illustrates how an EIS means different things to different users, thus enhancing its flexibility and adaptability not only to various aspects of data analysis and investigation, but also to different levels of decision-makers in an organization.

## What types of analyses can be associated with EIS and what are their benefits?

A typical new generation EIS is a point-and-click analytical application, which enables users to immediately retrieve existing information from many critical sources for better decision-making. It aids in intuitive navigation through specific data sets. For a healthcare facility, these systems extend the analytical capabilities to a whole new level with financial and clinical data marts that allow for tailored analysis. The result is a constant source of information to fine-tune processes and policies that increase productivity. Work flows and processes can be tweaked via quantitative study of how work has been done. Combined with powerful data mining and drill-down tools, knowledge workers can easily retrieve information quickly and effectively, which results in superior decision-making. Users can view the data from several aggregations, the most granular generally being the patient level (see example below). These systems can also be custom integrated with a facility's cost accounting system so as to create a single reference point for profit and loss analysis.

By expanding breakdown abilities to new degrees and providing in-depth analyses that mine the most knowledge rich data, a new generation EIS offers the kind of capacity, and insight, that was never available before. They also bring to the table extensive graphing capabilities and the customization and saving of analyses, endeavors that are normally required by analytical staff on a regular basis. Through visualization, graphical representations of data can highlight important aspects within the data and assist the viewer in focusing on important items within the set of data being analyzed. Furthermore, individuals can quickly and easily spot events or trends that are of concern and can focus their resources on those activities that require their attention. By offering an array of breakdowns and filters on a subset of patient records, selected by date range, these systems become a tool that are as easy to use as they are prolific with results. Administrators, or users of the EIS, can selectively customize breakdowns and filters. Finally, the system comes with a built-in integration engine, requiring no other interface or support from a hospital's existing HIS system. It stands alone in its operation, but brings the full power of a data warehouse along with a dose of simplicity and ease-of-use.

The benefits of a solid new generation EIS system are many, but they could probably be summarized as below:

- **Increased revenues, reduced costs and ability to compete effectively:** Helps organizations achieve this by presenting holistic timely information and knowledge for effective decision-making.
- **Power to manage business complexity:** Helps enterprises organize their data to facilitate analysis and mining of data to unearth hidden patterns and trends.
- **Ability to leverage on their existing investments:** Help enterprises make full use of their existing investments in IT systems. They add value by

integrating and analyzing the data gathered in the operational and legacy systems, on a daily basis.

- **Information democracy:** Facilitates sharing of information across all borders of the enterprise, offering all decision-makers the tool to analyze data at their level and make better decisions.
- **Ability to make sound strategic decisions:** Perhaps the greatest benefit that a new generation EIS system offers is the ability to use all actionable information with the existing tacit knowledge within an organization and create a synergy that empowers strategic decision-makers to gain a competitive edge in the marketplace.

## An Example:

The following is an example that illustrates how [Millennium](#), a new generation EIS by TSG, can aid in performing in-depth analyses, with just a simple point-and-click.

Figure 1:

Year	IN	DIS	OUT	Total LOS	Average LOS	Charges	Average Charges	Reimb. Actual	Total Cost	Profit Actual	Profit Expected	Balance	
Jan 99	307	0	0	1061.5	3.45	\$1,556,402	\$1,465	\$5,070	\$967,127	\$170,917	81.50%	\$1,122,910	\$9,446
Jan 00	379	0	0	1299	3.43	\$2,350,783	\$1,812	\$5,203	\$1,520,057	\$1,656,686	-8.20%	\$419,750	\$20,408

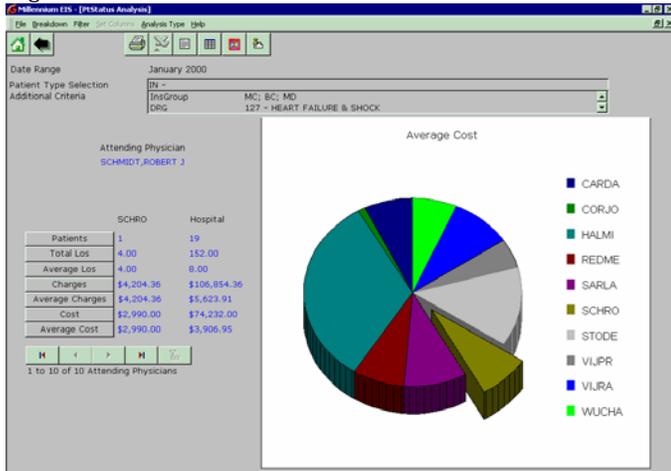
Figure 1 above shows the system's main screen for analysis, which comes in the form of a numerical grid, offering in depth data investigation via traditional row and column tables. Data is broken down into valuable segments, providing rapid discovery of various win/loss situations. The grid can be ranked, customized, selected, and manipulated to best bring about results, while the application of breakdowns, filters, and drilldowns extract dynamic changes to the size, and content, of the grid.

Figure 2:

Year	IN	DIS	OUT	Total LOS	Average LOS	Charges	Average Charges	Reimb. Actual	Total Cost	Profit Actual	Profit Expected	Balance	
Jan 99	15	0	0	45	3.0	\$49,810	\$1,327	\$7,323	\$9,852	\$6	99.55%	\$45,646	\$
Jan 00	19	0	0	152	8.0	\$106,054	\$7,040	\$5,024	\$106,054	\$12,493	12.13%	\$32,622	\$

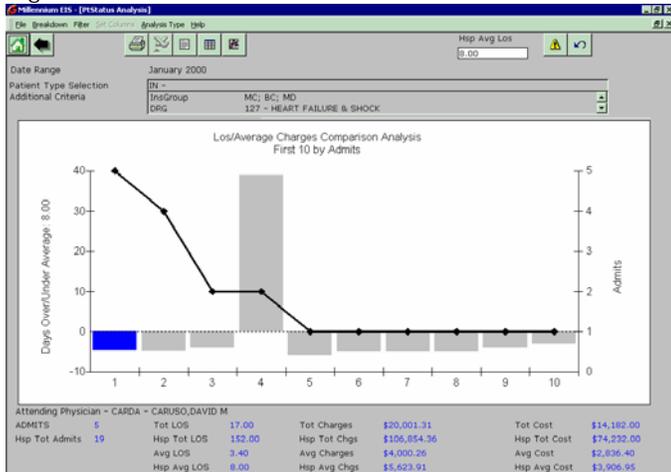
Figure 2 shows how the grid has been changed to reflect a certain scenario. According to the row and column headers in the screenshot, we can see that for the time period dated January 2000, there were 10 attending physicians treating inpatients with DRG 127 (heart failure and shock), and who had the insurances Medicare, Blue Cross, and Medicaid. With this as our breakdown/filter combination, we can then take a look at how these physicians performed with respect to parameters like patient volume, average length of stay, charges and costs, and profit/loss balances.

Figure 3:



Another way to view data is via the pattern analysis screen, as shown in Figure 3. This screen utilizes the 'largest piece of the pie' analogy to graphically illustrate your analysis of data. Here we can see the 10 physicians from the previous screen, now put together on one pie of results. The various categories on the left of the pie graph can be separately activated to gain a quick understanding of each physician's performance in each individual category. A quick reference of the actual numbers is also provided along with the graphical display.

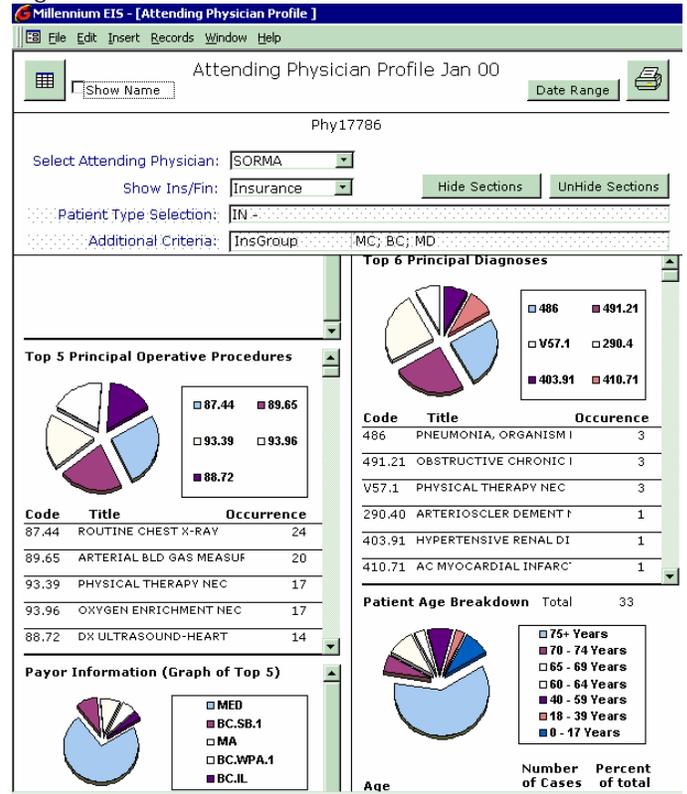
Figure 4:



Yet another way to view information is via the Length of Stay Comparison, as shown in Figure 4 above. Since length of stay tends to be a valuable form of performance evaluation, a bar graph is provided for immediate recognition of variations from the norm. As can be seen by the screenshot, physicians are analyzed together to evaluate how they compare to the length of stay average. Details such as patient volume, costs, and

charges can all be seen below as a particular physician's bar is selected. This graph can also be viewed as a bubble graph (as shown in Figure 6), with axes that can be changed to reflect hospital, community, or statewide averages.

Figure 5:



Profiling is another analysis one can do once an item of interest has been obtained. This is shown in Figure 5 above. Whether it be DRG, Insurance, Employer, or Physician, profiling can be done of any EIS breakdown in order to obtain a closer look at the who, what, and where of that particular item. The physician profile in the screenshot above takes one sample physician and illustrates summarized reports of details like principle diagnoses, payor information, re-admission reports, and patient destination. Profiling provides an in depth look at the history behind a given entity and provides insightful clues as to why a certain performance level has been attained.

Figure 6:

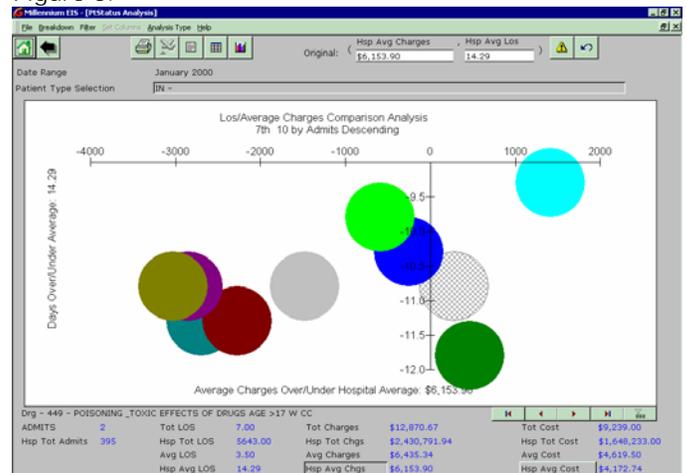


Figure 6 is an example of the length of stay comparison, in the form of a bubble graph. Here, the axes represent two important measurements: length of stay and charge comparisons. The size of the bubbles, as well as their distance from the origin, give insight as to how near or far they are from the average. Up above, we can note some fields that allow for the change of these average amounts, so that a more fine-tuned analysis can be made.

Figure 7:

DAY	DATE	COUNT	PROCEDURE	DESCRIPTION	CHARGES	COST
Day 1	12/31/1999	5	5207590	LANOXIN 0.25MG TAB	\$1.60	\$0.00
Day 1	12/31/1999	1	3001480	BLOOD GASES, CAPILLARY	\$66.65	\$34.36
Day 1	12/31/1999	1	3001480	BLOOD GASES, CAPILLARY	\$66.65	\$0.00
Day 1	12/31/1999	1	4100011	ADDED AEROSOL TX DIAGNOSTIC	\$135.00	\$54.13
Day 1	12/31/1999	1	4100011	ADDED AEROSOL TX DIAGNOSTIC	\$135.00	\$0.00
Day 1	12/31/1999	1	3010170		\$4.90	\$2.53
Day 1	12/31/1999	1	3006110	METABOLIC PANEL, BASIC	\$52.25	\$26.94
Day 1	12/31/1999	1	3006110	METABOLIC PANEL, BASIC	\$52.25	\$0.00
Day 1	12/31/1999	2	2510310	HUMULIN 70/30 INSULIN	\$45.00	\$13.40
Day 1	12/31/1999	3	2507590	LANOXIN 0.25MG TAB	\$1.60	\$1.02
Day 1	12/31/1999	1	3011540	PHYGGLOBIN, QUAN. SERUM	\$50.10	\$0.00
Day 1	12/31/1999	1	2001000	INTENSIVE CARE UNIT	\$810.00	\$128.43
Day 1	12/31/1999	1	3009280	PROPIONIN	\$90.20	\$0.00
Day 1	12/31/1999	1	2718810	DRESSING OPSITE 10 X 14	\$1.00	\$0.00
Day 1	12/31/1999	1	7300020	ELECTROCARDIOGRAM	\$78.00	\$22.05
Day 1	12/31/1999	1	4100400	ARTERIAL PUNCTURE	\$15.95	\$0.00
Day 1	12/31/1999	1	4100400	ARTERIAL PUNCTURE	\$15.95	\$6.64
Day 1	12/31/1999	1	2400445	NONCOR FORT INFUSION SET	\$18.00	\$8.45
Day 1	12/31/1999	1	4500080	EE-INTERMEDIATE	\$222.90	\$134.09
Day 1	12/31/1999	1	2717190	URINAL DISP	\$1.05	\$0.55
<b>TOTAL AMOUNT</b>					<b>\$12,609.90</b>	<b>\$6,894.19</b>

Finally, in Figure 7, we can see the system's ability to drill all the way down to the patient level. Here, several forms of analysis can be made on a variety of details relating to a patient's medical experience. As can be seen, charge transactions, charge categories, diagnoses, operations, and CPT codes can all be viewed, in full detail, with the click of a button. As an example, the charge transactions page will illustrate anything and everything that occurred during the experience, on a day-by-day basis. Filters of these transactions, as well as intelligent ranking features, help to further enhance the data analysis endeavor.

### Conclusion:

Relevant, timely, and customized information has become the key ingredient that healthcare organizations and facilities need in order to stay competitive. Cutting costs, increasing revenue, and enhancing efficiency are a need for any facility as we march through the changing times. A data warehouse, with the new generation EIS, is a powerful analysis tool that provides

fast response times and the ability to perform in-depth analyses with utmost ease. This results in improved management ability for identifying key trends and changing courses of action more quickly due to increased access to knowledge rich data.

The Shams Group (TSG)  
 Product name: Millennium EIS  
 Tel: 972-906-9313  
<http://www.shamsgroup.com>

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