International Journal of Computer and Information Technology (ISSN: 2279 – 0764)
Volume 02– Issue 02, March 2013

Business Intelligence In Call Centers

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Abstract— **This document takes a look into the world of business intelligence and the implications this field of study has on the modern call center. This document includes a discussion of the factors driving the need for business intelligence, a discussion on the benefits and challenges of business intelligence implementations while concentrating on business intelligence capabilities and the associated enabling technologies. The top key performance indicators of a call center are discussed. Included is a case study on the award-winning successful implementation of the Northeast Utilities CallLogic business intelligence project.**

Keywords-business intelligence; capabilities; key performance indicators; call center; CallLogic

I. INTRODUCTION

Once considered an afterthought of operational stability, business intelligence has established itself in the forefront of every manager‟s and business process analyst‟s mind as the critical factor required in optimizing corporate profits and performance [10]. Business intelligence is no longer the backroom art form it once was in early 1990s. Through the emergence of the big five mega-vendors (SAP, Oracle, SAS Institute, IBM and Microsoft) who own two-thirds of the twelve billion dollar business intelligence market [1] and the efforts of Gartner evaluations; business intelligence has established itself as a source of metrics that every executive officer must take into consideration when making major operational and organizational decisions.

Business intelligence is defined as the process of providing decision makers with valuable information and knowledge by leveraging a variety of sources of data as well as structured and unstructured information [2]. In 2009, Oracle Corporation published a white paper discussing effective business intelligence products. The white paper states an effective business intelligence product fulfills at minimum three crucial requirements; data is accessed from multiple sources across an organization, data is presented in a user-friendly and understandable manner and the business intelligence solution provides an enterprise level view of metrics [13]. Organizations have the option to impose additional requirements on their own implementations of a business intelligence project.

A. *Factors Driving Business Intelligence*

The additional needs of businesses often result from the major factors driving business intelligence. Classification factors include; exploding data volumes, increasingly complicated decisions, the need for quick reflexes and technological progress [2].

Exploding data volumes is a factor that points out that as our ability to capture and store data increases, we have an ever increasing vault of valuable data to access, analyze and act upon.

The factor increasingly complicated decisions, pertains to the number of ever changing variables that must be considered in the modern business world; variables such as increased networking speeds and decreasing data storage costs. Much as the convergence of technology has allowed India and China to become part of the global supply chain [6]; this same convergence has increased both the complexity and time sensitivity of business decisions.

Continuing on the trend of time sensitivity, the need for quick reflexes with regards to decision making becomes a factor as well. Any delay in obtaining accurate and up to date information hampers the ability of decision makers. As exploding data volumes and increasingly complicated decisions continue to be factors driving business intelligence, the need for up to date data becomes increasingly evident.

The final factor, technological progress, drives innovative business intelligence ideas as sophisticated technology, in regards to decreasing costs while increasing processing power globally levels the business intelligence playing field.

These four factors have accelerated the business intelligence field into the spotlight that it currently holds in the modern business world.

B. *Products of Business Intelligence*

The phrase business intelligence is often a term synonymously referring to both the process and the product of

the process. Becerra-Fernandez & Sabherwal‟s definition above describes, at a high level, the business intelligence process and the factors that drive the necessity of said business intelligence process. The product of the business intelligence process is both information and knowledge. The business intelligence process gives meaning to raw data by transforming the raw data into information and knowledge.

Raw data consists of collected facts, observations or perceptions. These data may or may not be entirely accurate [2], yet they are still collected. At this level, it does not matter whether the data is meaningful or easily described. In its raw form, the raw data is simply a collection of items in a list. While there may be a correlation between the data somewhere, that correlation, and the knowledge or conclusions gained from that correlation, have yet to be determined. What truly matters at this level is that collected data is complete and in a form that caters to future correlation. An example of raw data is one month‟s worth of credit card purchases for a specific individual. Included in this raw data could be the purchase price, purchase date, purchase location and type of goods purchased.

Information is a more meaningful interpretation of the raw data. Often times, information is simply a subset of the raw data [2]. A business intelligence solution will help translate the raw data into useful information. Information based on one user‟s monthly credit card statement could include information such as total number of dollars spent, total number of purchases, number of times the credit card was used or average number of dollars spent per transaction. This information would otherwise not readily be available without a manual transformation or calculation on the raw data. The business intelligence solution takes data in its raw form and turns it into information by utilizing automated aggregation and computation functionalities.

Knowledge, in ways both similar and different than information, is a conclusion or collection of conclusions driven by the information obtained from the raw data. Knowledge is the derived relationship and potential insights hidden within the information and raw data. This gained knowledge is useful for determining an intelligent way to proceed with daily business functions. Collected information about an individual‟s number of credit card purchases of a particular product category leads to justified knowledge. This justified knowledge can be applied in a future targeted marketing campaign to this specific individual of products in that category. This targeted campaign has a higher likelihood of yielding positive results because we know the individual has a history of purchases in this category.

C. Benefits and Challenges

The products of business intelligence have become a necessity for both long term planning and day to day strategic decisions. Business intelligence yields long term benefits as years of legacy data and trending information is transformed into knowledge. This knowledge, when applied at the executive level, is used to make large scale and enterprise decisions. Typical day to day operational improvements are realized as middle managers utilize up to date and accurate data. These operational improvements allow organizations to keep up with ever shifting market changes, one of the factors driving business intelligence.

The long term benefits of implementing a business intelligence solution vary by company and type of business intelligence implementation. There are a number of benefits realized over nearly all implementations [11]. In 2008, Microsoft published a white paper describing the benefits of implementing a business intelligence solution. A business intelligence solution reduces costs by identifying inefficiencies, promoting automation and reducing labor costs. These three benefits lower operational costs and save the organization money. Inefficiencies are detected by evaluating months‟ or years‟ worth of data at a glance and link this data to past changes or opportunities missed. Labor hours are saved as data is no longer transformed and reported by hand. These reports are generated instantaneously by the business intelligence solution. A business intelligence implementation enables an organization to operate in an informed manner. Armed with valid information and justified knowledge, executives can confidently make decisions that will have a positive impact on a company‟s future.

Business intelligence can help identify problems with current business processes. Becerra-Fernandez and Sabherwal write of an oil and gas company that was facing cash flow problems. This company, although delivering its products on time, failed to promptly deliver their invoices. After discovering this inefficiency, organizational performance, including improvements in increasing cash flow, was improved by leading the company to institute new polices that would ensure that invoices were delivered closer to the delivery time of its products.

Business intelligence benefits do not extend themselves only to individuals stationed at the executive level. Additionally, business intelligence benefits do not limit themselves to solely long term organizational goals. Business intelligence shines when applied on a daily basis to the day to day operations of a company. Through alerts and other methods of automatic notifications, business intelligence places real time information in the hands of the right employees [11]. This information is used to make time sensitive decisions allowing companies to adapt to current market conditions. Business intelligence has direct uses in the fields of marketing and advertising. Marketing data is often outdated by the time it lands in the hands of those developing marketing and

advertising strategies. With an automated business intelligence system, this information can be made available earlier. No longer is there a lag time between the request for information and delivery. Previous to implementing a business intelligence solution, information technology professionals would spend time gathering and transforming the raw data into a manner more useful to the marketing professionals. With the business intelligence solution in place, marketing professionals gain the ability to generate the reports they need without relying on IT. This newfound independence empowers the marketing professionals to complete their job in a completely self-reliant manner.

Business intelligence initiates improvements in customer service [2]. By collecting data such as common complaints or reported incidents, a company can use this data to better identify product problems. The faster complications are identified the quicker they can be addressed. This quality mindset leads to improvements in customer satisfaction levels.

A case study of The Cincinnati Zoo discusses how the zoo plans to build upon the knowledge gained from its implementation of IBM Cognos 8 through the development of a zoo loyalty program [5]. This program, driven solely from measureable and informed data, is aimed to pinpoint customer spending habits based on customer zip code and season pass holder status. The loyalty program introduces the capacity to intelligently target and market to certain individuals. Data has shown that season pass holders are likely to attend after hours zoo events, but aren"t likely to spend a lot of money during a day trip to the zoo. Intelligent marketing can be used to send specific offers to season pass holders to try and entice them to spend money during a day trip.

The generation of knowledge and information from raw data is the foundation that allows business intelligence systems to identify new opportunities for modern businesses. While business intelligence alone is not the only way new ideas are generated, it certainly facilitates and accelerates the process through the removal of the manual work that is involved in analyzing and transforming data.

Despite its benefits and proficiencies, business intelligence does face its share of challenges. An organization implementing a business intelligence solution faces both technical and organizational obstacles [2]. At the center of executive hesitation are difficulties involved in capturing the tangible benefits of business intelligence and the near impossible to calculate return on investment.

Becerra-Fernandez and Sabherwal discuss both the technical and organizational obstacles presented to an organization implementing a business intelligence solution. The technological obstacles include beliefs that business intelligence tools are difficult to use and have a steep learning curve. There is also the thought that in order to fully realize the benefits of business intelligence solutions; an individual must spend a substantial amount of time configuring and learning to use the product. The organizational hurdles include resistance to change, lack of preparation for business intelligence and lack of faith that the business intelligence solution will fulfill daily needs. These fears and misconceptions hinder the business intelligence development process and often stifle an organization"s acquisition and acceptance of new business intelligence products.

D. Technologies Enabling Business Intelligence Capabilities

Four main concepts, also commonly referred to as capabilities, drive the typical benefits of a business intelligence solution. Each business intelligence solution has at least one and most have all of these capabilities. When utilized together, these four capabilities describe a complete business intelligence solution that is capable of delivering a number of beneficial process improvements. There is also the potential the business intelligence solution can identify areas of technology improvements or needs. The four key capabilities of business intelligence solutions are as follows: organizational memory, information integration, insight creation and presentation capability [2]. Each capability has a corresponding single technology or set of technologies that facilitate that capability.

Organizational memory, defined as the storage of information and knowledge, is a key capability upon which each business intelligence solution is built. Organizational memory represents data, information and knowledge that have been accumulated over the years [2]. Organizational memory is structured (data stored with a consistent and defined standard) or unstructured (data such as media files or text documents) data. Regardless of whether data is in a format that is structured or unstructured, data is ultimately stored in a manner that allows it to be accessed at a later time. The importance of organizational memory increases as more and more data is accumulated. Over recent years, data accumulation has increased dramatically as data storage prices have decreased.

There are a number of technologies driving organizational memory. These technologies primarily store structured data, but many have the ability to store unstructured data. Perhaps the most significant piece of technology enabling organizational memory is the data warehouse. Typically storing structured data, a data warehouse is a copy of transactional data specifically stored in a manner optimal for query and analysis; data stored is informational, analysis and decision support oriented, not operational or transaction processing oriented [10]. The goal of a data warehouse is to facilitate users" access to data in effort to support the decision making process.

Information integration builds off of data stored by organizational memory capabilities. Information integration is the ability to link structured data, such as data stored inside a data warehouse, to unstructured data from a variety of external or internal sources [2]. Information integration is identified as important because it provides value to data stored within the organizational memory capability. Data located in disparate sources is often difficult to manage and link together. Information integration saves users the trouble of sifting through complex data from both internal and external sources. The information integration capability of a business intelligence solution performs the linking process automatically for end users. Information integration directly feeds insight creation, the third identified business intelligence capability.

The main technologies enabling information integration are environmental scanning and the various types of text and web mining. These technologies focus on collecting structured and unstructured data from both internal and external sources. Text and web mining are key technologies in collecting unstructured data. Due to the sheer amount of unstructured data on the web, these technologies save time and energy by using algorithms to search and collect data. Environmental scanning is a systematic way of analyzing factors outside of the organization"s own data to determine how these factors could potentially affect the organization. Data gained from environmental scanning and web mining adds a new layer of observation and analysis to the information integration process; thus increasing information value and accuracy.

Insight creation, fed from information integration, is the ability to develop and utilize new insights to make better decisions [2]. Arguably the most important business intelligence capability, insight creation is the basis for predicting future market trends and patterns. Insight creation follows closely along the same lines as the benefits of business intelligence itself. The information and knowledge gained from information integration is used in insight creation to develop theories and predict market changes. Both the need for quick reflexes and increasing market complexity are contributing factors to insight creation [2]. This information is utilized by executives and managers to make better informed decisions about the future of their market.

A number of technologies enable insight creation. The technologies range from data mining to real-time decision support systems. Data mining is the nontrivial extraction of implicit, previously unknown, and potentially useful information from data [10]. Data mining techniques expose relationships in seemingly unrelated data. Data mining is often alternatively referred to as knowledge discovery. Real-time decision support systems utilize data mining techniques in real time to identify current patterns or currently occurring events that have been stored in the data warehouse. Real-time decision support systems generate up to date data that allows insight creation to facilitate real time decision making in organizations.

There are a number of effective data mining techniques in use today. These techniques range from simple queries to complicated and in-depth formulas. Some of the most popular data mining technique categories are classification, clustering, predication and the development of association rules [3]. Each category contains a number of varying data mining techniques.

The classification category contains the most commonly applied data mining techniques. Classification techniques allow an analyst to use smaller subsets of data; subsets that represent a whole, and draw conclusions for the entire population. Techniques included in the classification category are decision tree induction, Bayesian classification and neural networks. Classification techniques are commonly used to identify fraud or calculate credit-risks in data.

The clustering and association categories of data mining contain a set of methods useful in identifying groups or classes in result sets. Clustering techniques allow an analyst to correlate individual data points with a larger population that share similar characteristics. Correlation techniques are commonly used in the retail industry to identify customer purchasing patterns based on various distinguishing factors. Common clustering techniques are density based and partitioning methods.

The most complex category of data mining techniques is the predication category. The nature of predicate data mining is high-risk high-reward; the formulas are very complicated and the conclusions driven from the results do not always come to fruition. Predication data mining is often used for predicting stock market prices or product failure rates. The most common forms of predication data mining techniques include regression techniques such as linear and nonlinear regression.

Business intelligence suites often come equipped with these industry standard data mining techniques built into the base product. These data mining techniques assist analysts in bridging the gap between information and knowledge. By uncovering hidden data patterns and relationships between data sets, organizations are one step closer to predicting the market trends necessary for gaining a competitive edge.

The presentation capability refers to the visualization aspect of a business intelligence solution. While insight creation produces new knowledge, a business intelligence solution"s presentation capability displays knowledge to the user in a manner in which they can comprehend and act upon. The presentation capability is the most dynamic capability of business intelligence as it must constantly adapt to its user base. Three key details define the presentation user base [2].

These three details (role, task and preference) guide the system to determine what is appropriate to display during the visualization process. An executive level report would not be as detailed as the screen presented to someone managing a storeroom. The executive level report would contain the reports of all storerooms while a manager would see individual stock levels of a single storeroom. High level reports allow for quick assertions and comparisons between presented components.

Various technologies are incorporated in a business intelligence solution"s presentation capability. The technologies vary from dashboards and scorecards to online analytical processing (OLAP) screens. Dashboards interactively display many metrics at a point in time. Scorecards present metrics in a format that are easily comparable to a targeted goal or anticipated result level. Powerful OLAP screens are interactive devices that dynamically allow the user to explore and analyze data to varying degrees of detail. OLAP screens update as the user selects different options for the set of data they are examining. These technologies enable business intelligence solutions to fulfill the objective of presentation capability. That objective being to deliver the results of insight creation capability to the users such that the users can make their best possible use in terms of learning and decision making [2].

When properly implemented, the seamless interactions of all four business intelligence technologies build a solid base for the four business intelligence capabilities. Each capability brings something to the table. These capabilities together create a complete business intelligence solution; a foundation for real time predictive analysis and on the spot adaptation that allows an organization to remain competitive in the modern global economy.

II. Business Intelligence In Call Centers

Business intelligence has practical implementations in many organizational settings. One of the settings in which business intelligence finds itself most utilized is the dynamic call center. The call center is a physical place where telephone calls are handled by an organization. Business intelligence brings to the table a number of tangible and intangible benefits for a call center. The call center environment is ripe with metrics and key performance indicators (KPIs) that allow management to keep a watchful eye on system performance and agent effectiveness. Through KPI monitoring, it is possible to identify business process strengths and weaknesses. It is also possible to evaluate whether or not the current level of technology deployed in the call center fulfills the needs of the organization. During the implementation process, business intelligence integration into call centers does have a number of challenges. These challenges focus majorly on the overwhelming amount of data and the need for decisive decision making.

A. Call Center Key Performance Indicators

Key performance indicators help organizations define and measure progress toward organizational goals. There are a number of key performance indicators that a call center can utilize to measure its performance. These metrics include average speed of answer, cost per call, agent utilization rate, first contract resolution rate, customer satisfaction and aggregate call center performance.

Average speed of answer, or call wait time, plays a significant role in customer satisfaction [7]. Call wait time exists between the time a customer finishes dialing the number to the call center until the moment the customer first makes contact with the system. The time also exists after a customer has left an automatic voice response system and is waiting to speak to an actual agent. A study of over three thousand customers revealed that the longer a customer waits on the phone, the less likely they will be satisfied with the call. The results of this study did show that if the customer was calling seeking information, and they received satisfactory information, they were more willing to accept a longer queue time.

Realizing that customers are more interested in being satisfied with their call rather than simply having their calls answered quickly displays the importance of empowering agents with information. Agents can be empowered through the use of knowledge repositories. The knowledge repository, often referred to as a document management system or knowledge database, supports the capture of unstructured data and knowledge to be retrieved and reused by the organization [2]. A knowledge repository contains information about and solutions to known customer issues. Effective knowledge databases can quickly be queried by agents for answers to customer inquiries.

The cost per call metric measures how much each call is costing the call center to handle. To calculate cost per call, we take the volume of calls and compare it with operational costs. Equation 1 displays the formula for calculating the cost per call metric. Managing staffing levels is important to reducing the cost as per metric as labor costs typically account for two thirds of total operating costs [9]. Costs can be additionally managed by reducing agent turnover. On average, it costs a call center about ten dollars to take one call. The cost for replacing an agent is over six thousand dollars [4]. This equates to agent replacement costing the center the same amount of money that it takes to handle six hundred calls.

$$\frac{Operational\ Costs}{Call\ Volume} = Cost\ Per\ Call$$

(1)

Call volume data is captured by business intelligence solutions in a data warehouse. After being stored and archived, this data has become organizational memory. After being transformed into a manner presentable in various visualizations such as a dashboard, it is possible to compare the cost per call metric at different points in time. If a new technological innovation was put into production in a single month, the value of that technology can be measured by comparing the cost per call metric from neighboring months. By stabilizing or decreasing labor costs through technological progress, a call center can improve their cost per call metric.

Agent utilization is a formula to measure call center labor efficiency. By increasing the agent utilization metric, a call center does more work with less staff. By doing more with less, the organization saves money. The more utilized an agent is, the less downtime they have. By having agents with little downtime, a call center can keep staffing costs down. The agent utilization metric is a delicate KPI to measure as at first glance its results can be misleading. A high utilization amount of eighty to ninety percent at first would seem like the call center is performing very well and keeping costs low. This fact may be true, but can result in unanticipated side effects. These side effects include agent burnout, agent dissatisfaction with their job (which eventually spills over onto the customer during a call) and high rates of agent turnover. The turnover rate in call centers for the year 2000 was approximately fifty percent [4]. Agent burnout was cited as one of the main reasons for call center turnover. Agent utilization is calculated by dividing the number of minutes an agent is on the phone per month by the number of working minutes they have in that same month period. This number is then multiplied by one hundred to get a percentage rate. Equation 2 displays the given formula for calculating agent utilization. In order to reduce agent utilization in a productive manner, agents are often given training or some other office activity so they do not feel the stress of or burn out too quickly from being on the phone for extended periods of time.

$$\left(\frac{Number\ of\ Minutes\ Taking\ Calls}{Number\ of\ Working\ Minutes}\right) x\ 100 = Agent\ Utilization$$

(2)

A business intelligence solution can help increase or decrease the agent utilization KPI by discovering trends in the organizational memory of the call center. By discovering that call volume increases dramatically on Mondays or after a marketing campaign has been sent out, staffing levels can be preemptively modified to handle the additional anticipated volume. Trend monitoring in this fashion turns the reactive manager into a proactive manager.

First contact resolution rate is a highly valued key performance indicator. A high rate of first contact resolution represents quality and customer satisfaction [8]. Generally, first contact resolution rate is a straight forward KPI to gather statistics upon. This metric measures the amount of calls that are resolved with the customer needing to make only a single phone call. To calculate first contact resolution rate, we divide the number of repeat calls by total number of calls. This will give us the percentage of repeat calls. We then subtract this percent from one to give us the first contact resolution rate. Equation 3 displays the given formula for calculating first contact resolution rate. Each subsequent call made by a customer decreases their satisfaction level, another key metric in measuring call center performance, and unnecessarily increases both agent utilization and call volume. A small number of complex calls will never be solved on the first contact, but a majority of calls should be able to be resolved on the first contact. A low rate of first contact resolution often results from poor training, agent incentives or lack of available knowledge to quickly resolve issues [8]. A number of key technologies can be implemented to help improve first contract resolution rate.

$$1 - \left(\frac{Repeat\ Calls}{Total\ Calls}\right) = First\ Contact\ Resolution\ Rate$$

(3)

The investment in a knowledge database by call centers puts unstructured knowledge at the fingertips of all agents. This business intelligence technology allows an agent to search for solutions to common problems. Without a knowledge database, the agent would be forced to seek out the help of other resources to answer a question or resolve a common problem. If no resources are immediately available, the customer on the phone would need to call back or spend time out of their day waiting to be contacted by the agent. Even if the additional resource is immediately available, the customer still needs to wait for the knowledge transfer process to occur. Both of these scenarios waste the time of the customer and the agents involved leading to a decrease in customer satisfaction levels and an unproductive increase to agent utilization rates. Additionally, two agents are used to service a single call.

Customer satisfaction is a KPI driven by other KPIs. One of the most important factors to customer satisfaction is first contact resolution rate [8]. Additionally, a number of other metrics make up customer satisfaction. Agent utilization plays a role in customer satisfaction as over utilized agents tend to have a demeanor less friendly than properly utilized agents. A 2012 study by psychology journal SciRes directly links longer call wait times to lower customer satisfaction rates. Other significant metrics not mentioned above include call quality and total handle time. Call quality, often driven by agent utilization, refers to how well the customer was treated and if

the customer was satisfied with the resolution to their problem. Handle time is the length of time a customer is on the phone, including hold time and talking time.

With so many factors bundled into the generalized KPI that is customer satisfaction, call centers have difficulty judging what effect, if any, increasing a single KPI would have on the overall customer satisfaction KPI. It is critical that an organization utilize business intelligence technology to facilitate the capture of customer complaints in a repository. A customer complaint repository paints a clear picture of which KPIs to focus when pursuing a higher level of customer satisfaction. If there are many complaints made about the length of the wait time a customer must wait on the line before their calls are handled, call center managers can focus on ways to increase the average speed of answer KPI. Such a repository eliminates the need to treat each and every complaint on an individual basis. The complaints can be generalized and categorized in a manner that is much easier to understand at a glance. Customer dissatisfaction scoreboards can be created to track complaint volume versus an individual KPI.

Aggregate call center performance is a key performance indicator that is essentially the bundled results of the other metrics used to measure call center performance. It is specifically a formulaic calculation of the weighted performance value of each other KPI. The process to determine the aggregate call center performance rating involves assigning each individual metric a max value out of one whole. The max value of all individual KPIs must be equal the original one whole after all the weights have been assigned. For example, if you have ten individual metrics each given identical weighting and one hundred is your whole number; the whole number is divided by the number of metrics and a max KPI value is determined. In this case, each metric would be rated out of a maximum of ten points. To assign a value to each KPI, the individual KPI must be evaluated and given a percentage that is individualized to what the metric measures. For example, the cost per call metric is measured in dollars, not a simple percentage of a whole, so cost per call must be assigned a performance value based on dollar values. A call center may decide to give the cost per call metric a performance value of eighty percent if the metric is kept between ten and twelve dollars per call. In this scenario, because our max metric value is ten, and the cost per call metric was rated at eighty percent; the cost per call metric would be given a value of eight. After all the individual KPIs have been assigned a performance percent value, the weighted values are added together and divided by the original whole. This value is then multiplied by one hundred to receive the aggregate call center performance in a percentage value. Equation 4 displays the final formula for aggregate call center performance percent. This value should be measured often to determine overall call center performance. Table I displays a simple example of an aggregation call center performance summary table.

TABLE I. AGGREGATE CALL CENTER PERFORMANCE EXAMPLE

Key Performance Indicators				
Name	***Actual Value***	***Percent Performance Value***	***Max Value***	***Weighted Value***
Average Speed of Answer	28 seconds	90	20	18
Cost Per Call	$10.53	80	20	16
Agent Utilization Rate	80 percent	100	20	20
First contact resolution rate	70 percent	70	30	21
Customer Complaints (per 1000 calls)	25	70	10	7
Subtotals			**100**	**82**

$$\left(\frac{Sum\ of\ Weighted\ Values}{Sum\ of\ Max\ Values}\right) x\ 100 = Aggregate\ Call\ Center\ Performan \quad (4)$$

In the aggregate call center performance example, shown in Table 1, five different KPIs are measured and given various max values of ten to thirty points. These values are multiplied by their performance percentages to get their weighted values. Applying the aggregate call center performance formula to the data in Table 1 produces an aggregate call center performance for this call center of eight-two percent.

Predominately, the business intelligence technology used when presenting the aggregate call center performance KPI is the presentation capability enabling technology of the scorecard. The scorecard takes a graphical representation of data, in this case our aggregate KPI, and compares it to a target or threshold. This type of visualization is useful in this situation for organizations that have set a minimum benchmark or target aggregate call center performance rating. Advanced scorecards can quickly show the comparison between two or more points in time in which the KPI was measured. Spans of months or years can be visualized together on one screen.

The scorecard is not limited to just aggregate KPIs. Since aggregate call center performance requires KPIs to be translated to performance values, all call center metrics can displayed on a scorecard. This easily allows each KPI to be ported to scorecard visualization and presented in the same manner as the aggregate call center performance metric.

B. Call Center Benefits and Challenges

Each KPI and technology enabling the capture and visualization of the KPI are important factors that call center managers and executives must take into consideration when making decisions. These metrics effect day to day call center operations and corporate long term goals. The knowledge and insight gained from these business intelligence solutions leads to new initiatives. Initiatives such as agent training programs, customer satisfaction improvement projects and technological improvements to decrease handle time. Without business intelligence, the data required to validate the necessity of these initiatives would be disparate and difficult to draw conclusions from.

Despite the benefits, call centers, much like any other organization, face challenges both during and after the business intelligence implementation process. The sheer amount of data and importance of quick decision making are two critical challenges facing business intelligence in call centers. The unpredictable nature of a call center, in terms of call volume, also becomes a challenge for business intelligence systems. During an unexpected October storm in 2011, the call center of a utility company based in the northeastern United States received over half a million calls per day. The average call volume per hour was 16,000. This number was equivalent to a full days call volume under normal circumstances [15]. This unpredictably shows the need for building a robust system that scales well and processes quickly at times of high volume. These additional requirements incur additional costs that sometimes deter the enthusiasm and support from executives. Upper management support is critical for successful business intelligence implementations [2] especially if the project hits a snag or unexpected delay.

Many companies typically face resistance when integrating and training employees on new business intelligence systems. Fortunately for call centers, modern business intelligence systems capture data passively through automated processes. Many agents are unaware that the details about each and every one of their phone calls and actions are being tracked and monitored. Individuals leveraging business intelligence systems in call centers are typically managers and executives who use the presentation visualizations to develop new insights. In many scenarios, these managers and executives would have already been receiving these reports. Unless directly involved in the implementation, many managers and executives are potentially unaware that their reports are now being generated by a business intelligence solution. The difference now is the real time availability of the reporting systems and the dynamic nature of their visualizations. This lack of resistance by all levels of employees is a major win for business intelligence in call centers.

III. NORTHEAST UTILTIES CALLLOGIC PROJECT

Northeast Utilities (NU), the largest utility company in the northeastern United States, services more than 1.7 million electric customers in Connecticut, Massachusetts and New Hampshire. NU also provides natural gas services to over 200,000 Yankee Gas customers in Connecticut [14]. Northeast Utilities is a holding company for four subsidiary companies. These companies, Connecticut Light & Power, Western Massachusetts Electric Company, Public Service of New Hampshire and Yankee Gas, all rely on Northeast Utilities to provide for them a number of centralized services. Among these services is a call center. Northeast Utilities provides for its subsidiary utility companies two call centers, one located in Windsor, Connecticut and the other in Manchester, New Hampshire. All four operating companies have representation at each call center. The call center provides twenty four hour service to customers calling in for support. The typical nature of calls that the NU call centers handle vary from bill inquiries, customer complaints and reports of service interruption. The average daily call volume of the Northeast Utilities call centers is 16,000 calls. During time of high volume, as was the case in October of 2011, this number has seen peaks of over half a million calls in one day [15].

In 2009, a movement was started by the customer experience directors at Northeast Utilities to increase their ability to actively measure and monitor the typical call center key performance indictors in the dual call centers. The project called for a system that would passively capture all of the actions of an agent and all of the details of each individual call. This monitoring system would feed a central data repository in which business intelligence capabilities would be built upon. These capabilities would provide a real time view of many key performance indicators and trending agent behaviors. These types of information, specifically the specific call information and agent tendencies were currently not available to the customer experience directors. This project aimed to identify areas of improvement in the dual call centers by identifying any system faults or negative employee habit. The initiative would be henceforth referred to as the CallLogic project.

A. Objectives

The primary objectives of the CallLogic project are outlined in a summary document published by the Northeast Utilities Customer Experience in September of 2011. The three primary objects are as follows: technology optimization, workforce management and to increase the company"s understanding of customer behavior. Technology optimization is further defined as improving the agent interface by leveraging a comprehensive understanding of system interaction and navigation. Workforce management is further defined as reducing transaction time in order to mitigate the need for additional labor. A greater understanding of customer

behavior is more specifically defined as utilizing detailed transaction data to understand how customers interact with Northeast Utilities.

The original business case for the project called for an eight percent efficiency gain derived from increased process adherence through better coaching and training. [12].

The data and results collected for the CallLogic case study were collected from various sources: most significantly a document published by the CallLogic project team and the personal observations of the author, a participant during the implementation of the CallLogic project. The technical specifications of the data collection mechanisms of the CallLogic project have been omitted.

B. Results

The CallLogic system was initially piloted in 2010 by a select number of agents. As of January 2011, the dual customer call centers had placed 100% of its agents on the CallLogic system [12].

Using the metric data provided by a presentation web portal, the NU team was able to identify various areas of weakness. One area of weakness was the alarmingly high amount of time in which agents spent in the call „call work" phase of each call. The „call work" phase of a call is the time after a call is completed and before the agent picked up the phone to answer for the next call. During this time the agent performs a number of transactions, but is ultimately unavailable to take additional calls. These transactions include adding notes to an account, fixing customer information or performing other similar account maintenance tasks. Data from agents spending a significant amount of time in the „call work" phase was analyzed during the course of the project. It was discovered that it was a system limitation, a limitation of the software that the agents used to perform customer transactions, which caused the agents to spend so much time in the „call work" phase. The agent"s software application has a screen, the „Add Notes" screen, which was a modal window. A modal window is a type of software screen, often a smaller window on top of a larger window, which requires users to interact with it before they can return to interacting with another window. This meant that no other transactions could be performed until the „Add Notes" screen was closed either adding a note to the account or by canceling the noting process. Due to this limitation, forty percent of agents did not start noting an account until the „call work" call phase. Other agents, to get around the modal windows, would gather all the information to go into the „Add Notes" screen and capture it by hand on a piece of paper. Once the call was over, the agent would return to the „Add Notes" screen and input the handwritten comments into the system. They used this method as it was more important to have a shorter call duration and longer „call work" time than have a longer overall handle time. The directors requested a system enhancement through the development of a „Quick Notes" screen. This quick notes screen would float around like a digital notepad on the agents desktop PC. The „Quick Notes" screen was moveable and not modal; this allowed the agents to quickly write their notes in the „Quick Notes" window and get back to working the call. After the call was finished, the notes were already on the computer to be reviewed and submitted. This enhancement decreased „call work" time with minimal impact to total call handle time. Over the next year, a number of new system enhancements were implemented based on the CallLogic findings. These new software enhancements amounted to a time savings of eight percent for all agents across the dual call centers [12].

Through the NU CallLogic presentation web portal, each team supervisor had access to the KPI metrics and agent statistics at various levels. For a supervisor, the most beneficial way to view the metrics was at the individual subordinate level. By viewing the KPIs of each individual employee, team supervisors were able to identify individuals and areas need coaching. Through specialized coaching, team supervisors were able to better manage their team and decrease overall call handle time. By having each supervisor manage and coach only their own individuals, the directors took the burden off the training staff. The training staff, which was used to large classes and having to deal with various levels of experience, could now focus solely on the newest employees who required extensive training in all areas. Improved coaching based on web portal statistics was a major benefit derived from the CallLogic project [12].

One of the most significant findings in the CallLogic project summary document was the level of detail NU was able to get on its agents and how they work on a daily basis. This information required greater data analysis and was not available through the web portal on a regular basis, but expressed how powerful data collection can be when used to discover specific trends or anomalies within organization memory. The summary document, published in 2011, displayed that no agents at NU took advantage of the common keyboard shortcuts to copy and paste. Reports indicate that by using the keyboard shortcuts to copy and paste, each agent could shave 1.3 seconds off of each instance of copying and pasting. The project summary document showed that six percent of all keystrokes were for the backstroke key. It also showed that 15 of the 23 agents in the initial pilot group had below average typing speeds. These findings lead to at least two call center efficiency recommendations. For typing problems, recommendations were made for typing classes or refresher typing tutorials. For the lack of shortcut usage, recommendations were made to encourage the use of shortcuts

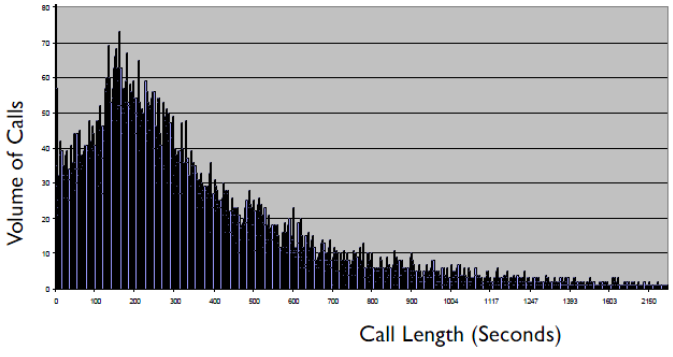
or develop a computer based training course where the usage of keyboard shortcuts and navigation tips would be emphasized.

The findings of the CallLogic system lead to discoveries and ideas on how to improve the fundamental call routing logic of the Northeast Utilities call centers. Traditionally, all calls are routed first to the integrated voice response (IVR) system. If the customer is unable to finish their call with the IVR or all IVR buses were being utilized, the call is then routed to the first available agent. While effective at lower average speed of answer metrics, this often leads to experienced agents handling very simple calls. The CallLogic web portal shows that 35% of all calls are less than three minutes in length [12]. Fig. 1 is a reprint of a graph presented in the NU CallLogic Summary document displaying the call duration frequency distrubtion of calls captured during the pilot phase of the CallLogic project. Fig. 1 displays that 35% of all calls are categorized as a non-complex calls. Simple calls like these require less training. These calls can be handled with no complications by inexperienced agents while more complex calls should be routed to the experienced agents. These findings from the CallLogic project lead to the concept of an intelligent call routing system by Northeast Utilities. This new call routing system would take various answers to questions asked by the IVR system and calculate the complexity of the call. If the call is simple, it will be routed to a group of agents best suited to handle these non-complex calls. If the call is classified to be a complex call type, the call can be escalated to a more senior call center agent. The proposed call routing system would result in multiple advantages over a traditional call routing system. As calls are more accurately directed to the most appropriate agent; overall call duration is decreased. An inexperienced agent is not caught off guard and then forced to seek the assistance of a more experienced agent. The training methodology of Northeast Utilities would be affected as well. The duration of initial training classes can be shortened as new agents could only be trained in the most simple of functions. As an agent gains experience they could be sent back to training for more involved training. This allowed for targeted training classes to be developed as the trainers would no longer need to cover all the material on the whole system in the initial training sessions.

Figure 1. Call duration frequency distribution during CallLogic pilot [12].

C. *Reception at Northeast Utilities*

The CallLogic project had the benefit of being transparent to the agents. The entire product runs behind the scenes on the agent desktop. Maintenance is performed silently. If the product has any problems, they are automatically reported and addressed by the information technology group without interrupting the agents" daily life. The CallLogic web portal is accessed via direct web address and only supervisors, managers and directors have access to the metrics displayed. During the entire CallLogic project implementation process there were no employee resistances to the projects efforts. This was primarily because of the silent nature of the product and careful design considerations to ensure no intrusions on the agents" daily activities. This fact allowed Northeast Utilities to bypass many of the political boundaries often encountered by other business intelligence solution implementations.



D. *Recognition*

The Northeast Utilities CallLogic project has received public recognition for its innovation in providing benefits to its dual call centers. The CallLogic project was the 2011 winner of the CS Week Expanding Excellence Award for Innovation in Customer Service. The award was given to a large and small utility during the conference. Due to its size, Northeast Utilities was considered in the large category. Northeast Utilities was awarded this recognition for its accomplishments in developing an innovative approach to improving service in the meter-to-cash customer experience lifecycle [12]. Each project considered was evaluated in five different categories: complexity, innovation, improved service levels, improvements to customer service and a cost/benefit analysis. Northeast Utilities accepted the award on May 24, 2011 at the CS Week Annual Conference in Orlando, Florida [12].

The Northeast Utilities CallLogic business intelligence solution is an example of a highly successful business intelligence project implementation. Northeast Utilities realized tangible benefits within the first year of implementation. From a twenty two percent improvement in average call handled time to an eight percent time savings for all agents [12], the CallLogic project was ultimately a success that continues to have the potential to provide future benefits to Northeast Utilities and its subsidiary companies.

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