

Project Number: DMS 0901

Business Analysis for Hanover: Program Analytics Dashboard

A Major Qualifying Project Report
Submitted to the Faculty
of the
WORCESTER POLYTECHNIC INSTITUTE
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Degree of Bachelor of Science

By

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Sponsored by:
The Hanover Insurance Group

Professor Diane Strong,
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Abstract

The goal of this project was to design an executive dashboard that tracks and measures detailed information relative to the performance of each business line at Hanover Technology Group (HTG). A prototype of the executive dashboard was built in Microsoft Visual Studio 2008 using VB.NET and Access Database. The Executive Dashboard would help the Business Delivery Vice Presidents take a performance first approach to the management of HTG.

Executive Summary

The Program Analytics Dashboard project was completed in cooperation with the Hanover Technology Group at Hanover Insurance Group (HTG), in Worcester, MA. The goal of this project was to design and build an executive dashboard that tracks and measures detailed information relative to the performance of each business line at HTG. The current reporting system, called Program Analytics, gives the Business Delivery Vice Presidents (BDVPs) of HTG an overall picture of how their business unit is doing, but the system does not let them drill deeper and break down the numbers. The executive dashboard will not only allow the BDVPs to analyze the numbers, but will also flag abnormal data in the report based on different criteria.

The project team used business process improvement to design and deliver the executive dashboard. The project objectives were used to determine the project deliverables. This in turn helped the team define the overall project scope, identify the risks and constraints and develop estimates for effort and duration. The scope of this Major Qualifying Project included the top four important deliverables. First, the team gathered, documented and analyzed the high-level requirements. Second, the team understood all the facets of the as-is system. Third, the team designed the executive dashboard. Fourth, the team developed a prototype of the executive dashboard in Microsoft Visual Studio 2008 using VB.NET and Access Database.

A key element to the project was to ensure that the deliverables would help the Business Delivery Vice Presidents take a performance first approach to the management of Hanover Technology Group. Besides delivering the expected functionalities, the team provided the users of the Program Analytics Dashboard with a training manual, which walks them through the application and clearly instructs them on how to use the different elements on each screen of the dashboard.

Authorship Statement

Abstract – Archana Reddy

Executive Summary – Archana Reddy

Acknowledgements – Divya Mathew

Introduction – All

Literature Review – All

Methodology – All

Analysis and Design – All

Implementation – Cordell Rogers

Cost Benefit Analysis – Divya Mathew

User Manual – Cordell Rogers

Tech Manual: Documentation – Divya Mathew, Archana Reddy

Tech Manual: Differences – All

Interview Transcripts - All

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Letter from Project Sponsor

The 3 of you did an excellent job on this project, you should be very proud of yourselves. It was a real pleasure working with each of you, and it was a fun and interesting project for me as well. It was great to see the effort and passion you put into your work - the final presentation certainly showed that!

Good luck with all of your future endeavors; you are well prepared to meet any challenge. Keep in touch and let me know how you are doing from time to time.

Thanks,

Dave

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Chapter 1: Introduction

The Hanover Technology Group

David Trigo of the Hanover Technology Group (HTG) is our project sponsor. HTG provides tools to help The Hanover run its business operations. This project will recommend a system to help the Hanover Technology Group run its own business operations.

Project Overview

David Trigo, VP Project Delivery, Enterprise IP Resources, and sponsor of this project, identified the need to design a new reporting system to review the performance of HTG's projects. The current reporting system, called Program Analytics, gives the Vice Presidents an overall picture of how their business unit is doing, but the system does not let them drill deeper and break down the numbers. The goal of this project is to help design a reporting system that tracks and measures detailed information relative to the performance of each business line. The new reporting system will not only allow the Vice Presidents to analyze the numbers, but will also flag abnormal data in the report based on different criteria. This will help the Vice Presidents take a performance first approach to management of the company.

Problem Description

The program analytics report is used for monthly reporting purposes to review the performance of projects/departments and keep track of budgets and spending. The program analytics report was created five years ago by an individual who was well acquainted with the financials and processes used at the time. The format of the analytics has not been updated since then. As the company has undergone many structural changes, policy changes and advances, some information in the report has become obsolete while other key information is missing. In addition, the analytics does not allow the user to drill down into the numbers and identify the

causes of inconsistencies. To do this, the user has to look through different sources of data and try and pinpoint the problem. This is a tedious and time consuming task. Therefore, there is a need to restructure the analytics to include only pertinent information and present it in a way that is useful to users. A large part of the analytics is in text and it is inconvenient and inefficient to dig through the text to find the needed information. It would be useful if information could be provided in the form of visuals such as graphs that could show trends over time and reasons for these trends.

Objectives

The project objectives were used to determine the deliverables. This in turn helped us define the overall project scope, identify the risks and constraints and develop estimates for effort and duration. The following statements describe the goals our project team is trying to achieve.

- Recommend ways to improve the program analytics
- Design a system that will
 - Display a dashboard that will present key information of the Program Analytics report for the VP, thus increasing efficiency and saving time
 - Depict trends over time that will assist with the monthly forecasting process
 - Flag the anomalistic numbers to facilitate a quick investigation into the problem areas
 - Have the ability to drill deeper into the financials in the dashboard
 - Link the different sources of data to enhance the ease of navigation between the different reports
- Develop a prototype of the proposed system

Chapter 2: Literature Review

The literature review provides a foundation of knowledge by reviewing information on subjects related to the project. It is composed of seven sections. Sections I, II, III, and IV establish a foundation of knowledge about the insurance industry, The Hanover Insurance Group, its two main business lines – Personal Lines and Commercial Lines, and the Hanover Technology Group. Section V, VI, and VII provide information on topics directly related to the problem at hand and the solution we need to provide. Since the project involves improving an important business process at Hanover we need to understand what Business Process Improvement is and the standard steps involved in this process. The process we are looking to improve involves HTG's performance management practices. Therefore, we must have a general idea of what performance management is and why it is important. One of the deliverables for this project is the design of a tool used in performance management: a dashboard. Hence, we need to be aware of industry specific dashboards and the tools used to generate them.

Section I: The Insurance Industry

Insurance is a form of risk management in which the insured transfers the cost of potential loss to another entity in exchange for monetary compensation known as the premium. Insurance allows individuals, businesses and other entities to protect themselves against significant potential losses and financial hardship at a reasonably affordable rate.

Insurance exists because risk exists. Be it accidents, fire damage, lawsuits, traveling or health problems etc., we all are always at risk of some problem or the other. The world's first insurance company, The Insurance Office or The Fire Office, was started in 1666 as a result of people and businesses facing extreme losses following the Great Fire of London. In the United

States, the first insurance company was started in Charleston, South Carolina in 1732 (Beattie, 2009).

Insurance works by pooling risk. A large group of people who want to insure against a particular loss pay their premiums into what we will call the insurance bucket, or pool. Because the number of insured individuals is so large, insurance companies can use statistical analysis to project what their actual losses will be within the given class. They know that not all insured individuals will suffer losses at the same time or at all. This allows the insurance companies to operate profitably and at the same time pay for claims that may arise (Perato, 2009).

Insurance and risk management make up an immense, complex global industry. Today there are insurance policies available for almost any situation. Anything that has a potential risk of loss or damage can be insured. Some of the important categories of insurance are:

- Health insurance is a type of insurance that pays for medical expenses in exchange for premiums (Perato, 2009).
- Disability Insurance is a form of insurance coverage that provides a portion of income lost as the result of a total or partial disability caused by either an accident or an illness (Perato, 2009).
- Life insurance is a contract between the policy owner and the insurer, where the insurer agrees to pay a sum of money upon the occurrence of the insured individual's death or other event, such as critical illness in return of regular premiums paid by the policy owner (Perato, 2009).

- Property and casualty insurance is insurance that protects against property losses to your business, home or car and/or against legal liability that may result from injury or damage to the property of others. Among the different lines of property and casualty insurance, private auto insurance is by far the largest single line, nearly four times greater than the next largest line, homeowners multiple peril (Perato, 2009).

We focus primarily on the Property and Casualty Insurance Industry as Hanover Insurance is a world-class property and casualty insurance provider. Figure 1 gives a Performance Summary of The Hanover Insurance Group versus the Property and Casualty Insurance Industry.

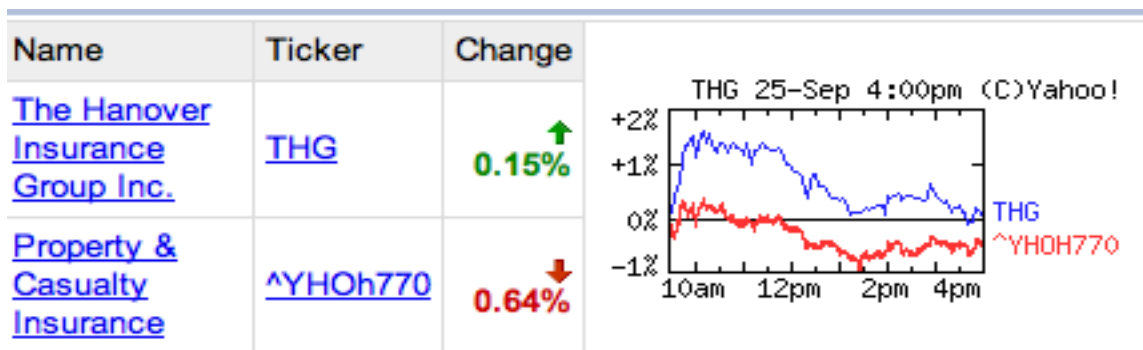


Figure 1: Performance Summary (Yahoo Finance, 2009)

The Property and Casualty Insurance industry is a competitive market, with a market capitalization total of over \$383.93 billion on the New York Stock Exchange (Yahoo Finance, 2009). Some of the top competitors in this market are State Farm, AllState, Berkley, Liberty Mutual, The Hartford and Travelers. From Figure 2 we see that the Hanover Insurance Group is at a competitive position in the Property and Casualty Insurance Industry 2008 Top 25 Companies list, with its number 20 ranking.

03/30/2009

**PROPERTY AND CASUALTY INSURANCE INDUSTRY
2008 TOP 25 COMPANIES BY COUNTRYWIDE PREMIUM
By Line of Business
04-Homeowners Multiple Peril**

RANK	GROUP/ COMPANY CODE	GROUP/COMPANY NAME	DIRECT PREMIUMS WRITTEN	DIRECT PREMIUMS EARNED	MARKET SHARE %	CUMULATIVE MARKET SHARE %	DIRECT LOSS TO EP RATIO*	DIRECT LOSS & DCC TO EP RATIO*
1	176	STATE FARM GRP	14,031,606,297	13,960,321,945	21.36	21.36	81.24	83.21
2	8	ALLSTATE INS GRP	6,970,171,745	7,108,162,888	10.61	31.97	72.18	73.84
3	212	ZURICH INS GRP	4,636,100,387	4,542,640,374	7.06	39.03	86.42	88.80
4	111	LIBERTY MUT GRP	3,210,946,420	3,113,951,689	4.89	43.92	68.57	70.29
5	3548	TRAVELERS GRP	2,906,041,145	2,838,188,889	4.42	48.35	52.35	54.70
6	140	NATIONWIDE CORP GRP	2,860,599,917	2,848,762,436	4.36	52.70	74.38	75.79
7	200	UNITED SERV AUTOMOBILE ASSN GRP	2,665,225,051	2,654,898,596	4.06	56.76	69.23	70.47
8	38	CHUBB & SON INC GRP	1,841,959,186	1,837,713,217	2.80	59.56	44.91	46.55
9	473	AMERICAN FAMILY INS GRP	1,414,173,569	1,413,559,882	2.15	61.72	91.45	92.46
10	91	HARTFORD FIRE & CAS GRP	1,101,874,438	1,109,100,722	1.68	63.39	65.14	63.72
11	10064	CITIZENS PROP INS CORP	1,035,505,843	1,257,427,269	1.58	64.97	37.45	39.76
12	12	AMERICAN INTL GRP	1,015,201,251	750,974,526	1.53	66.52	65.10	70.10
13	241	METROPOLITAN GRP	846,509,796	854,094,923	1.29	67.81	59.81	60.73
14	280	AUTO OWNERS GRP	829,188,271	823,205,117	1.26	69.07	100.18	101.65
15	213	ERIE INS GRP	743,324,938	737,761,314	1.13	70.20	62.06	63.90
16	761	ALLIANZ INS GRP	674,501,661	672,699,637	1.03	71.23	49.87	52.39
17	50	COUNTRY INS & FIN SERV GRP	547,134,272	532,043,888	0.83	72.06	80.71	81.29
18	1278	CALIFORNIA STATE AUTO GRP	490,018,778	493,941,896	0.75	72.81	47.28	49.01
19	4663	UNIVERSAL INS HOLDING GRP	460,152,021	456,549,900	0.70	73.51	27.16	27.90
20	88	THE HANOVER INS GRP	456,154,769	453,156,834	0.69	74.20	60.60	61.71
21	1318	AUTO CLUB ENTERPRISES INS GRP	424,236,201	411,333,471	0.65	74.85	79.63	85.29
22	28	AMICA MUT GRP	415,013,213	411,214,101	0.63	75.48	58.28	59.88
23	361	MUNICH RE GRP	375,088,153	215,187,936	0.57	76.05	68.37	69.53
24	215	UNITRIN GRP	318,305,373	312,547,437	0.48	76.53	72.47	73.36
25	244	CINCINNATI FIN GRP	302,802,493	303,012,517	0.46	76.99	93.16	95.15
		INDUSTRY TOTAL	65,682,086,696	65,034,595,177	100.00	100.00	70.74	72.53

* (Direct losses incurred / Direct premiums earned)

Figure 2: Property and Casualty Insurance Industry 2008 Top 25 Companies by Countrywide Premium (NAIC, 2009)

Section II: The Hanover Insurance Group

History

The Hanover Insurance Group, Inc. was formed in 1852 in New York City to protect businesses and homeowners from a commonly faced hazard at the time - fire. The company took its name from Manhattan's Hanover Square where it was located (The Hanover Insurance Group Inc., 2009).

The newly founded company survived a number of catastrophes in its early years, including natural disasters and fires and the 1929 stock market crash. Because the Hanover maintained its holdings in largely liquid form, the impact from these events was minimal. The

company even began to expand its business to include automobile and marine insurance policies (The Hanover Insurance Group Inc., 2009).

Following World War II, the company underwent a number of structural changes. In 1969, following the merger of the highly successful Citizens Insurance of Michigan and Worcester, Massachusetts-based State Mutual Life Insurance Company, The Hanover became affiliated with State Mutual. This new conglomerate provided Hanover with the latest resources for product development, underwriting, data processing, investment and claim, policyholder and agent services. In 1995, State Mutual became a publicly-traded company, and changed its name to Allmerica Financial Corporation. The Hanover leveraged the considerable resources of this group to build its line of products and services, while it continued to nurture its traditional strengths—its regional focus and local market knowledge, established relationships with high-quality, service-minded agents, and underwriting discipline (The Hanover Insurance Group Inc., 2009).

From 2003 to 2004, the company restructured to considerably improve its financial position, organization and operating model. Under the direction of CEO, Fred Eppinger, the company also developed a strategy to become a world-class property and casualty company. As a result, it decided to sell its life insurance affiliates in 2005. With this sale, and after making tremendous progress in all areas of its property and casualty business, the company changed its name from Allmerica Financial Corporation to The Hanover Insurance Group, Inc (The Hanover Insurance Group Inc., 2009).

Today, The Hanover Insurance Group, Inc (NYSE: THG), headquartered in Worcester, Massachusetts, is the stock holding company for a group of insurance companies. The Hanover's

two lead property and casualty insurers include The Hanover Insurance Company and Citizens Insurance Company of America. Together, they comprise approximately 4,000 employees and offer a wide range of property and casualty products and services to individuals, families and businesses through an extensive network of independent agents (The Hanover Insurance Group Inc., 2009). With revenues of \$2.7 billion, The Hanover is in excellent financial condition and ranks among the top 25 largest property and casualty companies in the country as can be seen from Figure 2. As a super regional insurer, The Hanover provides agent partners and their customers with the financial strength and product and service capabilities of larger national carrier, together with the local market understanding, accessibility and responsiveness of a smaller regional carrier - the best of both (The Hanover Insurance Group Inc., 2009).

The company has withstood the tests of time – successfully managing through periods of adversity as well as prosperity – while continuously delivering on its promises to its agent partners and their customers. As a stronger, more focused company, The Hanover continuously lives up to their service promise - *Our policy is performance* (The Hanover Insurance Group Inc., 2009).

Success at The Hanover

Successful companies are marked by dynamic leadership that provides guidance in the form of well-defined strategic goals. These goals along with a set of values are permeated throughout the company so that every employee understands what success means to the company. To better serve Hanover, we must not only review its history and the industry in which it competes, but must also have a thorough understanding of what factors contribute to success at Hanover.

Strategic Goals

Knowledge of The Hanover's strategic goals will help us align our solution to its needs. The following are The Hanover's strategic goals:

- *Become a World Class Regional Property & Casualty Company*

To The Hanover, the path to becoming a world class regional Property & Casualty company consists of three factors: consistent top-quartile financial performance, consistent top-quartile products and service, and a top place to work for outstanding professionals (The Hanover Insurance Group Inc., 2009) .

- *Develop Deep Partnerships with Winning Agents*

One of The Hanover's top priorities is to create efficient, long-lasting and mutually beneficial relationships with their independent agents. It strives to know the needs of its agents and customers better than its competitors so it can align its services with the right opportunities (The Hanover Insurance Group Inc., 2009).

- *Build a World Class Underwriting and Product Capability*

The Hanover's focus lies on the business it know best – small to midsize commercial lines and the customers they rely most heavily on – personal lines. To serve the needs of these two markets, it is committed to outperforming its competitors by sustaining the best underwriting practices and producing the most innovative products (The Hanover Insurance Group Inc., 2009).

- *Attract, Retain and Develop the Best People*

The Hanover relies on its employees to distinguish itself from the rest of the pack. Therefore it has and will continue to spend considerable resources on its people to build the best

leadership, home office and front-line staff possible (The Hanover Insurance Group Inc., 2009).

- *Maintain a Financially Strong Company and a Strong Culture of Execution*

The key to success in this industry is to deliver on one's promises. This can be done through effective execution which in turn breeds success. Knowing this, The Hanover is committed to providing its customers with the reliability and stability that they require (The Hanover Insurance Group Inc., 2009).

Values

We must understand and assume The Hanover's values so that we can provide a solution that is truly important and useful to it. The Hanover prides itself on the following values (The Hanover Insurance Group Inc., 2009)

- Integrity and Honesty
- Teamwork and Collaboration
- Accountability for Results
- Commitment to Winning
- Meritocracy

Core Skills

Awareness of The Hanover's core skills will enable us to utilize them when developing our solution. The Hanover's core skills comprise superior **local market management**, outstanding **agency and customer service**, exceptional **underwriting**, effective and efficient **claims service**, disciplined **performance management and measurement**, timely

implementation of **value-added technology** improvements, and aggressive **talent management** through thoughtful people development (The Hanover Insurance Group Inc., 2009).

Section III: Hanover Personal & Commercial Lines

The Hanover is largely divided into two businesses: Personal and Commercial Insurance. The Hanover Technology Group provides services to both of these businesses separately as well as projects that benefit both of them. Our project involves interacting with both of these businesses and providing a dashboard for their technology spending. The following sections will describe these businesses to provide further background.

Personal Insurance

On the Hanover website (The Hanover Insurance Group Inc., 2009), this business is called Personal Insurance. Internally however, it is called Personal Lines. This business provides insurance for individuals. The main categories under Personal Insurance are: Automobile Insurance, Homeowner's Insurance, Boat Owner's Insurance, and Personal Umbrella Liability Policy.

Automobile Insurance is the most complex of Hanover's Personal Insurance Lines. Hanover provides many services under this category. It is further complicated because Michigan drivers are treated differently for some services, and Massachusetts drivers are treated differently for other services.

Liability insurance for automobiles is mandatory in most states. It covers any property or bodily harm to others due to an accident. Medical Payments Coverage covers medical expenses of the insured and any passengers that are incurred in an accident. Collision Coverage covers damage to the insured automobile caused in an accident. Comprehensive Coverage covers any

new car stolen within six months of purchase. The customer will receive the actual cash value of the car. Automobile insurance combines several types of insurance in one policy.

Hanover also offers protection for fire, vandalism and other things that may happen to an insured car not related to a collision. For example they offer protection for electronic equipment and customized vans. They even offer coverage for car rental reimbursements and towing fees for an automobile disabled by an accident as well as a car rental reimbursement.

They also offer endorsements for customers to enhance their policies further at an extra cost. An endorsement is an extension to the customer's insurance policy. For Massachusetts drivers, they offer the following endorsements: DriveSmart, DriveSmart Advantage, Additional Customized Equipment, and Loan Lease Gap Coverage. DriveSmart includes the following features: Second Chance Accident Forgiveness, Ultimate Towing and Labor, Ultimate Rental, Educator's Benefit, and Pet Injury Coverage.

Second Chance Accident Forgiveness allows for one accident to be forgiven in a 36-month period. Forgiveness in this sense means that the customer's insurance premium will not increase and no surcharge points will be charged to the policy. Ultimate Towing and Labor reimburses the customer for all towing costs to the nearest auto repair shop regardless of the limit on the regular policy. It also covers all towing and labor costs if the keys are lost, broken or locked in the car. Ultimate Rental will cover up to \$3,000 of the cost of a rental until the customer's car is repaired or replaced, assuming that the damage to the car is covered and the automobile is being repaired at a Hanover approved repair shop. Educator's Benefit reduces the deductible to \$25 for damage to a customer's automobile due to mischief or vandalism done on school grounds. Pet Injury Coverage pays for veterinary fees up to \$500 for when a dog or cat is

injured in a collision. It also pays up to \$500 for burial or disposal if the cat or dog dies in an accident.

DriveSmart Advantage for Massachusetts drivers includes all of the above benefits with two additional features: New Car Replacement Guard and Deductible Dividends. New Car Replacement Guard protects the customer when his/her new car is declared a total loss within one year of purchase or 15,000 miles, whichever comes first. Hanover will cover the cost to get the same exact car, same model, make, and equipment. The Deductible Dividends reduces the customer's deductible by \$100 as soon as the Drive Smart Advantage is activated (when the customer begins subscribing to this protection), and at every annual renewal after that up to \$500 for every year that the customer does not have a surchargeable accident.

Additional Custom Equipment protects all custom equipment added to the car. Loan Lease Gap Coverage pays the difference between the actual cash value of the customer's car at the time of loss and any amount that needs to be paid to a loan or lease.

Non-Massachusetts drivers only have the following endorsement options: DriveSmart Advantage and Ultimate Service. DriveSmart Advantage for Non-Massachusetts drivers is different in that it only offers New Car Replacement Guard, Deductible Dividends, and Second Chance Accident Forgiveness. Ultimate Service is a combination of the previously mentioned Ultimate Towing and Labor and Ultimate Rental.

Michigan Drivers have more protection in their policies, including coverage for wage loss. This difference is because Michigan Drivers are required to have no fault insurance. Michigan Law requires that no fault automobile insurance must include wage loss protection among other things (Barone Law Offices, PLC, 2009).

Homeowner's Insurance is also complicated because it is divided into categories. These categories are more intuitive than the automobile insurance categories. They are based on the kind of property the customer is looking to protect. There is Homeowner's Insurance, Condominium Owner's insurance, Renter's Insurance and Rental Property Insurance.

Homeowner's Insurance covers the customer's home and other structures on the property. This covers Additional Living Expense (for a place to live when a home is damaged), Liability Insurance (for people and property damage that is the fault of family members), Medical Payments to Others (for non-household members accidentally injured on the property or by the owner or a family member), and inflation (this increases the policy limit as house repair and other costs rise). Condominium Insurance includes Loss Assessment Coverage, which protects the customer if his association settles a legal judgment and asks him to pay his share. It also includes coverage for Improvements, Possessions, and Liability. Renter's Insurance includes coverage for Liability, Additional Living Costs, Business Property, Credit Cards, and Water Damage. They will even provide coverage for jewelry, furs, and other possessions.

Hanover Calls its Rental Property Insurance Dwelling Fire-Plus. This policy includes coverage for Personal Property Protection (such as appliances kept at the rental location for tenants), Loss of Rental Income and Other Structures (such as detached garages, service structures, etc.). Landlords may also purchase additional coverage for things such as Tenants Relocation Expense and Liability for injury or damage to others.

Boat Owner's Insurance has fewer facets. One may get protection for liability, property, towing, automatic unattached equipment, and optional uninsured boater coverage.

Personal Umbrella Liability Policy can be purchased to increase the customer's current liability by \$1 million. This covers the insured for lawsuits for Personal Injury, Negligent Damage (particularly useful for landlords with property that they rent to others), and Liability Loss.

Business Insurance

The Business Insurance part of Hanover is called "Commercial Lines" internally, but Business Insurance on their website (The Hanover Insurance Group Inc., 2009). This business offers two kinds of insurance: Small Business Insurance and Midsize Business Insurance.

Small Business Insurance serves over 250 different business categories including retail, service, office, apartments, etc. The Hanover offers Employment Practices Liability Insurance. This protects businesses from lawsuits for discrimination, harassment, and the like. They also offer a Home Entrepreneur Program which adds business coverage to your homeowner's insurance. This protects: business property, business personal property, money and securities, loss of business income, loss of accounts receivable records, credit and ATM cards, and business liability.

Midsize Business Insurance includes packaged property and liability programs, commercial auto, commercial umbrella liability, inland marine, and worker's compensation. The Hanover also provides specialized insurance programs for Marinas and Jewelers.

With the services that The Hanover provides in these two businesses, it is evident that a large amount of information technology infrastructure is required to manage business operations such as billing, marketing, claims, and other operations.

Section IV: The Hanover Technology Group

The Hanover Technology Group (HTG) provides information services for The Hanover. Michael Clifton, the Chief Technology Officer of The Hanover, manages HTG. HTG provides The Hanover with the necessary tools to run its business. This includes services such as networking, telecommunications and technical support. This is called the “baseline” section of HTG as it is just the essentials of what the Hanover needs. David Trigo, Sue Trombley and Cilsy Harris are the Business Delivery Vice Presidents of the Claims, Commercial Lines and Personal Lines, respectively. They work with “discretionary” projects – projects that are not essential to keeping the business running but can be used to improve the business performance. Our project will be focused on recommending a performance management/business intelligence system so that David, Sue, and Cilsy can track the performance of these discretionary projects.

Section V: Business Process Improvement

In a world driven by customers, competition and change, companies are continually searching for new innovative solutions for the business problems they have (Muthu, Whitman, & Cheraghi, 1999). Before a project team determines what requirements are important for a system, they should have a clear idea of the system’s purpose and how it will benefit the organization. Requirements Analysis techniques help an analyst lead the users through steps so that the vision of the system can be developed. The three most popular requirements analysis techniques are business process automation (BPA), business process improvement (BPI) and business process reengineering (BPR). The technique we will use for our project is Business Process Improvement (Dennis & Wixom, 2003).

Business Process Improvement means making reasonable changes to the way in which an organization operates to take advantage of new technological opportunities or to imitate what

competitors are doing. This method can improve efficiency and effectiveness (Dennis & Wixom, 2003).

This requirement analysis technique can yield considerable benefits for an organization. Nevertheless, it requires commitment because improving processes can be time consuming and complex.

The Business Process Improvement life cycle consists of four important steps:

Step 1: Identify Business Processes

Identifying business processes creates an increased understanding of the current way of doing business, shows the level of involvement of stakeholders in the process, and highlights ideas for change (The Frames Group, 2009).

This step involves identifying all key business processes, including their sub-processes, activities and other steps. The primary focus of this step is to analyze and consider the movement of information and resources between business processes. The information is gathered from process users, owners and experts.

Step 2: Document the Process

Documenting process flows ensures that there is a consistency in routines. Physical documentation is a quality approach that is also used for training new employees and ongoing maintenance.

The tasks and decisions that define the flow of information through the workflow are included while documenting a process. All the resources required and all the influences which

affect the operations of the process, directly or indirectly, are listed. This step also documents the departments and job functions involved in the process (The Frames Group, 2009).

Step 3: Analyze and Measure the Process

Analyzing and measuring a process helps an organization identify the cost and lead time involved in a process. The possible benefits from improving a process are carefully considered and any apparent problem areas are noted.

This step involves evaluating each process to validate the current priority level and consider opportunities for improvement. Information useful in assisting with this step includes process flows, user input, policies and procedures (The Frames Group, 2009).

Step 4: Improve the Process

In the process improvement step of the life cycle, the focus is fixed on optimizing resources, promoting efficiency, reducing costs, and increasing the return on investment.

Process improvement is the re-optimization of business processes through the introduction of change. This is done by developing new prototypes of process flows, policies and procedures, or defining new reporting requirements (The Frames Group, 2009).

Section VI: Performance Management

HTG relies heavily on performance management to produce effective solutions for its business partners. To understand the importance of performance management to HTG, we first need an understanding of what performance management is, and what the standard performance management practices are.

Performance management encompasses techniques used to ensure that goals are consistently being met in an effective and efficient manner. Performance management can apply to the performance of the organization, a department, processes to build a product or service, projects, employees, etc. (McNamara, 2008).

In HTG, performance management is an integral part of project management. Project management is a carefully planned and organized effort to accomplish a specific objective, e.g., create a new product or implement new software. Project management comprises various tasks such as developing a project plan, quantifying the resources needed, and determining budgets and other estimates. Project management further includes managing the implementation of the project plan, and conducting frequent measures to ensure the availability of accurate and objective information on performance. This information is then used to review the performance of the project relative to the plan and initiate remedial actions if required (Authenticity Consulting, LLC., 2009). With respect to projects, performance management is this integrated process of planning, managing and controlling project performance (PMI College of Performance Management, 2006).

To HTG, performance management is highly important as it improves the capability of its business delivery lines. It provides three important services: information delivery, performance oversight, and performance effectiveness. These services help to identify the sources of problems, and to determine ways to correct these problems (Riverside, 2006). Performance management allows managers to tap into the full potential of all the project resources. Its use ensures that projects are not only completed but that they are completed on time, in the most efficient and economical way possible, while meeting project objectives and everyone's satisfaction. Hence, the success of a project greatly depends on the robustness of the performance

management practices and tools applied to it. Increasingly, managers are looking for tools that provide them with the most pertinent, high-level performance information in an easy to understand manner. Performance dashboards are gaining popularity as effective solutions to this problem.

Section VII: Executive Dashboard

“An executive dashboard is a computer interface that displays the information corporate officers need to effectively run an enterprise” (WhatIs.Com, 2006). Dashboards display this information in a small amount of space and in the clearest, most effective manner possible (Few, 2006). This is where Systems Analyst skills are important.

Executive dashboards are business intelligence tools that can pool data from many sources and make it all useful to the executive viewing it. The “dashboard” term comes from the metaphor of a business to a vehicle (Best Price Computers). This tool can be used to measure the status of the company similar to how a car’s dashboard can be used to check the speed, gas and other vital statistics.

There are many tools that may be used to create dashboards. SAP, IBM, and Oracle are all popular firms that create business intelligence tools.

SAP’s business intelligence suite is under the umbrella name BusinessObjects after the company they acquired that created the tools. BusinessObjects has multiple options for business intelligence tools including one called SAP BusinessObjects Dashboard Builder. The Dashboard Builder offers drag-and-drop functionality allowing for quick assembly. Recognizing that a lot of business information is often connected, the Dashboard Builder also allows for communication between dashboard components. The dashboards also have drill down capabilities, and the

administrator can create web enabled reports. The company website seems to highlight security as a strength for the Dashboard Builder. This is important for Executive Dashboards as much of the pertinent information is very private (SAP AG, 2009).

IBM's business intelligence suite is called Cognos after the company they acquired that created the tools. Cognos 8 Business Intelligence has a Dashboard tool amongst others. This dashboard builder also has drag-and-drop functionality, drill down capability and cross component communication. It also includes flash graphics which may appeal to executives on an aesthetic level. It does not seem to include the ability to enable web access to reports. Cognos Business Intelligence 8 does offer three kinds of dashboards: operational, tactical, and strategic. Operational dashboards allow an employee to review real-time performance. Tactical dashboards allow an employee to review performance daily, weekly or over some other time period. Strategic dashboards allow for managers to monitor progress and see how it compares to strategic goals (IBM Corporation , 2009).

Oracle's Hyperion, also named after the company they acquired that created the tools, offers two kinds of Dashboard Tools. The first, Dashboard Studio, allows for dashboard creation without code. The studio is like the other two suites in that it includes the ability for different information sources to work together. It is very much optimized for the end user (manager) to have control over the information they want and how it is displayed without needing IT to go into the back end and code the necessary changes. Dashboard Architect is more technical in nature. It is an integrated development environment for building, testing, and debugging the Interactive Reporting tools. Features such as the ability to access source code in real time are conducive to more developer control of the dashboard (Oracle Corporation, 2009).

Simpler tools like Microsoft Access and Excel can be used to create dashboards, but will likely not be sufficient for an organization such as the Hanover Technology Group, due to the large amounts of data required for their performance management. For this project, we will explore what types of report building tools HTG already has and recommend those if they satisfy HTG's needs. If the tools are not satisfactory, we will determine the best tool and recommend it for the development of the dashboard.

Chapter 3: Methodology

SDLC

The Systems Development Life Cycle (SDLC) is the process of understanding how an information system can support the needs of a business, planning the development of the system, designing it, building it, and delivering it to the users (Dennis & Wixom, 2003). The SDLC has four fundamental phases: planning, analysis, design, and implementation. Different projects emphasize different parts of the SDLC but all projects have some elements from these phases. The primary approach used to complete this project focuses on the first three phases of the SDLC. A list of the techniques used by the project team to produce the deliverables in each phase can be found in Table 1.

Table 1: SDLC Phases and Deliverables

Phase	Step	Technique	Deliverable
Planning Focus: Why build the system? How to structure the project?	Identify Opportunity	Project Identification	Project Introduction
	Understand Background	Research	Literature Review
		Analyze Feasibility	Technical Feasibility
	Economic Feasibility		
	Organizational Feasibility		
	Develop Timeline	Time Estimation	Timeline
		Task Identification	
Staff Project	Project Staffing	Staffing Plan	
Control and Direct Project	Scope Management	Project Scope	
	Risk Management	Risks/Constraints	

Analysis Focus: Who, what, where, and when for this system?	Develop Analysis	Business Process	Requirements
	Strategy	Improvement	Analysis
	Determine Business Requirements	Interview Observation Document Analysis	Requirements Definition
	Create Use Cases	Use Case Analysis	Use Cases
	Model Processes	Data Flow Diagramming	Process Models
	Model Data	Entity Relationship Modeling Normalization	Data Models
Design Focus: How will this system work?	Design Architecture	Architecture design Hardware, Software Selection Database Format Selection	System Architecture Report
	Design Interface	Use Scenarios Interface Structure	Interface Design
	Build Prototype	Prototype Development	Prototype
Implementation: Focus: Support of Proposed System	Create Training Manual	Training	Training Manual

Scope

The following, high-level scope definition was created by taking into consideration the deliverables and boundaries of the project. It includes all the work that needs to be accomplished, to produce the deliverables that will satisfy the project goals. The section also defines the

boundaries of the project, which are stated in terms of those things that are applicable to our project versus items that are not included in the scope of the project.

The project scope includes the following:

- **Planning and Analysis**

- *Gather, document and analyze the high-level requirements*

- Interview the Business Delivery Vice Presidents to gather requirements and understand the types of data that they find most pertinent and their need for this data
- Document and analyze these requirements based on priority

- *Understand the facets of the as-is system*

- Understand the deficiencies and problems with the as-is system from the perspective of the Business Delivery Vice Presidents
- Interview members of Resource Management Team, HTG Finance group and other analysts involved with compiling the Program Analytics report to understand the meaning of the data that is used in the as-is system and will be used in the new system
- Identify the various sources of input for data in the as-is system and how these sources relate to one another

- **Development**

- *Design the system*

- Create a hierarchical map of the system that will depict the flow from one screen to the next and the different views that can be obtained
- Create a complimentary map consisting of screen shots that will highlight the features available on each screen

- Provide detailed and documented recommendations for a complete dashboard system.
This will include a complete list of features that the system must have to satisfy the prioritized requirements and the tool or software that will be used to build the system.
- Perform a cost-benefit analysis for the complete dashboard system to depict the value add that the system will provide
- Compile a training manual for users of the system
- *Build a Prototype*
 - Build a prototype to cover two or three use scenarios that will show how a user can manipulate the system to drill through the information and identify sources of problems
 - Include intelligence to highlight problem areas based on criteria provided by the users
 - Display pertinent high-level information on the dashboard that will provide a snapshot of the performance of each business line

The project scope does not include the complete development or testing of the system proposed through the recommendations.

Deliverables and Timeline

Table 2 lists the deliverables for the project and the deadlines by which they are due.

Table 2: Project Deliverables and Timeline

Deliverable	Deadline
Proposal Presentation	October 7 th 2009
Business Analysis <ul style="list-style-type: none">• <i>Gather, document and analyze the high-level requirements</i>• <i>Understand the facets of the as-is system</i>	November 4 th 2009
Prototype <ul style="list-style-type: none">• <i>Demonstrate Two or three use scenarios</i>• <i>Utilize intelligence to highlight problem areas</i>• <i>Display pertinent high-level information on the dashboard</i>	November 18 th 2009
Final Draft	December 2 nd 2009
Final Presentation	December 9 th 2009 (or following week depending on availability)

Work Plan

Figure 3 shows the tasks that compose each deliverable and the duration of each task.

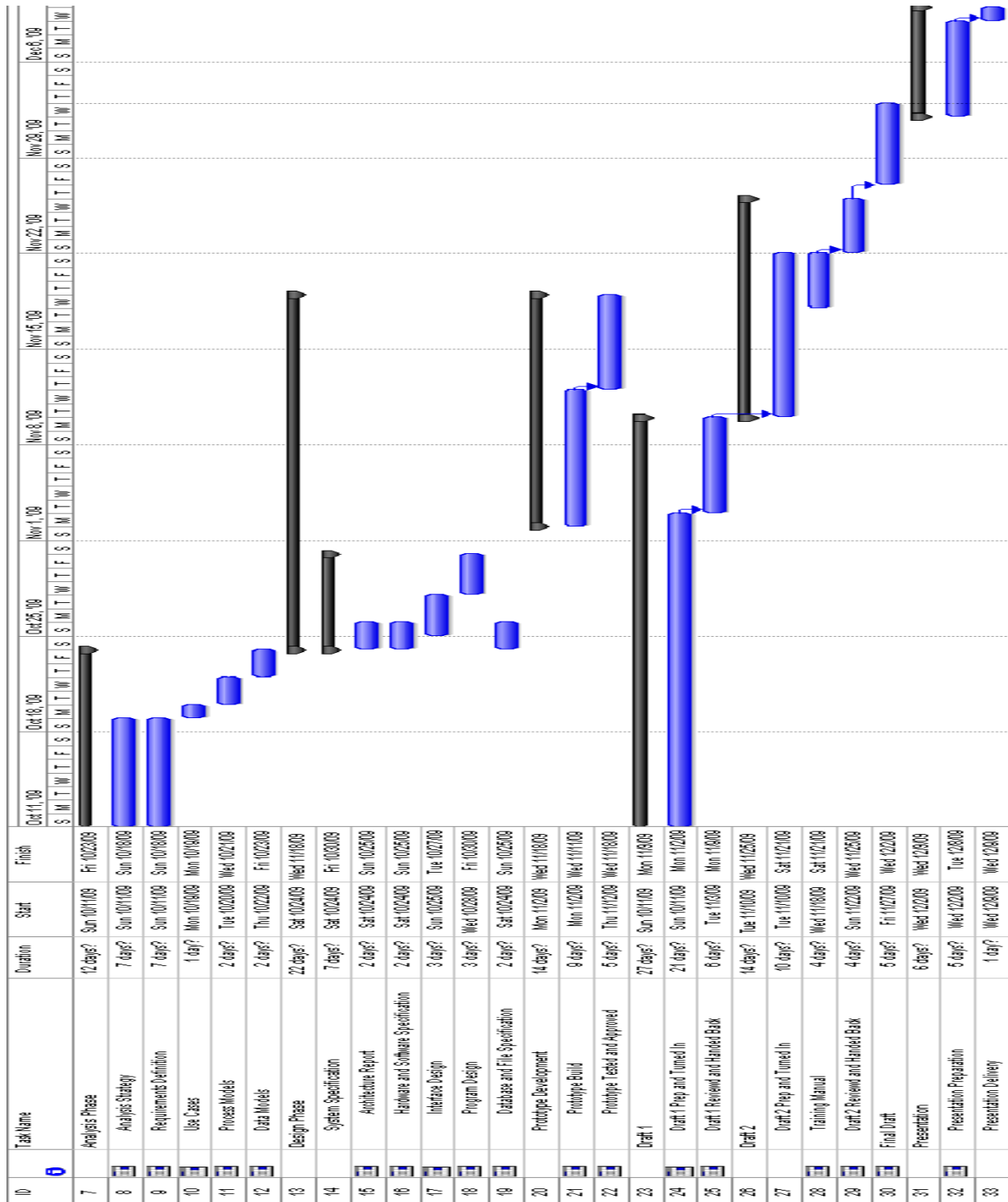


Figure 3: Project Work Plan

Staffing Plan

This section describes the skills that the team members possess that will ensure the success of this project. This reassures the project sponsors that this project is in good hands.

Divya Mathew



Divya Mathew is a Management Information Systems major and has a strong background in this field. Her coursework in Systems Programming, Database Management and System Analysis and Design will help with both the prototype development and the business analysis aspects of the project. In addition, her previous internship experience with the Hanover Technology Group is very beneficial as she can facilitate the group's acclimatization to the Hanover environment.

Archana Reddy



Archana Reddy is a Management Information Systems major. Her courses such as System Analysis and Design and Database Management have equipped her with skills related to the different phases of the Systems Development Life Cycle. Her past internship experience as a Technical Intern at Fidelity Investments has provided her with the necessary corporate systems background for this project.

Cordell Rogers



Cordell Rogers is a Management Information Systems major and a senior. He has taken the System Analysis and Design course in preparation for this project. He has also taken an Access Database course that covers the database

management skills needed for this project. He brings business and technical acumen to the project team.

Stakeholder List and Roles

For the project to be successful, the project must not only meet the users' expectations, but also meet the expectations of all the other stakeholders of the project. Anyone who participates in the project or is affected by its results is a stakeholder. Some of the important types of stakeholders we have identified are the project manager, the project team, the project advisor, the project sponsor, the users of the system, points of contact, and individuals involved with the As-Is System. The complete list of stakeholders and their responsibilities can be viewed in Table 3.

Table 3: Stakeholders' Roles and Responsibilities

Name(s)	Department/ Organization	Project Role	Responsibilities
Dave Trigo	HTG Claims	Project Sponsor/ User	<ul style="list-style-type: none"> • Project reporting • Project oversight • Provide high level requirements
Divya Mathew Archana Reddy Cordell Rogers	WPI MIS MQP Team	Project Managers/ Project Team	<ul style="list-style-type: none"> • Analysis of As-Is system • Requirements gathering • Develop proposal • Design the To-Be system • Develop prototype of the proposed system • Prepare training manual

Prof. Strong	WPI MQP Team Advisor	Faculty Advisor of the project team	<ul style="list-style-type: none"> • Monitor project team progress • Provide guidance • Review all deliverables • Primary contact of the WPI project team
Sue Trombley	HTG Commercial Lines	User	<ul style="list-style-type: none"> • Project guidance • Provide high level requirements
Cilsy Harris	HTG Personal Lines	User	<ul style="list-style-type: none"> • Project guidance • Provide high level requirements
Karin Winsky	HTG BA/QA Practice Center	Initial Point of Contact	<ul style="list-style-type: none"> • Initial point of contact for the WPI project team • Organize initial meetings with the HTG team
Donna Gould	HTG	Initial Point of Contact	<ul style="list-style-type: none"> • Initial point of contact for the WPI Project team
Tom Butler	HTG	Developer of the As-Is system	<ul style="list-style-type: none"> • Provide system analysis guidance • Explain the functionality of the As-Is system and the data involved
Lisa Balser	HTG	Business Analyst of the As-Is system	<ul style="list-style-type: none"> • Explain the functionality of the As-Is system and the data involved
Janet Cassasanto	HTG	Financial Analyst of the As-Is system	<ul style="list-style-type: none"> • Explain the functionality of the As-Is system and the data involved
Mike Cramer	HTG	Application Engineer of the As-Is system	<ul style="list-style-type: none"> • Explain the functionality of the As-Is system

Feasibility Analysis

In this section, we determine the feasibility of this project. We evaluate this on three criteria: Technical Feasibility, Economic Feasibility, and Organizational Feasibility.

Technical Feasibility

This section answers the question: “Can we build it?” (Dennis & Wixom, 2003). We examine the organization’s capability to complete this project based on technological capability, application familiarity, technological familiarity, compatibility, and project size.

Technological Capability

The Hanover Technology Group has multiple reporting tools at their disposal that can be used to create a high performance dashboard. In addition, there are a number of software developers and database architects whose skills can be utilized to develop supplemental functionality on top of these out-of-the-box tools.

Application Familiarity

The users are very familiar with the application area for the system. They currently conduct performance management for their projects and investment proposals. As analysts, we have become familiar with the application area through our interviews with employees who generate the current performance management reports.

Technological Familiarity

The users are not familiar with the technology that the system will employ. We, as the analysts however, are familiar with the technology. There are also other business analysts currently employed at The Hanover that could help with the implementation. These analysts have

even more experience with executive dashboards, the system we plan to develop. This will minimize the risk of the system being rejected due to unfamiliarity.

Compatibility

Since Hanover already has an installation of Hyperion on their network, we believe that the system will be compatible with the current technologies. This is important because it saves on the costs of developing more infrastructure.

Project Size

This Project would need at maximum 4 team members to implement the solution. This includes Business Analysts, Architects, Developers, and Quality Assurance Specialists. If approved, HTG can staff this project with current employees or consultants.

Economic Feasibility

This section answers the question: Should we build it? (Dennis & Wixom, 2003). It includes a cost/benefit analysis describing tangible costs and benefits as can be seen in Table 4. The section also includes the list of intangible benefits, outlined below Table 4.

Table 4: Cost Benefit Analysis

	2009	2010	2011	2012	Total
Benefits					
Reduced Time Spent on Creating Report*		5,400	7,560	7,938	20,898
Total Benefits		5,400	7,560	7,938	20,898
Development Costs					
Consulting Fee to WPI	15,000				15,000
Development Labor**		68,000	0	0	68,000
Training		10,000	0	0	10,000
Total Development Costs	15,000	78,000	0	0	93,000
Operational Costs					
Operational Labor***		18,000	25,200	26,460	69,660
Total Operational Costs		18,000	25,200	26,460	69,660
Total Costs	15,000	96,000	25,200	26,460	162,660
Total Benefits - Total Costs	-15,000	-90,600	-17,640	-18,522	-141,762
Cumulative Net Cash Flow	-15,000	-105,600	-123,240	-141,762	
Return on Investment	-87.15%	(-141762/162660)			

* 3 people, each working 8 hours a day for 9 days in 2010 and 12 days for the following years.
Rate: \$75/hour in 2010 with a 5% increase per following year

** 4 people (DA, DBA, MIS Report Dev, MIS QA Test Analyst) working for varying amounts of time as can be seen from Appendix 1

*** 1 person working for a fifth of the full time for 9 months in 2010 and the full year in the following years.
Rate: \$75/hour in 2010 with a 5% increase per following year

Intangible Benefits

- Increased Accuracy in Forecasting Process
- Increased Efficiency in BDVP's Project Review and Performance Management Process
- Executives gain surety by knowing more about the status of their projects.
- Executives will have a more comfortable user experience because of the system's intelligence, attractiveness, and interactivity. They will be more inclined to rely on the new system due to the enhanced user experience.

Since the dashboard is not directly connected to increased revenue or substantial cost savings, the tangible costs outweigh the tangible benefits. The intangible benefits described above make the dashboard a worthwhile investment. It is important to note that the purpose of this dashboard is not to cut costs for the Hanover Technology Group, but rather to provide the Executive Vice Presidents with the information they need in the way that is most convenient for them to view it.

Organizational Feasibility

This section answers the question: If we build it, will they come? (Dennis & Wixom, 2003). It is used to determine if the system will be well received by users and accepted by upper management who are key factors of implementation success.

This system is likely to be accepted well once developed. HTG is a very technology savvy organization, interested in using technology to improve its processes. This system helps them accomplish this. This performance management tool fits well with The Hanover's culture, exemplified by its slogan, "Our Policy is Performance" (The Hanover Insurance Group Inc., 2009). One of the key users, Dave Trigo is also the sponsor of this business analysis. He will be an ideal champion for this dashboard and will be able to get the other users interested in it as

well. Dave Trigo is also a part of the upper management of HTG along with Sue Trombley, and they can both play a significant role in advocating the system's adoption. This should mean little organizational technology resistance.

Conclusion

We have determined that the system is feasible and should be developed. HTG has the people to build the system. The cost necessary to build the system is manageable and yields substantial intangible benefits. With Dave Trigo as its champion, the system will be easily adopted.

Risk Assessment

Table 5 lists the risks that may cause us to vary from our timeline.

Table 5: Project Risks/Constraints

Risk	Risk Level	Impact	Description
Professor Review Delay	High	High	Professor Strong needs to review our documents before they get to certain stages. It is likely that this will sometimes take longer than expected and thereby delay the process.
Presentation Scheduling Conflicts	High	Low	Some particular people need to be present at our proposal presentation, as well as our final presentation. There is a high chance that schedule conflicts will arise, and thereby delay the process.
Interviewee Unavailability	Medium	High	Interviewees may not be available due to schedule conflicts such as vacations, business meetings, etc.
Lack of access to pertinent documents	Low	High	Documents may not be available to analyze for the project.

Risk Mitigation

We have recognized these risks and have identified the following methods to mitigate them:

- Professor Review Delay

To minimize this risk, we will let Professor Strong know what we are working on during our weekly meetings. We will also hand her multiple parts of the project at once, instead of one part at a time, so that she can read the sections in one sitting instead of having the deliverables scattered.

- Presentation Scheduling Conflicts

To avoid presentation scheduling conflicts we will provide due notification to the required attendees well in advance of the scheduled time. This will give them ample time to fit the presentation into their schedules or inform us of any changes.

- Interviewee Unavailability

To make sure that necessary interviewees are available, we will be flexible to an interviewee's schedule. If any schedule conflicts arise, we can conduct the interview with just one or two of our team members present and the absentees will read the meeting notes to find out what was discussed during the meeting.

- Lack of Access to Pertinent Documents

To ensure timely access to the documents needed to conduct a thorough document analysis, we will contact the key people that work with these documents on a daily basis and request copies of the documents in advance. This will give us the ability to look at the documents while we wait for formal access from the Technical Support Department.

Chapter 4: Analysis and Design

Section I: Analysis Strategy

Once the project sponsor, Dave Trigo, approved the system proposal, the project team began performing analysis activities. These analysis activities included gathering requirements using a variety of techniques, and analyzing the requirements that were gathered.

Requirements Analysis Techniques

The project team divided the process of analysis into four steps: understanding the As-Is system, identifying improvements, and determining requirements for and modeling the To-Be system.

The goal of business process improvement (BPI) is to improve processes and the quality or value delivered to the users of the system. The methods that we used as part of the BPI analysis technique include processes and procedures that identify, measure, and define the expectations of the project's stakeholders.

Step 1 & 2: Identify Business Processes and Document the Process

As part of our BPI analysis strategy, the project team first observed and documented the existing process of the HTG Program Analytics reporting system. We identified and documented the process flows of the As-Is system. This included documenting the details of inputs, outputs, interfaces and relationships of the existing process flows and understanding the organizational structure and stakeholders involved.

Step 3: Analyze and Measure the Process

The members of the project team conducted several interviews with people involved directly or indirectly with the As-Is system. Information was mainly gathered from the BDVPs, and also from the analysts and developers of the system. During the interviews, the team gathered information about process structure, as well as process performance data. The interview results were used to understand the existing process flow. The existing process flow was subsequently reviewed and integrated into the new flows, wherever possible. Possible process improvements, discussed during the interviews, were also integrated into the new process flows. Hence, a detailed examination of the As-Is system was performed by the project team.

Step 4: Improve the Process

The draft documentation was then reviewed by the important stakeholders to make sure that the team's analysis was proceeding as required by them. The potential benefits from improving the current reporting system were considered, and any likely problems with the system were also conceived during the analysis of the As-Is system. The project team identified the various opportunities and options available for improvement. The team then designed user-driven, non-technical conceptual process and data models using context diagrams, dataflow diagrams and entity relationship diagrams of the To-Be System. The BPI analysis technique concluded with the project team developing a prototype of the proposed system.

Requirement Gathering Techniques

The team used a variety of requirements gathering techniques to ensure that the current business processes and the needs for the new system were well understood before moving into design.

Interviews were conducted with individuals from different divisions across HTG in order to get a thorough understanding of the deficiencies with the As-Is System. The team conducted separate interviews with the BDVPs. The questions asked during these meetings were designed to get a picture of each BDVP's role in HTG, his/her understanding of the As-Is System and the problems with it, and the types of data that he/she finds most pertinent. In addition, each BDVP was also asked to explain his/her need and requirements for the To-Be System, and his/her criteria for the development of the prototype. The transcripts for the interviews with the BDVPs can be found in Appendix 2. The team also conducted interviews with members of the HTG Resource Management Team, the HTG Finance group and other analysts involved with compiling the Program Analytics report. This was done to understand the functionality of the As-Is System and the meaning of the data that is used in it, identify the various sources of input for this data, determine how these sources relate to one another, and where they are located.

During the interviews with the BDVPs, the team also observed their use of the As-Is System. The purpose of this **Observation** was to get a better understanding of how and why the BDVPs use the system, their familiarity with the technology used to create the system, and their comfort in using the system.

The team also conducted a **Document Analysis** of the inputs to and the reports produced by the As-Is System. This was done to further understand the system, the meaning of the data involved, the presentation of the data, and the interaction between the different types of data. The team also looked at a dashboard report produced by the HTG Enterprise Program Office (EPO) to get an understanding of how dashboards are created and presented in HTG.

A complete list of the documents that were reviewed and examined can be found in Table 6.

Table 6: Documents used for Document Analysis

Number	Document Name	Prepared By
1	Personal Lines Program Analytics	Resource Management Team
2	Commercial Lines Program Analytics	Resource Management Team
3	Claims Program Analytics	Resource Management Team
4	Monthly Program Analytics for Discretionary Programs	Resource Management Team
5	Strategic Forecast	Finance Team
6	Time Recording Resource Report	Resource Management Team
7	Personal Lines Program Overview	EPO

Section II: Requirements Definition

Purpose

The purpose of the Requirements Definition is to understand and record the various types of requirements for the development of the Program Analytics Dashboard.

Target Audience

This requirements definition is intended for the following audience:

- Project Sponsors

- System Users
- HTG Development Team
- HTG Testing Team
- HTG Resource Management Team

Requirements

The requirements defined below are based on various requirements gathering sessions with the different users of the system. They are divided into two sections: Functional Requirements and Non-Functional Requirements

Functional Requirements

A functional requirement is a statement that specifies a feature/functionality that should be in the system to enable a user to accomplish his/her task. Functional requirements typically answer the question, “What should the system do?” Functional requirements describe what the developers need to implement. A list of functional requirements for the To-Be system can be found in Table 7.

Table 7: Functional Requirements

User Priority (Low/Med/ High)	Functional Requirement	Stability Indicator (Low - likely to change, High – Not likely to change)
High	The system will display a dashboard that contains pertinent high-level information	High

High	The system will display trends over time for the financial and labor data on the dashboard	High
High	The system will enable the user to look at the data through common views. The criteria for these views can be obtained from the Business Delivery Vice Presidents	High
High	The system will highlight the problem areas using intelligence. The criteria for these problem areas can be found in the “Business Rules” section below	High
High	The system will consolidate information from two databases: MS Project Production Database and AFSOURCE Database and display information on both the finances and labor resources together	High
High	<p>The system will allow the user to drill down into the financial and labor data</p> <ul style="list-style-type: none"> • For the financial data the system will allow the user to drill down to one level to view the financial information of a given IP grouped by EPO categories • For the labor data the system will allow the user to drill down to four levels to view the labor information of a given Role grouped by Resource 	High
Med	The system will store relevant data from the beginning of the year	Med

Med	The system will display data relevant to the view option chosen by the user. The view options will be aggregated by BDVPs or by individual business lines	High
Med	The system will save the user's view option and preferences for the kinds of data (a certain BDVP's business lines or individual business lines) they would like to see	Med
Med	The system will have the ability to print reports	Med
Low	The system will retain the user's display choices (MTD/YTD/Full Year) between multiple screens	Med

Non-Functional Requirements

A non-functional requirement is a statement that augments the description of a system's functionality by describing it in various dimensions which are important either to users or developers. These dimensions are operational, performance, security, and cultural/political. A list of non-functional requirements for the system can be found in Table 8.

Table 8: Non-Functional Requirements

Non-Functional Requirements Type	Non-Functional Req Priority	Non-Functional Requirements	Stability Indicator
Operational	High	The system must support multiple users at the same time	High

Operational	Med	The system's interface needs to be at least one layer removed from dealing directly with pivot tables	Low
Performance	High	The system's new reports need to be accessible at the same time every month and then available thereafter for reference	Med
Performance	Med	The system needs to upload data overnight to be out of the way of other data driven software	Med
Performance	Med	The system needs to perform each function in under seven seconds	Med
Performance	Med	The system needs to have a 99.5% uptime	Med
Security	High	The system must be secured with appropriate passwords and administrative restrictions	High
Cultural/ Political	Med	The system must have the flexibility to incorporate structural changes	High

Business Rules

This section describes the criteria outlined by the BDVPs for identifying problem areas.

Criteria for Problem Areas

The following are the criteria for identifying problem areas:

Financial Data

- Green – Variance between Actual/Forecast and Approved: 0% -5%
- Yellow - Variance between Actual/Forecast and Approved: 5% – 10%
- Red - Variance between Actual/Forecast and Approved: >10%

Labor Data

- Green – Variance between Actual/Forecast and Commitments: 0% -10%
- Yellow - Variance between Actual/Forecast and Commitments: 10% – 20%
- Red - Variance between Actual/Forecast and Commitments: >20%

Section III: Use Cases and System Models

The following sections details the relationship hierarchy; use cases, process descriptions, data definitions, process models and data models that we created to explain the functionality of the To-Be System.

Relationship Hierarchy

Figure 4 shows the hierarchical relationship between the different groupings in the system's data. This diagram is necessary to further understand these relationships before the use cases, data flow diagrams, entity relationship diagram (ERD) and ERD Data Dictionary have been reviewed.

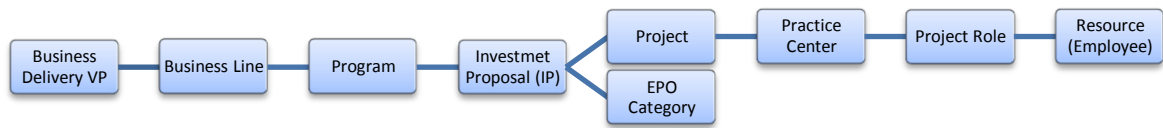


Figure 4: Hierarchical Relationships

Process Descriptions and Use Cases

This section describes each process that covers a certain functionality of the To-Be System and also details the associated use case and data definitions.

Process 1

1. **Access the System** – This process describes how a Business Delivery Vice President logs into the system and selects the relevant view option for the data; e.g., by individual business lines or by the group of business lines owned by different BDVPs

Inputs

- **Business Lines Info** - Information about all the business lines
- **Business Lines Owned Info** - Information about the business line(s) owned by each BDVP
- **Login Info** – User ID and Password provided by the user
- **Stored Login Info** – User ID and password stored in the User Table in the system

Outputs

- **View Option Menu** - A menu of options to view data aggregated by BDVPs or by individual business lines

Use Case 1

Use case name: Access the System

Primary Actor: Business Delivery Vice President (BDVP)

Description: This use case describes how a Business Delivery Vice President logs into the system and selects the relevant option by which he/she would like to view the data; e.g., by individual business lines or by the group of business lines owned by different BDVPs.

Trigger: The Business Delivery Vice President wants to access the system and view the data by a relevant view option.

Type: External

Major Inputs Description	Source	Major Outputs Description	Destination
Login Info	BDVP	View Option Menu	BDVP
Stored Login Info	User Table	Main Screen	System
Business Lines Owned Info	Business Line Table		
Business Lines Info	Business Line Table		
Desired View Option	BDVP		

<u>Major Steps Performed</u>	<u>Information for Steps</u>
<p>1. The BDVP enters his/her username and password and then clicks the login button. The system verifies the login information provided by the BDVP against the stored username and password in the Login file.</p>	<p>← Login Info</p> <p>← Stored Login Info</p>
<p>2. The BDVP is taken to a new screen that pulls information about the business line owned by each BDVP and the individual business lines and displays a menu of options to view data aggregated by BDVPs or by individual business lines.</p>	<p>← Business Lines Owned Info</p> <p>← Business Lines Info</p> <p>→ View Option Menu</p>
<p>3. The BDVP then selects a view option based on the data he/she would like to see and is taken to the main screen that displays the dashboard and the common view on different tabs</p>	<p>← Desired View Option</p> <p>→ Main Screen</p>

Process 2

2. **Maintain Account Information** – This process describes how the BDVP updates his/her account information. The BDVP enters his/her account information changes into the system. The system then updates User Table and/or Business Line Table with this new information.

Inputs

- **BDVP Account Info Changes** - The account information changes entered into the system by the user

Outputs

- **Business Line Owned Info Changes** - Updates to the system's Business Line table information
- **Updated Login Info** - Updates to the system's user login information in the User Table

Use Case 2

Use case name: Maintain Account Information

Primary Actor: BDVP

Description: This use case describes how the BDVP updates his/her account information.

Trigger: The BDVP needs to update his/her login or business line ownership information.

Type: External

Major Inputs Description	Source	Major Outputs Description	Destination
BDVP Account Info Changes	BDVP	Business Line Owned Info Changes	Business Line Table
		Updated Login Info	User Table

<u>Major Steps Performed</u>	<u>Information for Steps</u>
1. BDVP enters account information changes into the system.	← BDVP Account Info Changes
2. System updates User Table and/or Business Line Table with new information.	→ Updated Login Info → Business Line Owned Info Changes

Process 3

3. **Display Dashboard** – This process describes how a Business Delivery Vice President can display the dashboard and change the views through which the information is displayed on it

3.1. **View Dashboard** – This subprocess describes how a Business Delivery Vice President can generate the dashboard to view the high-level information

Inputs

- **Financial Data** – The financial data that is used to populate the dashboard
- **Labor Data** – The labor data that is used to populate the dashboard
- **Selected View Option** - The view option selected by the user

Outputs

- **Labor Graph/ Financial Graphs** – The graphs displayed on the dashboard that contain the labor and financial information
- **Labor Table/ Financial Table** – The tables displayed on the dashboard that contain the labor and financial information

3.2. **View Common Views** – This subprocess describes how a Business Delivery Vice President can display and print the most common views of the data that he/she would like to see.

Inputs

- **CV Financial Info** - The financial information that is used to create the selected common views
- **CV Labor Info** - The labor information that is used to create the selected common views
- **Selected Common Views** – The common views on the menu that the user would like to see

Outputs

- **Common Views Menu** – The menu of the views of the data that are most commonly used or looked at
- **Common Views** – The report of the common views that is created by the system

3.3. **Change Dashboard/Common Views View**– This subprocess describes how a Business Delivery Vice President can change the views on the dashboard or the common views tabs to view the information through a different time frame, month or business line

Inputs

- **New View Option** – The new view option through which the user would like the information to be displayed

- **Time Frame, Month** – The desired time frame (MTD, YTD, or Full Year) or month (Jan., Feb., ..., Dec.) through which the user would like the information to be displayed
- **Updated Financial Data** - The new financial data that is used to populate the dashboard based on the time frame or view option selected
- **Updated Labor Data** – The new labor data that is used to populate the dashboard based on the time frame or view option selected

Outputs

- **Updated Financial Info** - The new table with financial information displayed on the dashboard when the BDVP selects a new time frame or view option
- **Updated Labor Info** – The new table with labor information displayed on the dashboard when the BDVP selects a new time frame or view option

Use Case 3.1

Use case name: Display Dashboard

Primary Actor: Business Delivery Vice President (BDVP)

Description: This use case describes how a Business Delivery Vice President can display the dashboard.

Trigger: Business Delivery Vice President is interested in understanding labor and/or financial trends in the given business line(s).

Type: External

Major Inputs Description	Source	Major Outputs Description	Destination
Financial Data	Monthly Financials Table	Labor Graph/ Financial Graphs	BDVP
Labor Data	Monthly Labor Table	Labor Table/ Financial Table	BDVP
Selected View Option	BDVP		

<u>Major Steps Performed</u>	<u>Information for Steps</u>
1. Once the BDVP has selected the view option he/she would like to see, the system displays the main screen with the dashboard and the common view on different tabs	
2. The system automatically displays the dashboard tab with labor and financial data relevant to the business line(s) selected in Use Case 1. The information consists of graphs of the aggregate labor and financial trends and tables for the labor and financial data.	<p>← Labor Data, Financial Data</p> <p>← Selected View Option</p> <p>→ Labor Graph/ Financial Graphs</p> <p>→ Labor Table/ Financial Table</p>

Use Case 3.2

Use case name: Display Common Views

Primary Actor: Business Delivery Vice President (BDVP)

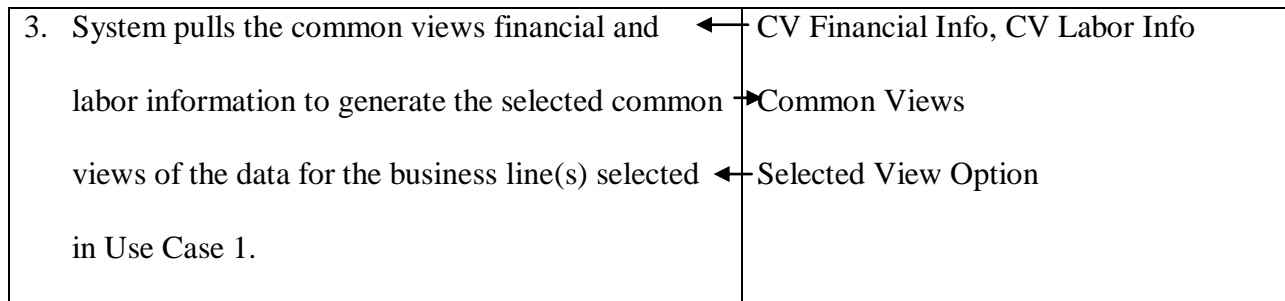
Description: This use case describes how a Business Delivery Vice President can display the most common views of the data that he/she would like to see.

Trigger: The Business Delivery Vice President would like to look at the data through some of the most common views without having to create them.

Type: External

Major Inputs Description	Source	Major Outputs Description	Destination
Selected Common Views	BDVP	Common Views Menu	BDVP
Selected View Option	BDVP	Common Views	BDVP
CV Financial Info	Monthly Financial Table		
CV Labor Info	Monthly Labor Table		

<u>Major Steps Performed</u>	<u>Information for Steps</u>
1. BDVP clicks on the ‘Common View’ tab on the main screen	
2. This tab displays a menu of common views. The BDVP then chooses the common views he/she would like to see.	<p>→ Common Views Menu</p> <p>← Selected Common Views</p>



Use Case 3.3

Use case name: Change Views on Dashboard or Common Views

Primary Actor: Business Delivery Vice President (BDVP)

Description: This use case describes how a Business Delivery Vice President can change views on the dashboard or the common views tabs.

Trigger: Business Delivery Vice President is interested in looking at another dashboard view.

Type: External

Major Inputs Description	Source	Major Outputs Description	Destination
Time Frame, Month	BDVP	Updated Financial Info	BDVP
Selected View Option	BDVP	Updated Labor Info	BDVP
Updated Financial Data	Monthly Financials Table		
Updated Labor Data	Monthly Labor Table		
New View Option	BDVP		

<u>Major Steps Performed</u>	<u>Information for Steps</u>
1. BDVP selects his/her desired time frame or month from a drop down menu to the left of the financials and labor data tables of the dashboard.	← Time Frame, Month
2. System displays information in the given time frame or month of data relevant to the business line(s) selected in Use Case 1.	← Selected View Option
3. BDVP selects his/her desired business line(s) and/or deselects unwanted business line(s) from the business line column.	← New View Option
4. System uses updated labor and financial information to display updated labor/financial data on the dashboard/common views based on the user's selection(s).	← Updated Financial and Labor Data → Updated Labor Info → Updated Financial Info

Process 4

4. **Drill Down** – This process describes how a Business Delivery Vice President can drill down into the financial or labor data to investigate the causes of problems

4.1. **Drill Down into Financial Data** - This subprocess describes how a Business Delivery Vice President can drill down into the financial data to investigate the causes of problems

Inputs

- **Selected Financial IP** – The Investment Proposal (IP) on which the user desires more financial information.
- **IP Financial Breakdown Info** – The transfer of financial information from the Monthly Financial Table to the system grouped by Enterprise Program Office Category

Outputs

- **IP Financial Break Down** - The financial information of a given IP grouped by EPO categories.

4.2. **Drill Down into Labor Data** – This subprocess describes how a Business Delivery Vice President can drill down into the labor data to investigate the causes of problems

4.2.1. **Drill Down into IP Labor Data** - This is the subprocess by which a Business Delivery Vice President can view Labor Data grouped by Project

Inputs

- **Selected Labor IP** – The IP on which the user desires more labor information
- **IP Labor Breakdown Info** – The transfer of labor information from the Monthly Labor Table to the system grouped by Project

Outputs

- **IP Labor Breakdown** – The labor information for a given IP grouped by Project

4.2.2. **Drill Down into Project Labor Data** - This is the subprocess by which a Business Delivery Vice President can view Labor Data grouped by Practice Center

Inputs

- **Selected Project** – The Project that belongs to an IP on which the user desires more labor information
- **Project Labor Breakdown Info**- The transfer of labor information from the Monthly Labor Table to the system grouped by Practice Center

Outputs

- **Project Labor Breakdown** - The labor information for a given Project grouped by Practice Center

4.2.3. **Drill Down into Practice Center Labor Data** - This is the subprocess by which a Business Delivery Vice President can view Labor Data grouped by Role

Inputs

- **Selected Practice Center** - The Practice Center that supplies resources to a project on which the user desires more labor information
- **Practice Center Labor Breakdown Info** - The transfer of labor information from the Monthly Labor Table to the system grouped by Role

Outputs

- **Practice Center Labor Breakdown** – The labor information for a given Practice Center grouped by Role

4.2.4. **Drill Down into Role Labor Data** - This is the subprocess by which a Business Delivery Vice President can view Labor Data grouped by Resource

Inputs

- **Selected Role** - The Role in a practice center on which the user desires more labor information
- **Role Labor Breakdown Info**- The transfer of labor information from the Monthly Labor Table to the system grouped by Resource

Outputs

- **Role Labor Breakdown** – The labor information for a given Role grouped by Resource

Use Case 4.1

Use case name: Drill Down into the Finances

Primary Actor: Business Delivery Vice President (BDVP)

Description: This use case describes how a Business Delivery Vice President can drill down into the financial data to investigate the causes of problems.

Trigger: The Business Delivery Vice President has noticed anomalistic financial data and would like to investigate the causes of these inconsistencies.

Type: External

Major Inputs Description	Source	Major Outputs Description	Source
Selected Financial IP	BDVP	IP Financial Breakdown	BDVP
IP Financial Breakdown Info	Monthly Financials Table		

<u>Major Steps Performed</u>	<u>Information for Steps</u>
1. The BDVP wants to further investigate the financial data of a given IP and so he/she double clicks on the IP in the financial table on the dashboard generated in Use Case 3.1 or in the common views generated in Use Case 3.2.	← Selected Financial IP
2. The BDVP is shown a new screen which uses IP financial breakdown information to display a breakdown of the selected IP based on the 7 EPO categories.	← IP Financial Breakdown Info → IP Financial Breakdown

Use Case 4.2

Use case name: Drill Down into the Labor data

Primary Actor: Business Delivery Vice President (BDVP)

Description: This use case describes how a Business Delivery Vice President can drill down into the labor data to investigate the causes of problems.

Trigger: The Business Delivery Vice President has noticed anomalistic labor data and would like to investigate the causes of these inconsistencies.

Type: External

Major Inputs Description	Source	Major Outputs Description	Source
Selected Labor IP	BDVP	IP Labor Breakdown	BDVP
IP Labor Breakdown Info	Monthly Labor Table	Project Labor Breakdown	BDVP
Selected Project	BDVP	Practice Center Labor Breakdown	BDVP
Project Labor Breakdown Info	Monthly Labor Table	Role Labor Breakdown	BDVP
Selected Practice Center	BDVP		
Practice Center Labor Breakdown Info	Monthly Labor Table		
Selected Role	BDVP		
Role Labor Breakdown Info	Monthly Labor Table		

<u>Major Steps Performed</u>	<u>Information for Steps</u>
<p>1. The BDVP wants to further investigate the labor data of a given IP and so he/she double clicks on the IP in the labor table on the dashboard generated in Use Case 3.1 or in the common views generated in Use Case 3.2.</p>	<p>← Selected Labor IP</p>
<p>2. The BDVP is shown a new screen which uses labor breakdown information to display a breakdown of the selected IP based on its component projects.</p>	<p>← IP Labor Breakdown Info → IP Labor Breakdown</p>
<p>3. The BDVP wants to further investigate the labor data of a given project in the IP and so he/she double clicks on the project.</p>	<p>← Selected Project</p>
<p>4. The BDVP is shown a new screen which uses project labor breakdown information to display a breakdown of the selected project based on its component practice centers.</p>	<p>← Project Labor Breakdown Info → Project Labor Breakdown</p>
<p>5. The BDVP wants to further investigate the labor data of a given practice center in the project and so he/she double clicks on the practice center.</p>	<p>← Selected Practice Center</p>

<p>6. The BDVP is shown a new screen which uses practice center labor breakdown information to display a breakdown of the selected practice center based on its component roles.</p>	<p>← Practice Center Labor Breakdown Info</p> <p>→ Practice Center Labor Breakdown</p>
<p>7. The BDVP wants to further investigate the labor data of a given role in the practice center and so he/she double clicks on the role.</p>	<p>← Selected Role</p>
<p>8. The BDVP is shown a new screen which uses labor breakdown information to display a breakdown of the selected role based on its component people.</p>	<p>← Role Labor Breakdown Info</p> <p>→ Role Labor Breakdown</p>

Process 5

5. **Upload Monthly Data** – This process describes how the system automatically uploads data from the external labor/financial databases to its internal data tables

Inputs

- **New Financial Data** - The new financial data uploaded from the Financial Database
- **New Labor Data** - The new labor data uploaded from the Labor Database

Outputs

- **Monthly Financial Data** - The uploaded data that is stored under the relevant month in the Monthly Financial Table
- **Monthly Labor Data** - The uploaded data that is stored under the relevant month in the Monthly Labor Table

Use Case 5

Use Case Name: Monthly Data Upload

Primary Actor: System

Description: This use case describes how the system automatically uploads data from the external labor/financial databases to its internal data tables.

Trigger: The labor and financial data for the previous month becomes available at the start of each month.

Type: Temporal

Major Inputs Description	Source	Major Outputs Description	Source
New Financial Data	Financial Database	Monthly Financial Data	Monthly Financial Table
New Labor Data	Labor Database	Monthly Labor Data	Monthly Labor Table

<u>Major Steps Performed</u>	<u>Information for Steps</u>
1. System automatically uploads new financial and labor data from external Financial	← New Financial Data ← New Labor Data
2. System saves the monthly financial data, and monthly labor data, into the respective tables.	→ Monthly Financial Data, → Monthly Labor Data

Data Flow Diagrams

The following sections describe the four levels of data flow diagrams that we created to provide graphical representations of the flow of data through the To-Be System. They help us understand how data is processed by the system, what are the inputs to each process, and what are the corresponding outputs.

Context Diagram

Figure 5 depicts the context diagram for the system. The context diagram is a depiction of the interactions between the system and its environment or the external entities. Here the system is represented by a single process (0.0 – Program Analytics System), while there are two kinds of external entities – the Business Delivery Vice Presidents (or the system users) and the databases that load data into the system.

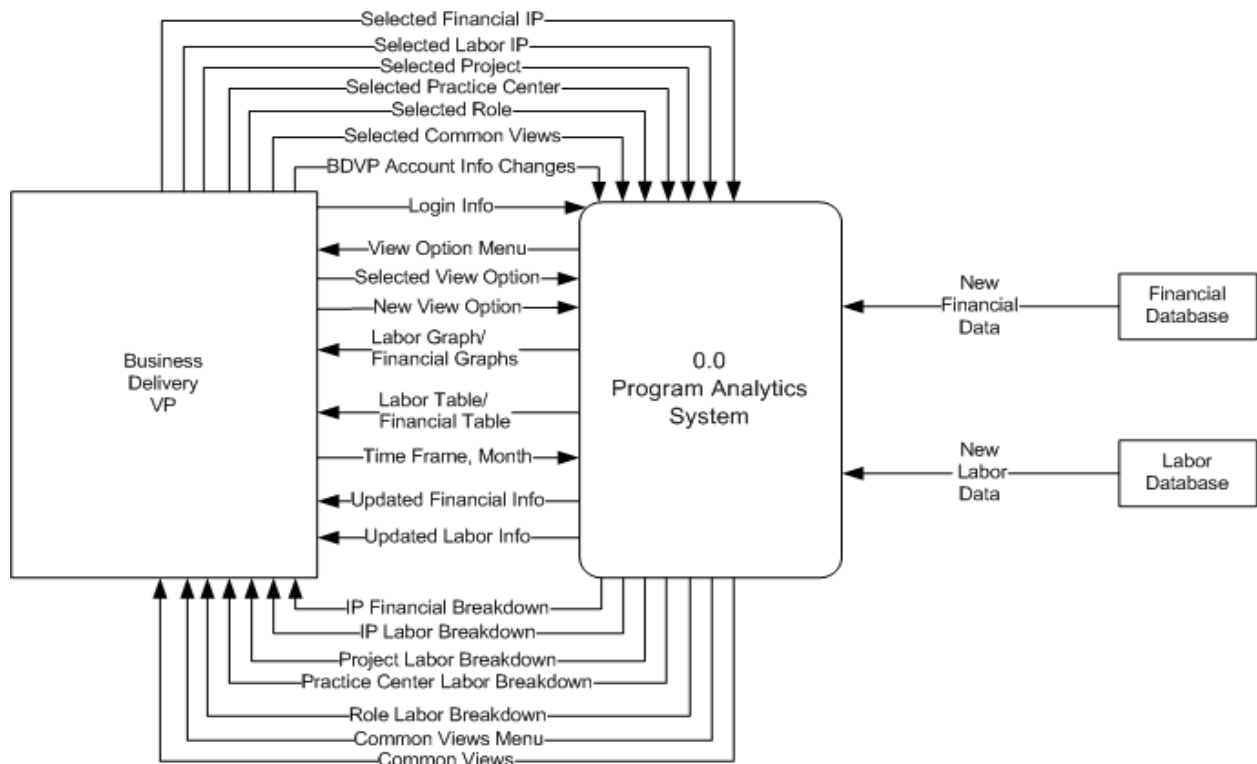


Figure 5: Context Diagram

Level 0 Data Flow Diagram

Figure 6 depicts the Level 0 Data Flow Diagram for the system. This diagram depicts a high level view of the processes that compose the system. In addition, the diagram also depicts data flows, data stores and external entities. In total we have five processes, out of which Processes 1, 3, and 4 will be implemented in the prototype.

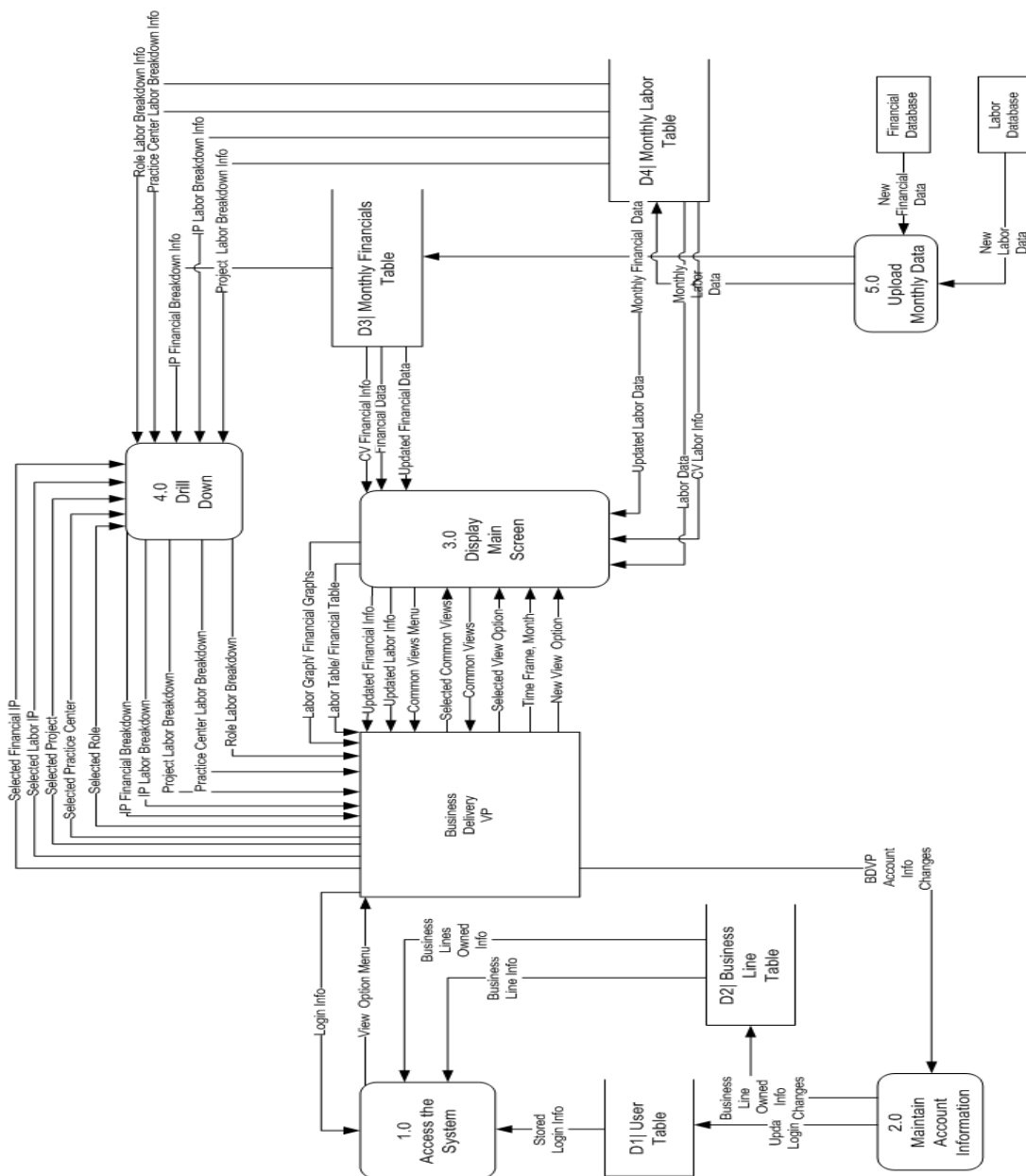


Figure 6: Level 0 Data Flow Diagram

Level 1 Data Flow Diagram

Figure 7 depicts the Level 1 Data Flow Diagram for the system. This diagram depicts greater detail for Processes 3 and 4. The reason only these processes are included in this diagram is because they consist of many steps or sub processes while the other processes can be accomplished in a single step.

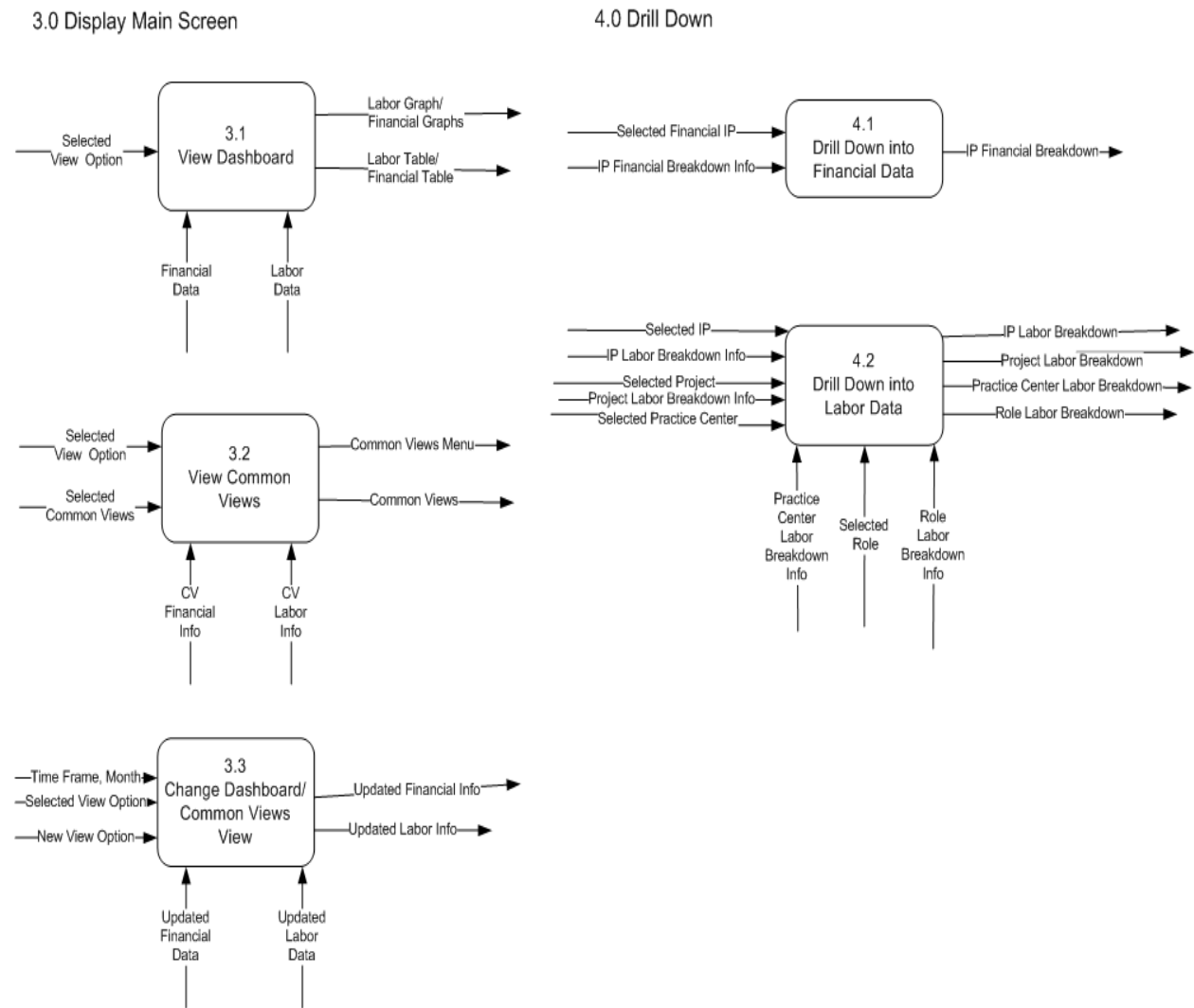


Figure 7: Level 1 Data Flow Diagram

Level 2 Data Flow Diagram

Figure 8 depicts the Level 2 Data Flow Diagram for the system. This diagram depicts even greater detail for Process 4.2 which consists of many steps or sub processes. Here we see that for the labor data we can drill down to four levels while for the financial data we could only drill down to one level and hence, the financial drill down was not included in this diagram.

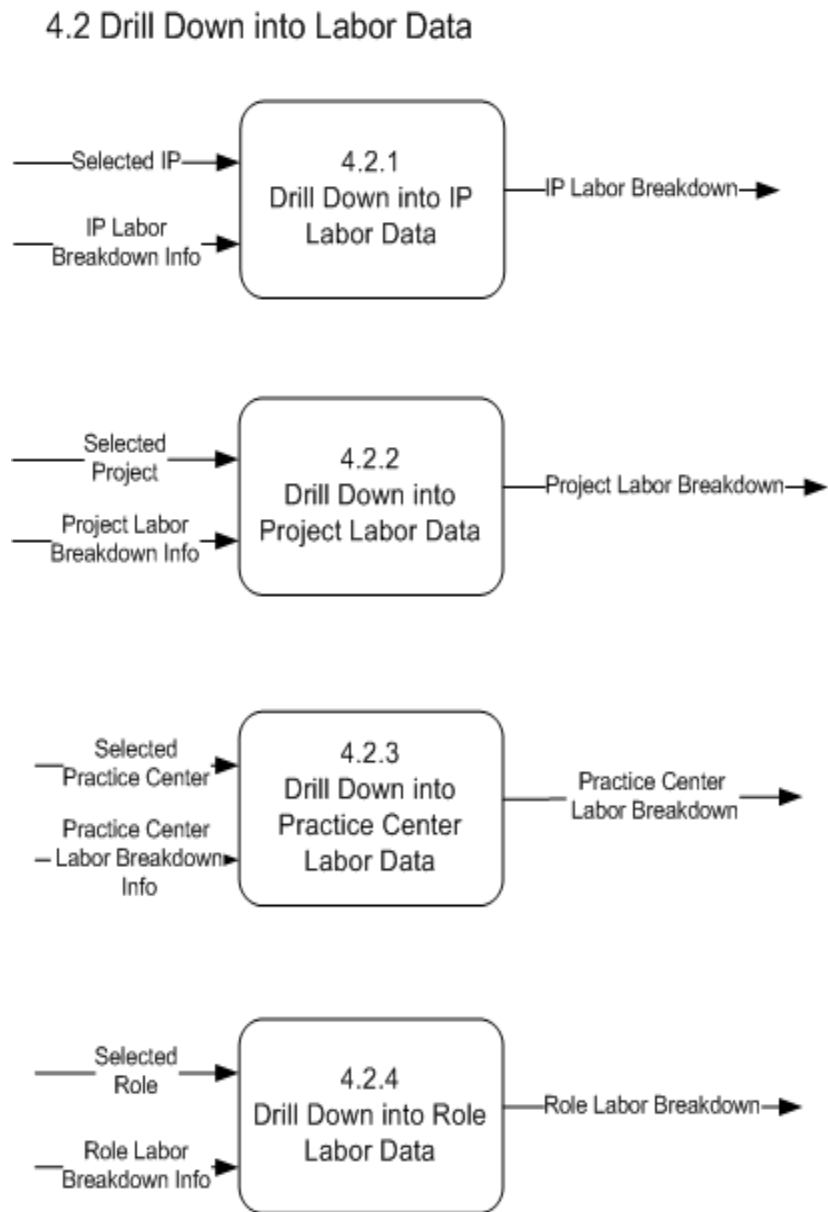


Figure 8: Level 2 Data Flow Diagram

Entity Relationship Diagram

The following section describes our data model and the design we used to create it.

Star Schema Database Design

A database is comprised of one or more tables, and the relationships among all the tables in the database are collectively called the database *schema*. Although there are many different schema designs, databases used for querying historical data are usually set up with a dimensional schema design, typically a star schema or a snowflake schema. A dimensional schema physically separates the measures (also called *facts*) that quantify the business from the descriptive elements (also called *dimensions*) that describe and categorize the business. Typically, this is in the form of a star schema, a snowflake schema, or some hybrid of the two. The dimensional schema can also take the form of a single table, where facts and dimensions are simply in separate columns (IBM, 2009).

A dimensional model is a Star Schema when it has all dimension tables joined directly to the fact table. One benefit of using a star schema for querying is that all dimension tables are directly joined with the fact table and this leads to a limited number of joins that need to be performed to obtain the query result. Performance is an important consideration of any schema, particularly with a decision-support system like the Hanover Program Analytics Dashboard database in which the user routinely queries large amounts of data. Star schemas tend to perform the best in decision-support applications; therefore the project team decided to use the star schema data modeling technique to map the multi-dimensional decision support data into the relational database.

The Program Analytics Dashboard Star Schema design, as seen below in the Entity Relationship Diagram in Figure 9, has two fact tables called Monthly Labor and Monthly Financials. Each of the fact tables refer to several dimension tables.

The Monthly Labor fact table comprises all of the labor data. The dimension tables that the Monthly Labor table refers to are Project, Practice Center, Project Role, Labor Measure, Employee, User, Business Line, Program and IP tables. The Monthly Financials fact table comprises all of the financial data. The dimension tables that the Monthly Financials table refers to are IP, EPO Category, Financial Measure, User, Business Line and Program tables.

The Monthly Labor fact table and the Monthly Financials fact table hold all the calculated or aggregated data of their respective dimension tables. The fact table can be joined with any of its dimension tables through an ID field. The ID fields in the fact tables maintain a compound key relationship with their respective dimension tables. The individual dimensional tables contain all possible values for the IDs which are unique across the table with the ID field as the primary key. For example, the User ID in the User dimension table contains all possible User IDs along with additional details related to the User ID such as the First Name, Last Name, and Password. This User ID from User Dimension is referenced from Monthly Labor fact table to gather the calculated information.

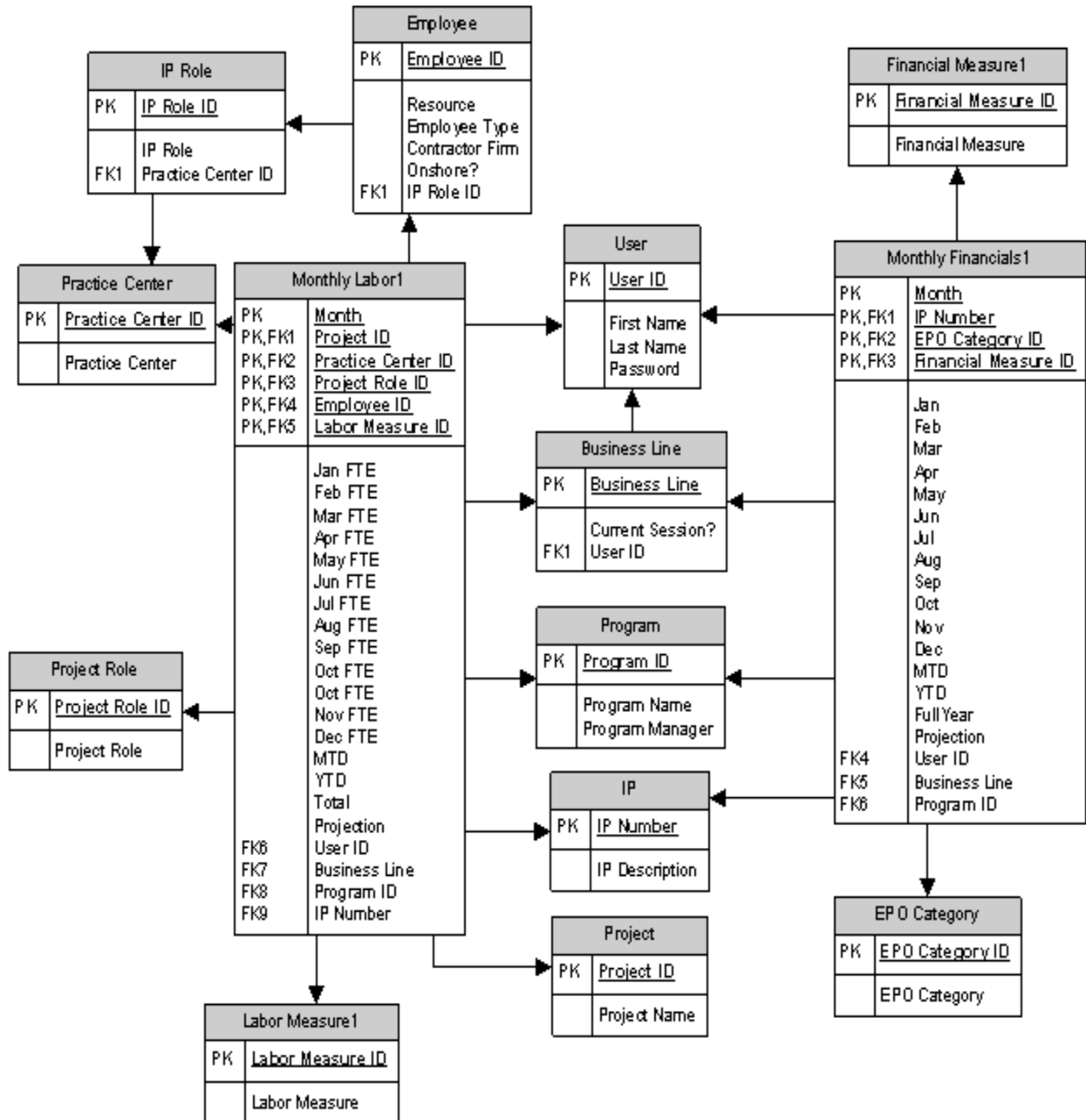


Figure 9: Entity Relationship Diagram

Entity Relationship Diagram Data Dictionary

This section explains the tables and the fields in our Entity Relationship Diagram.

Fact Tables

The following are the fact tables in the database:

1. **Monthly Financials** - Holds all of the financial information used in the system
 - Month - the month that this tuple was downloaded, and part of the composite primary key for this table
 - User ID – the User ID of the User that owns the Business Line on which this tuple provides data, and a foreign key for this table
 - Business Line ID – The Business Line ID of the Business Line that encompasses the Program on which this tuple provides data, and a foreign key for this table
 - Program ID - The Program ID of the Program that encompasses the IP on which this tuple provides data, and a foreign key for this table
 - IP Number - the IP number of the IP on which this tuple provides data, part of the composite primary key, and also a foreign key for this table
 - EPO Category ID - the EPO Category ID of the EPO Category on which this tuple provides data, part of the composite primary key, and also a foreign key for this table
 - Financial Measure ID - the Financial Measure ID of the Financial Measure that classifies the data in this tuple, part of the composite primary key, and also a foreign key for this table
 - Jan - the data this tuple has for January
 - Feb - the data this tuple has for February
 - Mar - the data this tuple has for March

- Apr - the data this tuple has for April
- May - the data this tuple has for May
- Jun - the data this tuple has for June
- Jul - the data this tuple has for July
- Aug- the data this tuple has for August
- Sep - the data this tuple has for September
- Oct - the data this tuple has for October
- Nov - the data this tuple has for November
- Dec - the data this tuple has for December
- MTD -the data this tuple has for the month that the tuple was downloaded
- YTD - the aggregate of the data for all of the months until the month that the tuple was downloaded
- Projection - the aggregate of the data for all of the months after the month the tuple was downloaded
- FullYear - the aggregate of the data for all months in the year

2. **Monthly Labor** - Holds all of the labor information used in the system.

- Month - the month that the data in this tuple was downloaded, and part of the composite primary key for this table
- User ID – the User ID of the User that owns the Business Line that this tuple provides data on, and a foreign key for this table
- Business Line ID – The Business Line ID of the Business Line that encompasses the Program that this tuple provides data on, and a foreign key for this table

- Program ID - The Program ID of the Program that encompasses the IP that this tuple provides data on, and a foreign key for this table
- IP Number - the IP number of the IP that encompasses the Project this tuple provides data on, and a foreign key for this table
- Project ID - the Project ID of the Project that this tuple provides data on, part of the composite primary key, and also a foreign key for this table
- Practice Center ID - the Practice Center ID of the Practice Center that this tuple provides data on, part of the composite primary key, and also a foreign key for this table
- Project Role ID - the Project Role ID of the Project Role that this tuple provides data on, part of the composite primary key, and also a foreign key for this table
- Employee ID - the Employee ID of the Employee for whom this tuple provides data, part of the composite primary key, and also a foreign key for this table
- Labor Measure ID - the Labor Measure ID of the Labor Measure that classifies the data in this tuple, part of the composite primary key, and also a foreign key for this table
- Jan FTE - the labor data this tuple has for January (FTE = Full Time Equivalent of one employees work)
- Feb FTE - the labor data this tuple has for February
- Mar FTE - the labor data this tuple has for March
- Apr FTE - the labor data this tuple has for April
- May FTE - the labor data this tuple has for May
- Jun FTE - the labor data this tuple has for June
- Jul FTE - the labor data this tuple has for July
- Aug FTE - the labor data this tuple has for August

- Sep FTE - the labor data this tuple has for September
- Oct FTE - the labor data this tuple has for October
- Nov FTE - the labor data this tuple has for November
- Dec FTE - the labor data this tuple has for December
- MTD - the data this tuple has for the month that the tuple was downloaded
- YTD - the aggregate of the data for all of the months until the month that the tuple was downloaded
- Projection - the aggregate of the data for all of the months after the month the tuple was downloaded
- FullYear - the aggregate of the data for all months in the year

Dimension tables

The following are the dimension tables in the data base:

1. **User** - Holds the information for all of the users of the system. This dimension table relates to both the Monthly Financials and Monthly Labor fact tables.
 - User ID - the user's user ID, the primary key for this table, and a foreign key in the Business Line, Monthly Financials, and Monthly Labor tables
 - First Name - the user's first name
 - Last Name - the user's last name
 - Password - the user's password
2. **Business Line** - Holds the information for the business lines. This dimension table relates to both the Monthly Financials and Monthly Labor fact tables.

- Business Line ID – The business line ID, the primary key for this table, and a foreign key in the Monthly Financials and Monthly Labor tables
 - Business Line - The name of the business line
 - User ID - the user that owns this business line, and the foreign key for this table
3. **Program** - Holds information for the programs. This dimension table relates to both the Monthly Financials and Monthly Labor fact tables.
- Program ID - the primary key for this table and a foreign key in the Monthly Financials and Monthly Labor tables.
 - Program Name - the name of this program
 - Program Manager - the name of the program manager who is responsible for this program
4. **IP** - Holds information for all of the Investment Proposals (IP). This dimension table relates to both the Monthly Financials and Monthly Labor fact tables.
- IP Number - the primary key for this table and a foreign key in the Monthly Financials and Monthly Labor tables.
 - IP Description - the name of the IP
5. **Project** - Holds information for all of the Projects. The only fact table that this dimension table relates to is Monthly Labor.
- Project ID - the primary key for this table and a foreign key in the Monthly Labor fact table.
 - Project Name - the name of the project
6. **Practice Center** - Holds information for all of the Practice Centers. The only fact table that this dimension table relates to is Monthly Labor.

- Practice Center ID - the primary key for this table and a foreign key in the Monthly Labor fact table.
 - Practice Center - the name of the Practice Center
7. **Project Role** - Holds information for all of the Project Roles. The only fact table that this dimension table relates to is Monthly Labor.
- Project Role ID - the primary key for this table and a foreign key in the Monthly Labor fact table.
 - Project Role - the name of the project role
8. **Employee** - Holds information for all of the Employees. The only fact table that this dimension table relates to is Monthly Labor.
- Employee ID - the employee's ID number, the primary key for this table, and a foreign key in the Monthly Labor fact table.
 - Resource - the employee's name
 - Employee Type - the classification of the employee
 - Contractor Firm - the contracting firm that the employee works for (N/A if the employee is not a contractor)
 - Onshore? - yes or no depending on whether or not the employee is onshore
 - IP Role ID - the IP role for this employee (the role that he/she typically plays on a project)
9. **IP Role** - Holds information for all of the IP Roles (the default roles that employees play on projects). This is the only table that does not relate to a fact table. It is a dimension table of the Employee dimension table. The IP Role is not necessarily the role that an Employee plays on a project, so it is not necessary to put this in any of the fact tables.

- IP Role ID - the primary key for this table and a foreign key in the Employee dimension table.
- IP Role - The name of the IP role
- Practice Center ID - The practice center that this IP Role belongs to

10. **EPO Category** - Holds information for all of the EPO Categories. The only fact table that this dimension table relates to is Monthly Financials.

- EPO Category ID - the primary key for this table and a foreign key in the Monthly Financials fact table.
- EPO Category - the name of the EPO category

11. **Labor Measure** - Holds information for all of the Labor Measures (the terms used to classify the labor data). The only fact table that this dimension table relates to is Monthly Labor.

- Labor Measure ID - the primary key for this table and a foreign key in the Monthly Labor fact table.
- Labor Measure - the name of the labor measure

12. **Financial Measure** - Holds information for all of the Financial Measures (the terms used to classify the financial data). The only fact table that this dimension table relates to is Monthly Financials.

- Financial Measure ID – the primary key for this table and a foreign key in the Monthly Financials fact table
- Financial Measure - the name of the financial measure

Section IV: Use Scenarios

This section describes the use scenarios that were created to further understand the uses of the system.

Use Scenario 1

Problem with an IP's Financials

It's December 16th 2009, 9:30 am and Dave Trigo would like to see what his Monthly Data looks like. He logs into the system with his username and password. From there he selects "Dave's Group" to see information on the group of business lines that he owns. Once the dashboard loads, he notices an IP (PCM930) that has its financials highlighted in red but its labor is highlighted green and clicks on it to further investigate. He gets to the "Drill Down" screen and sees that PCM930 is grossly overspent in its Fee-for-Service EPO Category. He prints this and schedules a meeting with Steve, a program manager for the PL IP's, to discuss strategies in reducing the number of consultants he hires for special jobs.

Use Scenario 2

Problem with an IP's Labor

It's December 16th 2009, 9:30 am and Sue Trombley would like to see what her monthly data looks like. She logs into the system with her username and password. From there she selects "Sue's Group" to see information on the group of business lines that she owns. Once the dashboard loads, she notices an IP (PCL925) with its financials highlighted in green but its labor highlighted in red and clicks on it to further investigate. She gets to the "Drill Down" screen and views the multiple projects inside of PCL925. She sees that one particular project (Comp Raters Project) has significantly more actuals than commitments. She clicks on this project to drill down

and see the actuals and commitments by Practice Center. She notices that the BAPC (Business Analyst Practice Center) is a source of the problem, prints this screen and schedules a meeting with Karin Winsky, the head of the BAPC, to inform her of this issue and discuss a solution.

Use Scenario 3

Sue wants to print a common view for a status meeting with superiors

It's 11:30am on December 21th 2009 and Sue Trombley has a 12pm meeting with Mike Clifton, who wants to know how much her Business Lines' IPs actually spent in November in comparison to approved spend. Sue logs in to the system with her username and password. From there she selects "Sue's Group" to view information on the business lines that she owns. She selects the "Common Views" tab on the next screen. She selects the "Actuals vs. Approved MTD" and prints two copies of this view for her meeting with Mike.

Use Scenario 4

Sue wants to see how accurately her Program Managers have been forecasting

It's 3:00 pm on December 31th 2009 Sue would like to know how well her Program Managers forecasted their IP's for November and compare that to how well Dave's Program Managers forecasted. Sue logs in to the system with her username and password. From there she selects "Sue's Group" to view information on the business lines that she owns. She then selects the "Common Views" tab. On this tab, she selects "Forecast vs. Actuals" and sees how her program managers forecasted for November compared to November's Actuals. She notices that they all forecasted under what they had actually spent. She then clicks on "Dave's Group" in the top of the left-hand sidebar and sees that Dave's Program Managers all forecasted over what they actually spent. She then schedules a meeting with Dave to get an understanding of how his program managers are keeping costs down.

Use Scenario 5

Dave wants to see how the actual cost of people has been trending over time in relationship to the approved cost of people for the business lines he owns.

It's December 16th 2009, 9:30 am and Dave Trigo would like to see how the actual cost of people has been trending over time in relationship to the approved cost of people for the business lines he owns. He logs into the system with his username and password. From there, he selects "Dave's Group" to see information on the group of business lines that he owns. On the top right part of the dashboard (default tab), he views the graph of actuals trending in relation to approved and notices an upward trend in the amount that approved are above actuals and forecasts. He then uses the dashboard and "Drill Down" screen to further investigate these lower costs.

Use Scenario 6

Dave needs to change the Business Lines in his "Group"

It's February 1st 2010 at 9:02am and Dave Trigo gets an e-mail from Mike Clifton saying that Dave now owns Personal Lines instead of Commercial Lines. He would like to update his default group of business lines in the system. He logs into the system with his username and password. From there, he selects "Maintain Account" from the upper right part of the next screen. On the "Maintain Account Information" page he edits the "My Group" section by un-checking Commercial lines and checking Personal Lines.

Interface Structure Chart

Figure 10 shows the interface structure chart, a hierarchical representation of the interface design. It shows the five screens in the To-Be system and the order in which these screen are presented to the user.

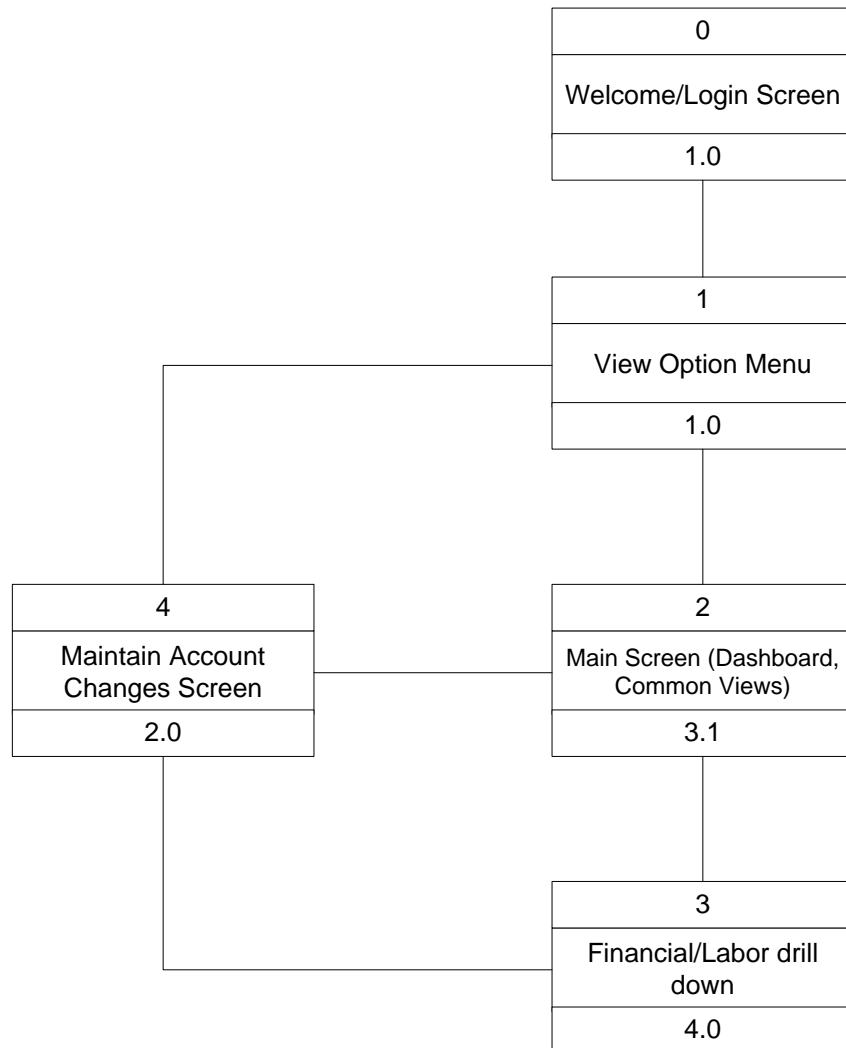


Figure 10: Interface Structure Chart

Chapter 5: Implementation

Section I: System Specification

This section of the project describes which parts of our system's software will be placed on which hardware. This typically stems from a system's non-functional requirements and helps define the Hardware and Software Specifications, also defined in this section.

Architecture Report

We recommend a client-server based architecture for the system. In particular, we recommend that the presentation logic and the application logic be placed on the client and the data access logic and data storage be placed on the server. Client-server based architecture is the most common architecture used in the industry and is the most relevant for this particular system. Placing the presentation logic on the client means that the client is responsible for generating the display of information to the user. Placing the application logic on the client means that the client is responsible for making necessary calculations and communicating with the server for necessary data. The server is then responsible for data storage and data access logic. This means that it stores the data necessary for the application and controls the access that the system has to this data.

Hardware and Software Specification

Hanover already has an installation of Hyperion on its network. From talking with Don Howe-Hughes, who deals with Hyperion, we understand that this same installation can be used to install the new dashboard and just needs to be connected to the right database (in the form of an Online Analytical Processing Cube). No new hardware or software is needed to build the system. Developers just need to develop the dashboard in Hanover's existing development environment and then put it on Hanover's existing production server for it to be implemented.

The client PC just needs to have a web browser to view it. Browsers are common on Hanover PC's in general and more specifically on the Business Delivery Vice Presidents' PC's.

Section II: Prototype Implementation

The following sections illustrate how the team implemented the prototype of the system in terms of the software and design approach used. The prototype was created to further aid in visualizing the To-Be System and to give the users a better idea of how the system would function so that they could provide feedback or suggest changes.

Software

The team built the database in Microsoft Access and created the interface in Microsoft Visual Studio by coding in VB.net. The team was most comfortable and had the most experience with this application and language and hence, we thought that it might be most efficient if we used them to implement the prototype.

Design Approach

To design the prototype the team first thought about all the data that would need to go into the system and then created an ERD to model the relationships between the data and DFDs to model the flow of data through the system. These were extremely helpful in developing the code for the prototype in the later stages. The team then moved on to interface design and created storyboards for each screen to visualize what the system would look like. Using these storyboards, the team then designed and developed each screen in Visual Studio using VB.net. The screen shots of the prototype can be found in the user manual in Appendix 3 while the code for each screen can be found in the technical manual in Appendix 4. Throughout the process the team met with Dave Trigo to obtain his feedback and changes to the design of the interface.

Chapter 6: Conclusions and Recommendations.

In this section, we discuss our recommendations for the final system based on our business analysis. We also discuss some conclusions that we have drawn from this project experience.

Recommendations

We recommend that the final system be implemented with Hyperion's Web Analysis Dashboard. This tool provides all of the functionality that the Business Delivery Vice Presidents need to investigate their data. We chose this over the other capable systems because HTG already has an installation of Hyperion, and they are looking to continue working with it. This is different from their installation of Business Objects which they refer to as the "legacy" (old) system.

Hyperion Web Analysis needs for the data to be in the form of an Oracle Online Analytical Processing (OLAP) cube, and we recommend that this cube be developed as close to our star schema design as possible. The relationships that we designed are directly in line with HTG's organizational structure and the star schema format streamlines the queries for faster performance.

After presenting our prototype to the users, they also recommended that the system include aggregate information at the bottom of each data table on the dashboard so that they may be able to have an overall picture of how a particular business line or group of business lines is doing. They also recommended that Fee-For-Service (consulting) data be shown, divided up by the different vendors for whom the consultants work. We understand that the users' needs and

the requirements might change as the full system is being developed. However, we believe that this report will provide a good foundation for its implementation.

Lessons Learned

The MQP team had the opportunity of working on a unique and challenging project. There are many lessons that the team has gained from this experience. We learned that there should be a proper integration between the business and the technology aspects in a business. To complete this project successfully, we had to integrate our financial skills with our technical skills to design the executive dashboard system. This experience has been very beneficial to all the team members. One of the biggest benefits in doing this project is the amount of knowledge we gained from the direct interactions we had with the Vice Presidents of Hanover Technology Group. The MQP team was faced with a challenge of familiarizing itself with new reporting tool applications as well as to a new corporation and culture. In a short amount of time, we had to understand how the As-Is system functioned and how to implement new functionality. All of this required communication with the members of HTG and integration of their feedback into the project solution. In all, the team believes that the MQP experience was extremely valuable. We learned a great deal about the business and technology aspects of The Hanover and had the opportunity to use this knowledge to go above and beyond what was required of us. These experiences will be of use to each member of the team in our future careers.

References

- Authenticity Consulting, LLC. (2009). *Project Management*. Retrieved 9 10, 2009, from Free Management Library: http://managementhelp.org/plan_dec/project/project.htm
- Barone Law Offices, PLC. (2009). *A Guide to Michigan No-Fault Auto Insurance*. Retrieved 9 26, 2009, from Barone Law: <http://www.michiganautoaccident.net/no%20fault%20guide.htm>
- Beattie, A. (2009). *The History Behind Insurance*. Retrieved 10 3, 2009, from Investopedia: <http://www.investopedia.com/articles/08/history-of-insurance.asp?&viewed=1>
- Best Price Computers. (n.d.). *Executive Dashboard Software Explined*. Retrieved November 25, 2009, from BPC, Articles and Glossart: <http://www.bestpricecomputers.co.uk/glossary/executive-dashboard-software.htm>
- Dennis, A., & Wixom, B. H. (2003). *System Analysis and Design*. Wiley.
- Few, S. (2006). *Information Dashboard Design*. Sebastopol: O'Reilly Media, Inc.
- The Hanover Insurance Group Inc. (2009). *About Us: Goals*. Retrieved 9 5, 2009, from The Hanover Insurance Group: <http://www.hanover.com/thg/about/goals.htm>
- The Hanover Insurance Group Inc. (2009). *About Us: Heritage*. Retrieved 9 5, 2009, from <http://www.hanover.com/thg/about/heritage.htm>
- The Hanover Insurance Group Inc. (2009). *About Us: Overview*. Retrieved 9 5, 2009, from The Hanover Insurance Group: <http://www.hanover.com/thg/about/index.htm>
- The Hanover Insurance Group Inc. (2009). *The Hanover Insurance Group - Homepage*. Retrieved 9 5, 2009, from <http://www.hanover.com/thg/index.htm>
- The Hanover Insurance Group Inc. (2009, June 1). *The Hanover Insurance Group: Who We Are. Internal Presentation: The Hanover Experience*. The Hanover Insurance Group Inc.
- IBM Corporation . (2009). *IBM- Cognos 8 Business Intelligence: Dashboards*. Retrieved October 2, 2009, from IBM.com: <http://www-01.ibm.com/software/data/cognos/products/cognos-8-business-intelligence/dashboards.html>
- IBM (2009). *Star Schema*. Retrieved 10 15, 2009, from IBM Information Center: <http://publib.boulder.ibm.com/infocenter/rbhelp/v6r3/index.jsp?topic=/com.ibm.redbrick.doc6.3/wag/wag32.htm>
- McNamara, C. (2008). *Performance Management -- Basic Concepts*. Retrieved 9 30, 2009, from Free Management Library: http://managementhelp.org/perf_mng/perf_mng.htm

Muthu, S., Whitman, L., & Cheraghi, H. (1999, 11 17). *Business Process Engineering: A Consolidated Approach*. Retrieved 09 19, 2009, from twsu.edu:
<http://webs.twsu.edu/whitman/papers/ijii99muthu.pdf>

NAIC. (2009, 03 30). *NAIC 2009*. Retrieved 09 03, 2009, from NAIC:
http://www.naic.org/documents/research_premium_by_LOB.pdf

Oracle Corporation. (2009). *Hyperion Dashboard Development Services*. Retrieved October 2, 2009, from Oracle Technology Network:
<http://www.oracle.com/technology/products/bi/interactive-reporting/dashboard-development.html>

Perato, C. (2009). *Intro to Insurance: Fundamentals of Insurance*. Retrieved 09 3, 2009, from Investopedia: <http://www.investopedia.com/university/insurance/insurance2.asp>

PMI College of Performance Management. (2006). *What is Performance Management?* . Retrieved 9 30, 2009, from PMI College of Performance Management: http://www.pmi-cpm.org/pages/about/1.60.what_is_evm.html

Riverside, J. (2006, 11 9). *The Importance of Corporate Performance Management*. Retrieved 9 30, 2009, from Ezine Articles: <http://ezinearticles.com/?The-Importance-of-Corporate-Performance-Management&id=352959>

SAP AG. (2009). *SAP - SAP BusinessObjects Dashboard Builder: Features and Functions*. Retrieved October 2, 2009, from SAP.com:
<http://www.sap.com/solutions/sapbusinessobjects/large/business-intelligence/dashboard-visualization/dashboard-builder/featuresfunctions/index.epx>

Yahoo Finance. (2009). Retrieved 09 26, 2009, from Yahoo Finance:
<http://finance.yahoo.com/q/in?s=THG>

Yahoo Finance. (2009). *Leaders and Laggards*. Retrieved 09 16, 2009, from Yahoo:
<http://biz.yahoo.com/p/432mktd.html>

Appendices

Appendix 1 - Development Labor FTE Allocation

Table 9 shows the allocation of labor to different groups that will be required to develop the full system.

Table 9: Development Labor FTE Allocation

2010	Jan	Feb	Mar	Total
Architect Practice Center	0.75	1.00	0.25	0.17
Data Architect	0.50	0.50	0.25	0.10
DBA	0.25	0.50		0.06
Infrastructure Architect				0.00
Solutions Architect				0.00
BA Practice Center	0.00	0.00	0.00	0.00
Business Analyst				0.00
Implementation Manager				0.00
Lead Business Analyst				0.00
Baseline IP Support	0.00	0.00	0.00	0.00
Baseline Application Support / BA				0.00
Baseline Application Support / Dev				0.00
Developer Practice Center	0.00	0.00	0.00	0.00
Software/Application Engineer				0.00
Tech Lead				0.00
Enterprise Change Management	0.00	0.00	0.00	0.00
ECM Resource				0.00
Information Management	0.00	1.50	1.75	0.27
IM Business Analyst				0.00
IM Data Architect				0.00
IM Project Manager/BSM				0.00
IM QA Test Analyst		0.50	1.00	0.13
IM Software Engineer/Report Developer		1.00	0.75	0.15
Infrastructure Technology Services	0.00	0.00	0.00	0.00
Security Analyst				0.00
System Engineer				0.00
PM Practice Center	0.00	0.00	0.00	0.00
Delivery Manager				0.00
Program Manager				0.00
Project Lead				0.00
Project Manager				0.00
QA Practice Center	0.00	0.00	0.00	0.00
QA Automation Analyst / Test Engineer				0.00
QA Project Lead				0.00
QA Test Analyst				0.00
Total FTE	0.75	2.50	2.00	0.44

Appendix 2 – Interview Transcripts

These are the notes from the interviews with the Business Delivery Vice President during which we gathered business requirements.

Interview Transcript - David Trigo

Interviewee- David Trigo, Business Delivery Vice President, Claims

Interviewers- Divya Mathew, Archana Reddy and Cordell Rogers

Type- In Person Meeting

Summary

HTG is divided into two groups: Baseline and Discretionary

Baseline provides the support for the day to day operations, networking, applications in production, coding, etc

Discretionary focuses on new technology product work

Project Life Cycle

Start off with a core team Project Manager, Tech Lead, Lead BA, Lead Architect, Lead QA

Requirements are defined: Business and Technology

Team starts growing, more BAs are brought onto the project

BAs look at the requirements in greater detail

Project goes to developers for programming

Project moves to testing phase

Integration environment/ UAT

Production and implementation

Discretionary supports project for 30 days

Support moves to baseline

Majority (95%) of project costs comes from people dollars

HTG Business Lines Structure

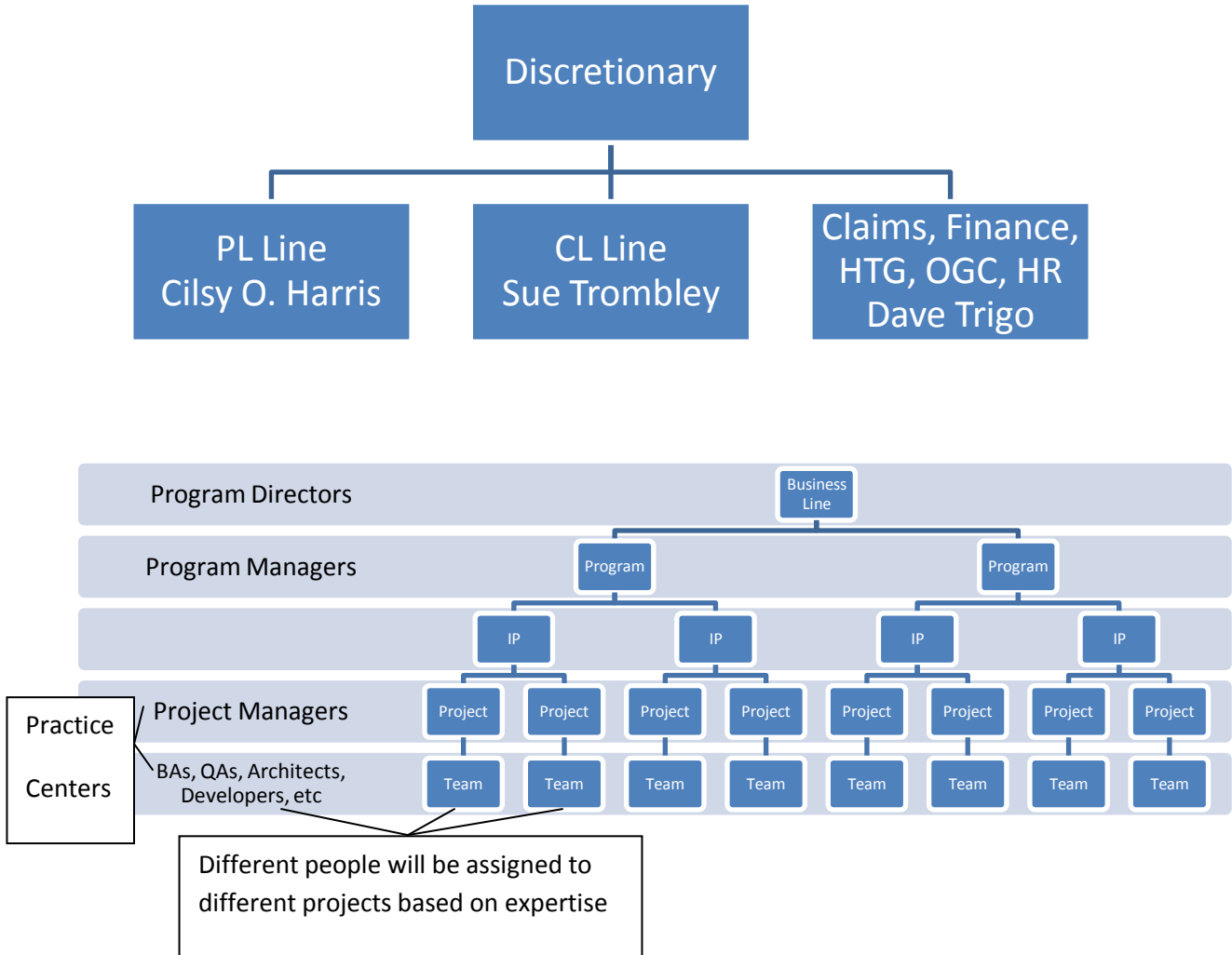


Figure 11: HTG Business Line Structure

Things Dave is concerned about:

Finances are pretty steady, pretty easy to predict what the costs are going to be.

However, we tend to lost sight of the trends

Exceptions: e.g. People might leave a project but still be tracking time to the project

Rate for people is not included in any of the files

Dashboard

Include Headcount report

Provide Interactive environment

Provide intelligence. e.g. if a project is more than 10% off

Categories

Cost center: group similar things together – people with the same role/jobs/depts., etc.

E.g.: Could be used, if you want to see what projects the AA people are working on

Role: Area of expertise, e.g. Project Manager, BA, DBA. Dept -> Roles -> People

Project Role: A person's role on a project. Could be different from their main role depending on its needs

Need: Skill that is non-existent here or is unavailable/occupied elsewhere. Used to check if project is fully staffed

Use two reports

Strategic Forecast: financial report that tells me there is a problem

Time Recording Resource Report: Not financial based but time spent based. Tells me why there is a problem.

Labor Categories

Approved Plan: How many people are approved to work on a project by the program managers (similar to Approved Spend)

Commitments: How many people are assigned to the projects by the practice center leads (should be similar to Actuals)

Actuals: Actual hours that people record on their timesheets (similar to actual)

Interview Transcript - Cilsy Harris

Date- 09/09/09

Interviewee- Cilsy Harris, Business Delivery Vice President, Personal lines

Interviewers- Divya Mathew, Archana Reddy and Cordell Rogers

Type- In Person Meeting

What Cilsy uses Program Analytics for:

Program managers tool to talk to me about the progress of their programs. (Program Managers handle a group of IP's (investment proposals))

- Accountability of individual program managers.

Information Cilsy would like to see in Program Analytics Dashboard:

Cilsy wants:

- To know the difference between last month's data and this month's
- To know the progress that the IP's and Projects were expected to make compared to what they actually made
- To know the Actual Cost of an IP or Project compared to what was expected
- The Program Managers to point out what they would like her to pay attention to
- To know what IP's or Projects are going on as planned and which ones are not going on as planned
- To know how the actuals have compared to the program manager's previous forecasts.
- To see an additional column providing Approved YTD Capitalization
- To see an additional section in the Financial results for Capitalized and Non-Capitalized
- To see an additional column in the GAAP section on Approved Spend, Capitalization and Amortization

Interview Transcript – Sue Trombley

Date - 09/18/09

Interviewee- Sue Trombley, Business Delivery Vice President, Commercial lines

Interviewers- Divya Mathew, Archana Reddy and Cordell Rogers

Type- Phone Conversation

Summary of Interview

Problems that Sue is having with the As-Is System:

- Difficulty in looking at the time tracking sheet and the strategic forecast separately
- Inability to drill into the financials
- No Practice Center view in the Program Analytics
- No comparison between the monthly actuals to the previous month's forecast

Sue's Suggestions for the To-be System:

- System must include information such as who is in charge for each project and how much fee-for-service is available?
- System must have the ability to drill down the financials to the EPO Category level
- Practice center view must be included in the dashboard
- System must have the ability to look at the run rate which gives an idea of how the project has been doing so far
- Overall approved spend and actuals/forecast and variance for every month to be included in the dashboard
- Include all the reports in the dashboard
- Numbers preferred to graphs/trends
- Compare the monthly actuals to the previous month's forecast

Hanover Technology Group Program Analytics Dashboard Prototype User Manual

By Divya Mathew, Archana Reddy, Cordell Rogers

Introduction

Welcome to the Program Analytics Dashboard Prototype User Manual. The purpose of this manual is to show the users, step by step, how to operate the prototype.

Welcome Screen



Welcome to The Hanover Insurance Group.
World-class performance when and where you need it.

Our policy is performance.™

Welcome to the Program Analytics Dashboard

Please Enter your UserID and Password

UserID:

Password:

Login

Figure 12: Welcome Screen

- Enter your UserID
- Enter your Password



Welcome to The Hanover Insurance Group.
World-class performance when and where you need it.

Our policy is performance.™

Welcome to the Program Analytics Dashboard

Please Enter your UserID and Password

UserID:

Password:

Login

Figure 13: Welcome Screen with UserID and Password entered

- Press Enter or Click the Login button.

View Options Screen

- If you want to view David Trigo’s Group, click the “Trigo’s Group” button
- If you want to view Sue Trombley’s Group, click the “Trombley’s Group” button

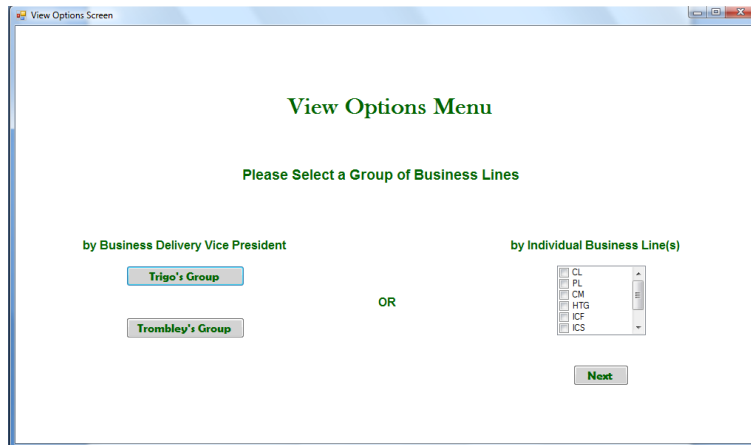


Figure 14: View Options Menu

- If you want to select an individual business line or multiple business lines check the box to the left of the business line(s) abbreviation(s) and click the Next Button



Figure 15: View Options Menu with Check Box Section Highlighted

Dashboard

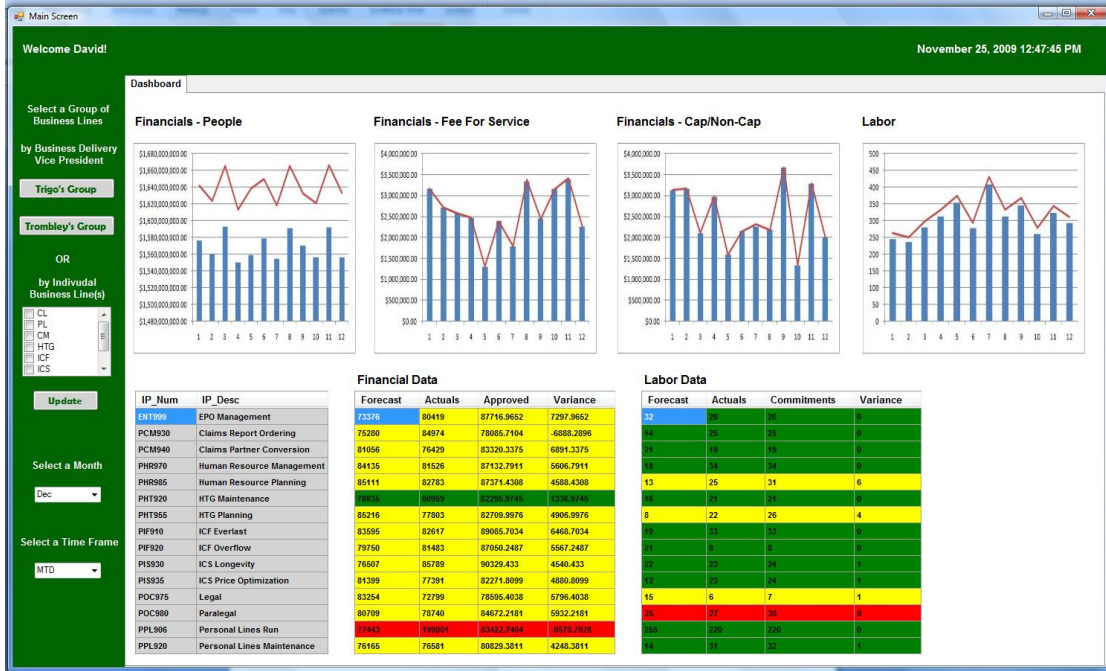


Figure 16: Dashboard Screen with Dave's Graphs

- The graphs for a particular user's group of IP's are displayed on the top of the dashboard. If you selected "Trigo's Group", the system will show the graphs for David Trigo's group of business lines. If you selected "Trombley's Group", the system will show the graphs for Sue Trombley's group of business lines. If you selected individual business lines, it will show David Trigo's Business Lines – Change this by clicking on the "Trombley's Group" button.

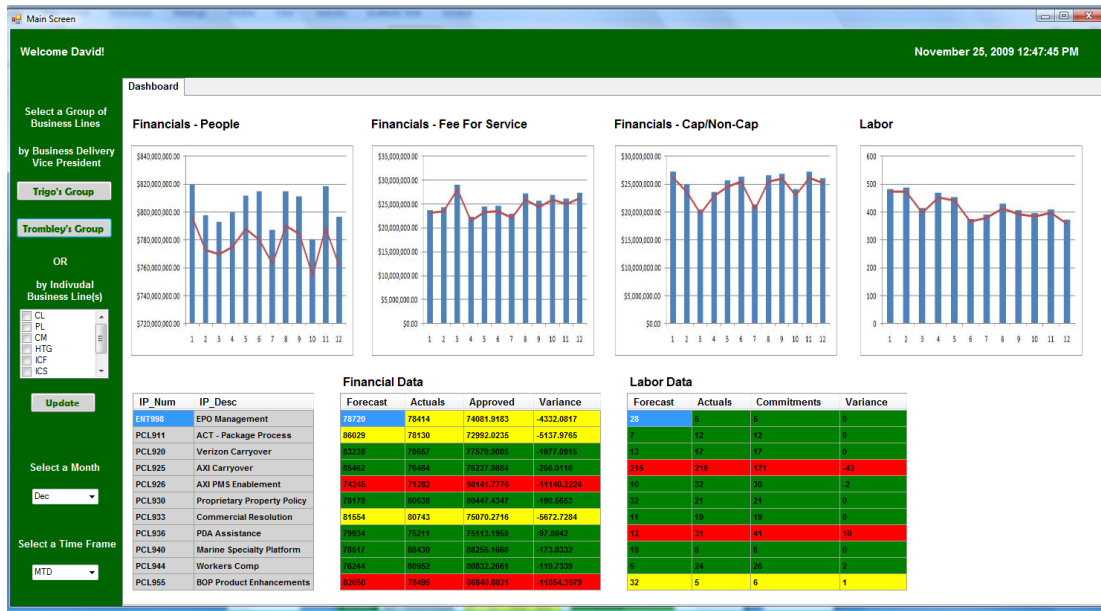


Figure 17: Dashboard Screen with Sue's Graphs

- The graphs are a full year picture of the data for that particular group of IP's. They compare actual spend (blue bars) to approved spend/commitments (red line). The light blue bars show forecasted numbers, dark blue bars show actual numbers.
- The descriptions of the graphs are provided in Table 10, numbered from left to right

Table 10: Graph Descriptions

Graph Number	Graph Name	Data being measured
1	Financials- People	Money spent on employees
2	Financials- Fee For Service Consulting	Money spent on consultants
3	Financials- Cap/Non-Cap	Money spent on capital and non-capital equipment

4	Labor- Staffing	FTE (Full Time Equivalent) of people working on IP's
---	-----------------	--

- On the bottom left is the financial information for the selected business lines. On the bottom right is the labor information for this business line selection.
- To reselect the business lines that you want to look at you have the following options:
 - Select an individual business line or business lines by selecting them from the checkbox on the top right (red).
 - Select a user's group of business lines by clicking either the "Trigo's Group" button or the "Trombley's Group" button (black).

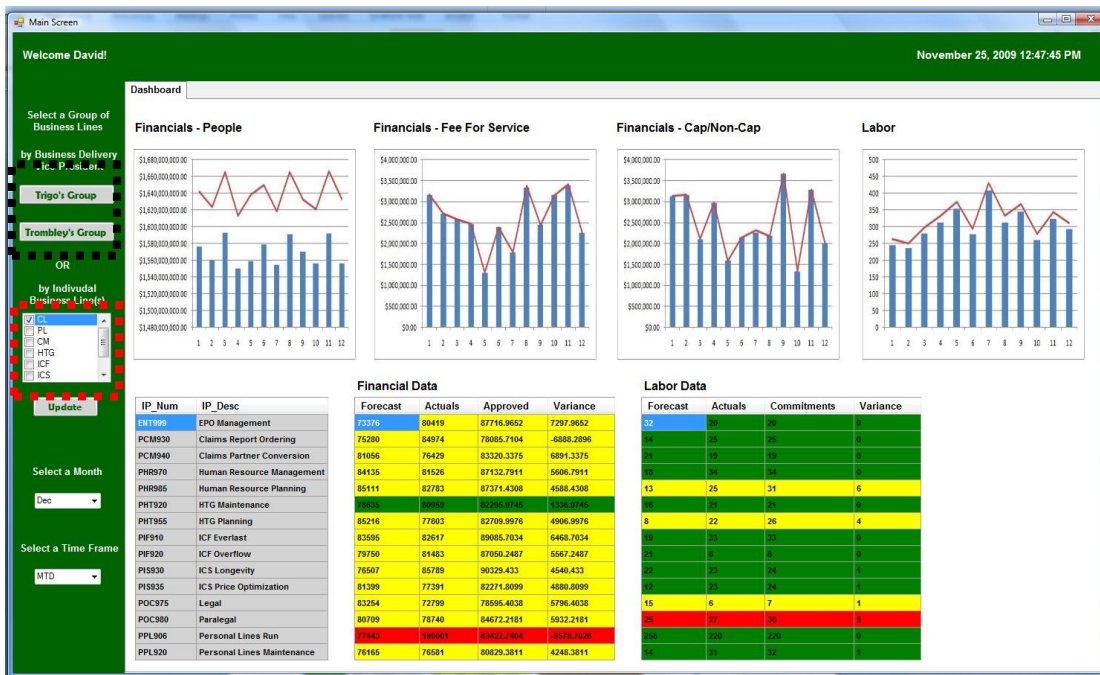


Figure 18: Dashboard Screen with Individual Business Lines Section in Red and the "Group" Buttons in Black

- The default month is the current month at the time that you log in. This month represents the time that this data was recorded. To change this and look at older data, click on the drop down on the lower left of the screen, above time frame, and select the month that you would like to view. This drop-down only contains the data from the months that have data recorded in the system data base. So, if December's data hasn't been recorded yet, you won't be able to select it.

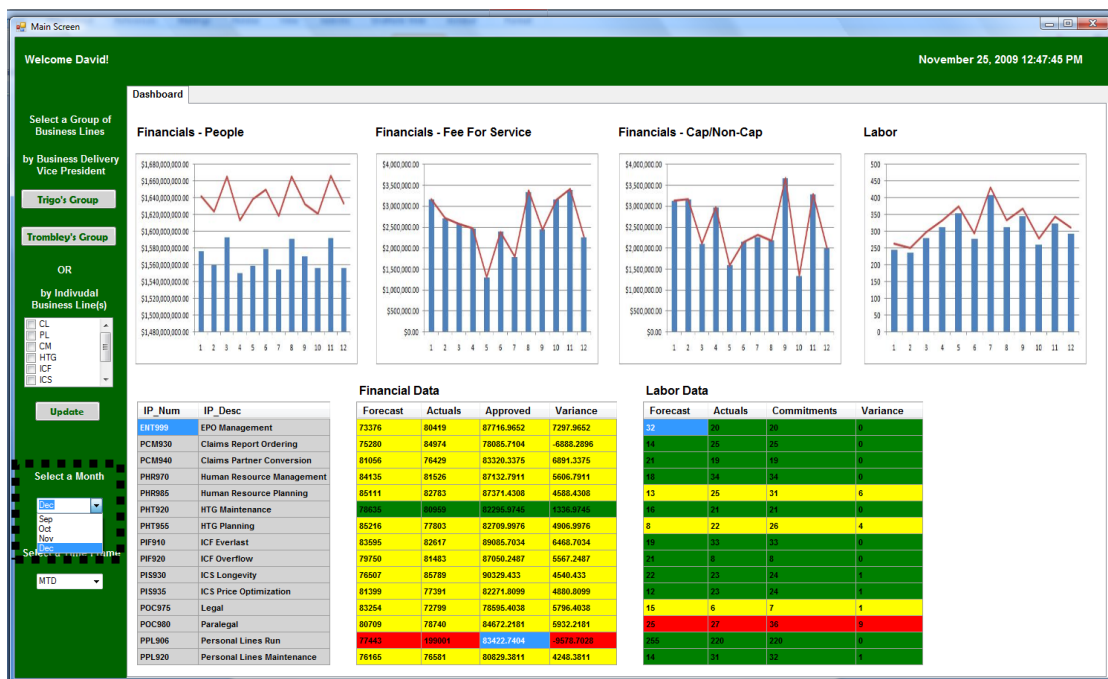


Figure 19: Dashboard with Month Selection Highlighted

- The default time frame view is MTD. Change this by clicking the dropdown on the bottom left of the screen and selecting the time frame you would like to view

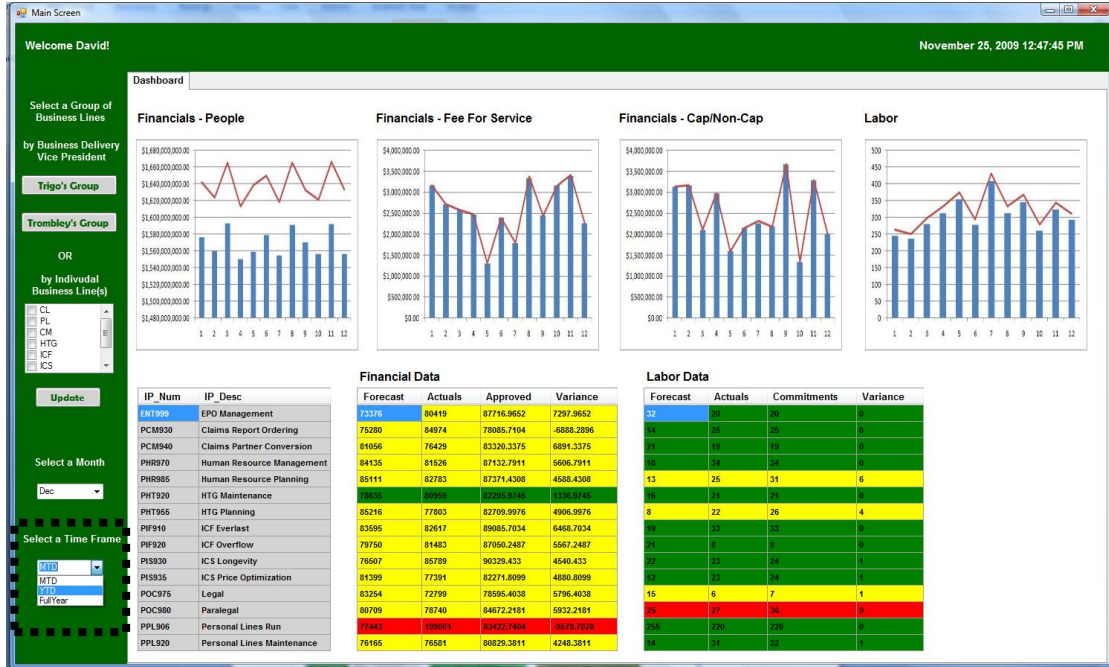


Figure 20: Dashboard with Time Frame Selection Highlighted

- Table 11 describes the time frame options

Table 11: Time Frame Options Descriptions

Time Frame	Description
MTD	(Month-to-Date) The current month's data
YTD	(Year-to-Date) The data from the beginning of the year up until the current month
Full Year	The data for the whole year. YTD added to the projections for the rest of the year

- Table 12 defines the Financial Measures used in the financial data on the bottom left of the Dashboard.

Table 12: Financial Measure Descriptions

Financial Measure	Description
Forecast	Previous month's prediction for the current month- can be used to compare to actuals
Actual	The data for the actual spend
Approved	The data for the approved spend
Variance	Approved minus Actual

- Table 13 defines the Labor Measures used in the labor data on the bottom right of the Dashboard.

Table 13: Labor Measure Descriptions

Labor Measure	Description
Forecast	Previous month's prediction for the current month- can be used to compare to actuals
Actual	The data for the actual FTE's
Commitments	The data for the FTE's committed (approved)
Variance	Commitments minus Actual

- Table 14 defines the criteria for the colors on the financial section of the dashboard.

Table 14: Financial Color Criteria

Color	% Variance to Approved
Green	0-5
Yellow	5-10
Red	10

- Table 15 defines the criteria for the colors on the labor section of the dashboard

Table 15: Labor Color Criteria

Color	% Variance to Commitments
Green	0-10
Yellow	10-20
Red	20

- If you would like to investigate a particular IP double click on it. This will open up the drill down screen in a separate window.

Drill Down

- For the Financial data, the drill down breaks the IP's up into Enterprise Program Office (EPO) categories. Click on the plus sign next to the IP that you want to investigate to expand the "tree" and look at its information broken up into the EPO categories.

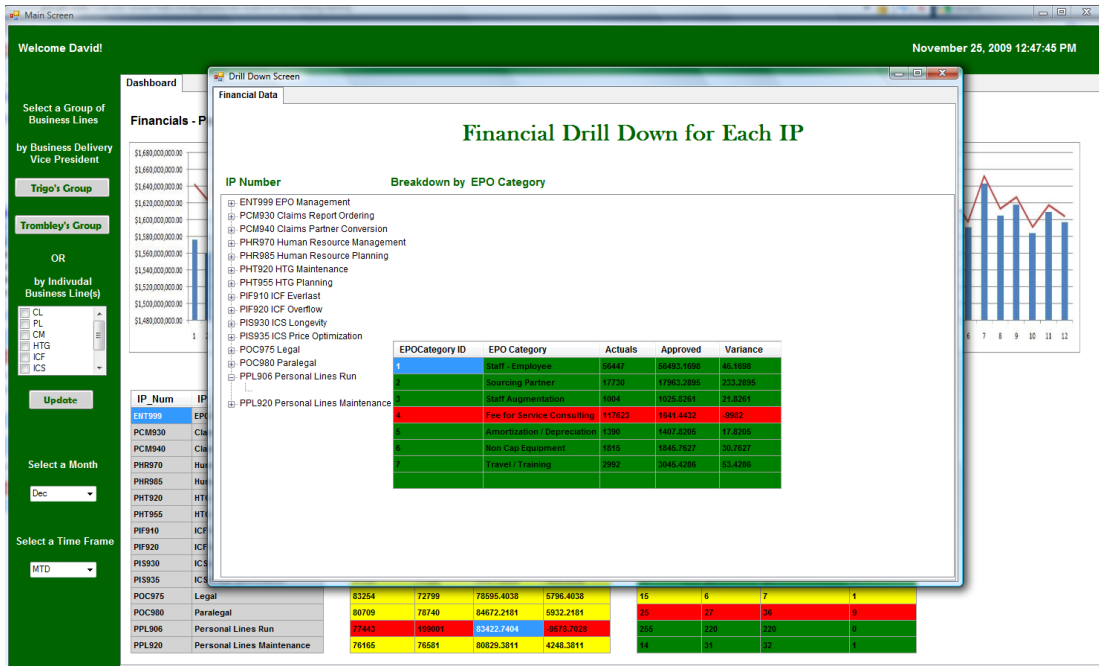


Figure 21: Financials at the EPO Category Level

- For the Labor data, the drill down breaks the IP's up into Projects then breaks the Projects up into Practice Centers. Click on the IP that you want to investigate to expand the "tree" and look at its information broken up into Projects. Click on the project that you are interested in to view that project broken up into Practice Centers. This will open up in a new tab with the selected project's name and its information grouped by Practice Center.

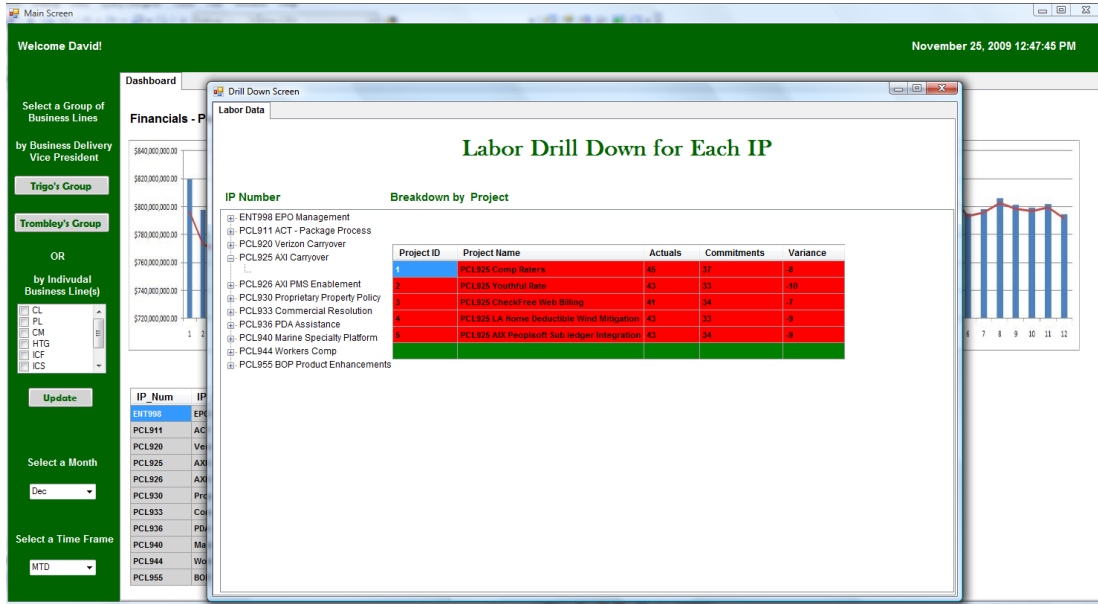


Figure 22: Labor Drill Down to the Project Level

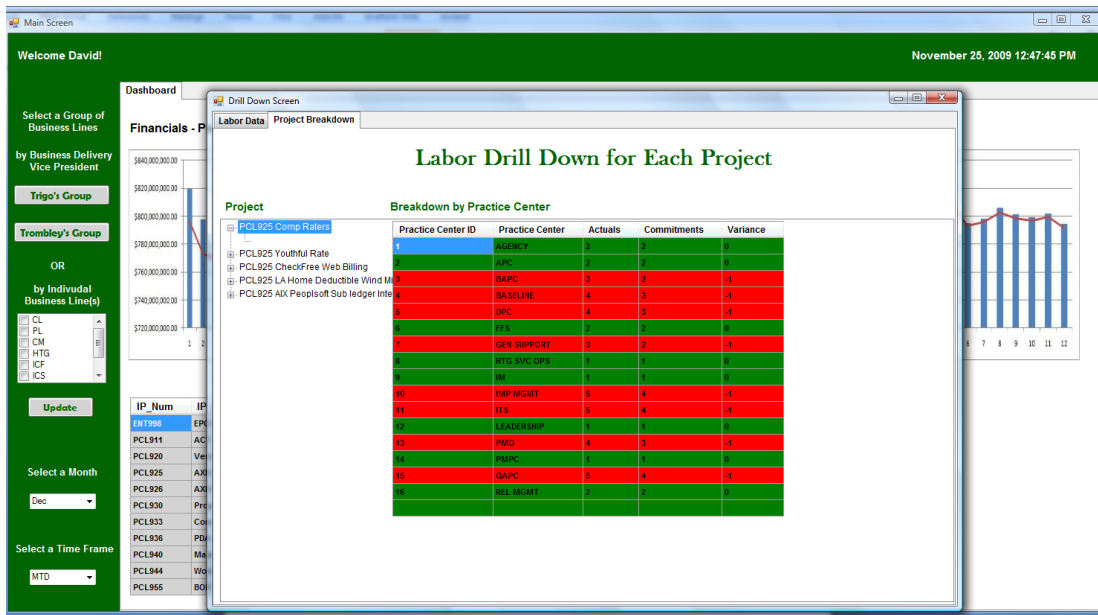


Figure 23: Labor Drill Down to the Practice Center Level

- The criteria for the colors here on the drill down screen are the same as they are for the Dashboard, see Table XX.

Appendix 4 – Technical Manual

This Manual serves the purpose of allowing future developers to build off of our prototype. It includes the documentation of our code, and the difference between this prototype and our recommendations for the final system.

Documentation for the Prototype

Welcome Screen

Public Class frmWelcome

```
Public userRow As ERD_MQPDataSet.UsersRow
```

'This sub handles the first step of Use Case 1 which covers the login functionality. Once the user

'enters his user ID and password and clicks the login button the system matches the entered information

'to the login information stored in the User table. If the information is correct then the system 'display the next screen. If the information is not correct then the system displays a message box which

'asks the user to enter the correct information.

```
Public Sub btnLogin_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
```

Handles btnLogin.Click

```
Dim flag As Integer = 0
```

'Going through each line in the User table to find the user that is logging in

```
For Each Me.userRow In ERD_MQPDataSet.Users.Rows
```

'Checking if both the user ID and password entered by the user match the stored user information

```
If txtUserID.Text = Me.userRow.User_ID AndAlso txtPassword.Text = Me.userRow.Password Then
```

```
user = Me.userRow.First_Name
```

```
Me.Hide()
```

```
frmViewOptions.Show() 'If the information is correct then display the next screen
```

```
flag = 1
```

```
Exit For
```

```
End If
```

```
Next
```

'If the login information is incorrect then display a message box, asking the user to reenter the information

```
If flag = 0 Then
```

```
MessageBox.Show("Please enter the correct UserID and Password.", "Incorrect Login",  
MessageBoxButtons.OK)
```

```

txtPassword.Clear()
txtUserID.Clear()
txtUserID.Focus()
End If

```

```
End Sub
```

'This sub loads the Welcome Screen.

```
Private Sub frmWelcome_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load
    'TODO: This line of code loads data into the 'ERD_MQPDataSet.Users' table.
    Me.UsersTableAdapter.Fill(Me.ERD_MQPDataSet.Users)

```

```
End Sub
```

```
End Class
```

View Options Screen

'This module is used to declare all global variables that will be used throughout the project

```
Public Module modGlobal
    Friend user As String
    Friend usergraph As String = ""
    Friend nameGraph As String = "Trigo"
    Friend listBL As New ArrayList
    Friend dataMonth As String = MonthName(Today.Month(), True)
    Friend prevMonth As String = MonthName(Today.Month() - 1, True)
    Friend monthArray() As String = {"Jan", "Feb", "Mar", "Apr", "May", "Jun", "Jul", "Aug",
"Sep", "Oct", "Nov", "Dec"}
End Module

```

```
Public Class frmViewOptions
    Friend blRow As ERD_MQPDataSet.Business_LineRow
    Friend userRow As ERD_MQPDataSet.UsersRow

```

'This sub loads the View Options Screen

```
Private Sub frmViewOptions_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load
    'TODO: This line of code loads data into the 'ERD_MQPDataSet.Users' table.
    Me.UsersTableAdapter.Fill(Me.ERD_MQPDataSet.Users)
    'TODO: This line of code loads data into the 'ERD_MQPDataSet.Business_Line' table.
    Me.Business_LineTableAdapter.Fill(Me.ERD_MQPDataSet.Business_Line)

```

```
Dim yPos As New Integer()
yPos = 324
```

'Dynamically adding a button to the View Options Screen for each user whose information is

'stored in the User Table

```
For Each Me.userRow In ERD_MQPDataSet.Users.Rows
    Dim dynamicButton As New MyButtonView
    'Setting the properties for each button
    dynamicButton.Name = "btn" & userRow.Last_Name
    dynamicButton.Location = New Point(150, yPos)
    dynamicButton.Size = New Size(160, 28)
    dynamicButton.Text = userRow.Last_Name & "'s Group"
    dynamicButton.BackColor = Color.LightGray
    dynamicButton.ForeColor = Color.DarkGreen
    dynamicButton.Font = New Font("Berlin Sans FB Demi", 12, FontStyle.Bold)
    Me.Controls.Add(dynamicButton)
    yPos += 70
Next
```

'Adding each business line to the checked list box

```
For Each Me.blRow In ERD_MQPDataSet.Business_Line.Rows
    clstboxBL.Items.Add(blRow.Business_Line, False)
Next
End Sub
```

'This sub handles the second step of Use Case 1 where the user decides to view individual business line(s).

'The system stores the business lines the user checks in the list box in an array so that their relevant information can be displayed on the main screen. The system then displays the main screen.

```
Public Sub btnNext_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
Handles btnNext.Click
```

If clstboxBL.CheckedItems.Count <> 0 Then 'Checking whether the user checked any business lines

```
listBL.Clear()
```

```
Dim count As Integer
```

```
For count = 0 To clstboxBL.CheckedItems.Count - 1
```

listBL.Add(clstboxBL.CheckedItems.Item(count)) 'Storing all the selected business lines in an array

```
Next
```

```
End If
```

```
Me.Hide()
```

```
frmMain.Show() 'Displaying the next screen
```

```
End Sub
```

```
End Class
```

'Class that represent each dynamically added button on the View Options Screen

```
Public Class MyButtonView
```

Inherits System.Windows.Forms.Button

'This sub handles the second step of Use Case 1 where the user decides to view business lines aggregated

'by BDVP. Depending on which BDVP's button the user clicks the system goes through the Business Line

'table to find the business lines owned by that BDVP. These business lines are then stored in an array

'so that their relevant information can be displayed on the main screen

```
Private Sub MyButton_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles MyBase.Click
```

```
listBL.Clear()
```

```
nameGraph = MyBase.Name.Substring(3)
```

'Checking if the user checked any business lines in the list box before clicking on the button

```
If frmViewOptions.clstboxBL.CheckedItems.Count <> 0 Then
```

```
For count = 0 To frmViewOptions.clstboxBL.Items.Count - 1
```

```
frmViewOptions.clstboxBL.SetItemChecked(count, False) 'Clearing all the checked items
```

```
Next
```

```
End If
```

'Finding the business lines that are owned by the user whose button was clicked

```
For Each frmViewOptions.userRow In frmViewOptions.ERD_MQPDataSet.Users.Rows
```

```
If frmViewOptions.userRow.Last_Name = MyBase.Name.Substring(3) Then
```

```
For Each frmViewOptions.blRow In frmViewOptions.ERD_MQPDataSet.Business_Line.Rows
```

```
If frmViewOptions.blRow.User_ID = frmViewOptions.userRow.User_ID Then
```

```
listBL.Add(frmViewOptions.blRow.Business_Line) 'Adding the business line to the array
```

```
End If
```

```
Next
```

```
Exit For
```

```
End If
```

```
Next
```

```
frmViewOptions.btnNext_Click(sender, e) 'Calling the btnNext click event handler to bring up the next screen
```

```
End Sub
```

```
End Class
```

Main Screen

Imports System.Data.OleDb

Public Class frmMain

'Declaring the various variables that will be used in this class

Friend blRow As ERD_MQPDataSet.Business_LineRow

```

Friend userRow As ERD_MQPDataSet.UsersRow
Public strSQLIP As String = ""
Public strSQLFin As String = ""
Public strSQLLab As String = ""
Public timeFrame As String = "MTD"
'Intializing the connection string for the database
Dim myConnection As OleDbConnection = New
OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data
Source=|DataDirectory|\ERD_MQP.accdb")
Dim cmdIP, cmdFin, cmdLab As OleDbCommand
Dim daIP, daFin, daLab As OleDbDataAdapter
Dim dtIP As DataTable = New DataTable
Dim dtF As DataTable = New DataTable
Dim dtL As DataTable = New DataTable
Dim dtFAct As DataTable = New DataTable
Dim dtLAct As DataTable = New DataTable
Dim dtFApp As DataTable = New DataTable
Dim dtLCom As DataTable = New DataTable
Dim dtFVar As DataTable = New DataTable
Dim dtLVar As DataTable = New DataTable
Public length As Integer = listBL.Count
Public x, y As Integer

Private Sub frmMain_Load(ByVal sender As System.Object, ByVal e As System.EventArgs)
Handles MyBase.Load
'TODO: This line of code loads data into the 'ERD_MQPDataSet1.Users' table.
Me.UsersTableAdapter.Fill(Me.ERD_MQPDataSet.Users)
'TODO: This line of code loads data into the 'ERD_MQPDataSet1.Business_Line' table.
Me.Business_LineTableAdapter.Fill(Me.ERD_MQPDataSet.Business_Line)

'Setting the text for the welcome label depending on the user that logged in
lblGreeting.Text = "Welcome " & user & "! "
'Setting the text for the datetime label to display the current date and time
lblDateTime.Text = MonthName(Today.Month()) & " " & Today.Day & ", " & Today.Year
& " " & TimeOfDay

Dim yPos As Integer = 138
'Dynamically adding a button to the Main Screen for each user whose information is stored
'in the User Table
For Each Me.userRow In ERD_MQPDataSet.Users.Rows
Dim dynamicButton As New MyButtonMain
'Setting the properties for each button
dynamicButton.Name = "btn" & userRow.Last_Name
dynamicButton.Location = New Point(7, yPos)
dynamicButton.Size = New Size(130, 28)
dynamicButton.Text = userRow.Last_Name & "'s Group"

```

```

dynamicButton.BackColor = Color.LightGray
dynamicButton.ForeColor = Color.DarkGreen
dynamicButton.Font = New Font("Berlin Sans FB Demi", 10, FontStyle.Bold)
Me.pnlViews.Controls.Add(dynamicButton)
yPos += 50

```

Next

'Adding each business line to the checked list box

```

For Each Me.blRow In ERD_MQPDataSet.Business_Line.Rows
    clstboxBL.Items.Add(blRow.Business_Line, False)

```

Next

cboMonth.Text = MonthName(Today.Month(), True) 'Setting the month drop down to the current month

Me.btnUpate_Click(sender, e) 'Calling the btnUpdate click event handler to update the information displayed on the screen

End Sub

'This sub handles the first and second step of Use Case 3.3 where the user changes the timeframe of the data

'displayed on the dashboard. Depending on the timeframe selected the system displays the updated information.

Private Sub cboTimeFrame_SelectedIndexChanged(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles cboTimeFrame.SelectedIndexChanged

```

timeFrame = cboTimeFrame.Text

```

```

length = listBL.Count

```

'Clearing all the datatables of the previous information stored in them

```

dtIP.Clear()

```

```

dtF.Clear()

```

```

dtFAct.Clear()

```

```

dtFApp.Clear()

```

```

dtFVar.Clear()

```

```

dtL.Clear()

```

```

dtLAct.Clear()

```

```

dtLCom.Clear()

```

```

dtLVar.Clear()

```

```

For Me.y = 1 To 4

```

```

    If y = 1 Then

```

'Querying the financial and labor forecasts for this month for the selected timeframe, month, and business lines

```

        strSQLFin = "SELECT [Monthly Financials.IP Number] AS IP_Num, SUM([Monthly Financials." & dataMonth & "]) AS Forecast"

```

```

        strSQLLab = "SELECT [Monthly Labor.IP Number] AS IP_Num, SUM([Monthly Labor." & dataMonth & " FTE]) AS Forecast"

```

```

ElseIf y = 2 Then
    'Querying the financial and labor actuals for this month for the selected timeframe,
    month, and business lines
    strSQLFin = "SELECT [Monthly Financials.IP Number] AS IP_Num, SUM([Monthly
    Financials." & timeFrame & "] AS Actuals"
    strSQLLab = "SELECT [Monthly Labor.IP Number] AS IP_Num, SUM([Monthly
    Labor." & timeFrame & "] AS Actuals"
    ElseIf y = 3 Then
        'Querying the financial and labor approved data for this month for the selected
        timeframe, month, and business lines
        strSQLFin = "SELECT [Monthly Financials.IP Number] AS IP_Num, SUM([Monthly
        Financials." & timeFrame & "] AS Approved"
        strSQLLab = "SELECT [Monthly Labor.IP Number] AS IP_Num, SUM([Monthly
        Labor." & timeFrame & "] AS Commitments"
    Else
        'Querying the financial and labor variance of actual to approved for this month for the
        selected timeframe, month, and business lines
        strSQLFin = "SELECT [Monthly Financials.IP Number] AS IP_Num, SUM([Monthly
        Financials." & timeFrame & "] AS Variance"
        strSQLLab = "SELECT [Monthly Labor.IP Number] AS IP_Num, SUM([Monthly
        Labor." & timeFrame & "] AS Variance"
    End If
    strSQLIP = "SELECT [Monthly Financials.IP Number] AS IP_Num, [IP.IP Description]
    AS IP_Desc FROM [Monthly Financials], [IP], [Business Line] WHERE [Monthly Financials.IP
    Number] = [IP.IP Number] AND [Monthly Financials.Business Line ID] = [Business
    Line.Business Line ID] AND ("
    strSQLFin &= " FROM [Monthly Financials], [IP], [Business Line] WHERE [Monthly
    Financials.IP Number] = [IP.IP Number] AND [Monthly Financials.Business Line ID] =
    [Business Line.Business Line ID] AND ("
    strSQLLab &= " FROM [Monthly Labor], [IP], [Business Line] WHERE [Monthly
    Labor.IP Number] = [IP.IP Number] AND [Monthly Labor.Business Line ID] = [Business
    Line.Business Line ID] AND ("
    For Me.x = 0 To length - 2
        strSQLIP &= "[Business Line] = " & listBL(x) & " OR "
        strSQLFin &= "[Business Line] = " & listBL(x) & " OR "
        strSQLLab &= "[Business Line] = " & listBL(x) & " OR "
    Next
    If Not y = 1 Then
        strSQLFin &= "[Business Line] = " & listBL(x) & ") AND [Monthly
        Financials.Month] = " & dataMonth & " AND [Monthly Financials.Financial Measure ID] = "
        & y - 1 & " GROUP BY [Monthly Financials.IP Number], [IP.IP Description]"
        strSQLLab &= "[Business Line] = " & listBL(x) & ") AND [Monthly Labor.Month] =
        " & dataMonth & " AND [Monthly Labor.Labor Measure ID] = " & y - 1 & " GROUP BY
        [Monthly Labor.IP Number], [IP.IP Description]"
    Else

```

```

strSQLFin &= "[Business Line] = " & listBL(x) & " AND [Monthly
Financials.Month] = " & prevMonth & " AND [Monthly Financials.Financial Measure ID] = 1
GROUP BY [Monthly Financials.IP Number], [IP.IP Description]"
strSQLLab &= "[Business Line] = " & listBL(x) & " AND [Monthly Labor.Month] =
" & prevMonth & " AND [Monthly Labor.Labor Measure ID] = 1 GROUP BY [Monthly
Labor.IP Number], [IP.IP Description]"
End If
strSQLIP &= "[Business Line] = " & listBL(x) & " AND [Monthly Financials.Month] =
" & prevMonth & " AND [Monthly Financials.Financial Measure ID] = 1 GROUP BY
[Monthly Financials.IP Number], [IP.IP Description]"

```

Querying the database

```

cmdIP = New OleDb.OleDbCommand(strSQLIP, myConnection)
cmdFin = New OleDb.OleDbCommand(strSQLFin, myConnection)
cmdLab = New OleDb.OleDbCommand(strSQLLab, myConnection)

```

Pulling the queried information from the database

```

daIP = New OleDbDataAdapter(cmdIP)
daFin = New OleDbDataAdapter(cmdFin)
daLab = New OleDbDataAdapter(cmdLab)

```

Setting the primary keys for the datatables to enable merging

```

dtF.PrimaryKey = New DataColumn() {dtF.Columns("IP_Num")}
dtL.PrimaryKey = New DataColumn() {dtL.Columns("IP_Num")}

```

Populating the datatables with the queried information and merging them

```

If y = 1 Then
    daIP.Fill(dtIP)
    daFin.Fill(dtF)
    daLab.Fill(dtL)
ElseIf y = 2 Then
    daFin.Fill(dtFAct)
    daLab.Fill(dtLAct)
    Try
        dtF.Merge(dtFAct)
        dtL.Merge(dtLAct)
    Catch e1 As Exception
    End Try
ElseIf y = 3 Then
    daFin.Fill(dtFApp)
    daLab.Fill(dtLCom)
    Try
        dtF.Merge(dtFApp)
        dtL.Merge(dtLCom)
    Catch e1 As Exception
    End Try
Else

```



```

    daFin.Fill(dtFVar)
    daLab.Fill(dtLVar)
    Try
        dtF.Merge(dtFVar)
        dtL.Merge(dtLVar)
    Catch e2 As Exception
    End Try
End If
Next

```

'Binding the datagridviews to the datatables and setting their properties

```

dgIP.DataSource = dtIP
dgIP.AutoSize = True
dtF.PrimaryKey = Nothing
dtF.Columns.Remove("IP_Num")
dgFinancials.DataSource = dtF
dgFinancials.AutoSize = True
dgFinancials.Location = New Point(dgIP.Location.X + dgIP.Width + 3, dgIP.Location.Y)
lblFinancial.Location = New Point(dgFinancials.Location.X, lblFinancial.Location.Y)
dtL.PrimaryKey = Nothing
dtL.Columns.Remove("IP_Num")
dgLabor.DataSource = dtL
dgLabor.AutoSize = True
dgLabor.Location = New Point(dgFinancials.Location.X + dgFinancials.Width + 3,
dgFinancials.Location.Y)
lblLabor.Location = New Point(dgLabor.Location.X, lblFinancial.Location.Y)

```

'Coloring each row in the financial datagrid view based on the percentage variance from approved

```

Dim dgvRow As DataGridViewRow
For Each dgvRow In dgFinancials.Rows
    If Math.Abs(dgvRow.Cells.Item(3).Value) / dgvRow.Cells.Item(2).Value * 100 > 10
Then
        dgvRow.DefaultCellStyle.BackColor = Color.Red
    ElseIf Math.Abs(dgvRow.Cells.Item(3).Value) / dgvRow.Cells.Item(2).Value * 100 > 5
Then
        dgvRow.DefaultCellStyle.BackColor = Color.Yellow
    Else
        dgvRow.DefaultCellStyle.BackColor = Color.Green
    End If
Next

```

'Coloring each row in the labor datagrid view based on the percentage variance from approved

```

For Each dgvRow In dgLabor.Rows

```

```

    If Math.Abs(dgvRow.Cells.Item(3).Value) / dgvRow.Cells.Item(2).Value * 100 > 20
Then
    dgvRow.DefaultCellStyle.BackColor = Color.Red
ElseIf Math.Abs(dgvRow.Cells.Item(3).Value) / dgvRow.Cells.Item(2).Value * 100 > 10
Then
    dgvRow.DefaultCellStyle.BackColor = Color.Yellow
Else
    dgvRow.DefaultCellStyle.BackColor = Color.Green
End If
Next

End Sub

```

'This sub handles the first and second step of Use Case 3.3 where the user changes the month of the data displayed on the dashboard. Depending on the month selected the system displays the updated information.

```

Private Sub cboMonth_SelectedIndexChanged(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles cboMonth.SelectedIndexChanged
    dataMonth = cboMonth.SelectedItem 'Setting the variable to the month selected
    Dim monthCount As Integer
    For monthCount = 1 To 11
        If monthArray(monthCount) = dataMonth Then
            prevMonth = monthArray(monthCount - 1) 'Storing the previous month based on the month selected
        End If
    Next
    Me.btnUpate_Click(sender, e) 'Calling the btnUpdate click event handler to update the information displayed on the main screen
End Sub

```

'This sub handles the third and fourth step of Use Case 3.3 where the user decides to view individual business line(s).

'The system stores the business lines the user checks in the list box in an array so that their relevant information can be updated on the main screen.

```

Public Sub btnUpate_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles btnUpate.Click
    If clstboxBL.CheckedItems.Count <> 0 Then 'Checking whether the user checked any business lines
        listBL.Clear()
        Dim count As Integer
        For count = 0 To clstboxBL.CheckedItems.Count - 1
            listBL.Add(clstboxBL.CheckedItems.Item(count)) 'Storing all the selected business lines in an array
        Next
    End If

```

Me.cboTimeFrame_SelectedIndexChanged(sender, e) Updating the information displayed in the tables on the dashboard

The following statements display the relevant graphs on the dashboard depending on the BDVP or month selected by the user

```
usergraph = nameGraph + dataMonth
If usergraph.Contains("TrigoDec") Then
    Me.picGraph1.Image = My.Resources.DaveDecPPL
    Me.picGraph2.Image = My.Resources.DaveDecFFS
    Me.picGraph3.Image = My.Resources.DaveDecCNC
    Me.picGraph4.Image = My.Resources.DaveDecStf
ElseIf usergraph.Contains("TrigoNov") Then
    Me.picGraph1.Image = My.Resources.DaveNovPPL
    Me.picGraph2.Image = My.Resources.DaveNovFFS
    Me.picGraph3.Image = My.Resources.DaveNovCNC
    Me.picGraph4.Image = My.Resources.DaveNovStf
ElseIf usergraph.Contains("TrigoOct") Then
    Me.picGraph1.Image = My.Resources.DaveOctPPL
    Me.picGraph2.Image = My.Resources.DaveOctFFS
    Me.picGraph3.Image = My.Resources.DaveOctCNC
    Me.picGraph4.Image = My.Resources.DaveOctStf
ElseIf usergraph.Contains("TrigoSep") Then
    Me.picGraph1.Image = My.Resources.DaveSepPPL
    Me.picGraph2.Image = My.Resources.DaveSepFFS
    Me.picGraph3.Image = My.Resources.DaveSepCNC
    Me.picGraph4.Image = My.Resources.DaveSepStf
ElseIf usergraph.Contains("TrombleyDec") Then
    Me.picGraph1.Image = My.Resources.SueDecPPL
    Me.picGraph2.Image = My.Resources.SueDecFFS
    Me.picGraph3.Image = My.Resources.SueDecCNC
    Me.picGraph4.Image = My.Resources.SueDecStf
ElseIf usergraph.Contains("TrombleyNov") Then
    Me.picGraph1.Image = My.Resources.SueNovPPL
    Me.picGraph2.Image = My.Resources.SueNovFFS
    Me.picGraph3.Image = My.Resources.SueNovCNC
    Me.picGraph4.Image = My.Resources.SueNovStf
ElseIf usergraph.Contains("TrombleyOct") Then
    Me.picGraph1.Image = My.Resources.SueOctPPL
    Me.picGraph2.Image = My.Resources.SueOctFFS
    Me.picGraph3.Image = My.Resources.SueOctCNC
    Me.picGraph4.Image = My.Resources.SueOctStf
ElseIf usergraph.Contains("TrombleySep") Then
    Me.picGraph1.Image = My.Resources.SueSepPPL
    Me.picGraph2.Image = My.Resources.SueSepFFS
    Me.picGraph3.Image = My.Resources.SueSepCNC
    Me.picGraph4.Image = My.Resources.SueSepStf
```

```
End If
End Sub
```

'This sub handles the first step of Use Case 4.1 or Use Case 4.2 depending on whether the user clicks on the

'Financial Datagridview or the Labor Datagridview

```
Private Sub dgFinancials_CellClick(ByVal sender As System.Object, ByVal e As System.Windows.Forms.DataGridViewCellEventArgs) Handles dgFinancials.CellDoubleClick, dgLabor.CellDoubleClick
```

```
Dim s1 As DataGridView = sender
```

```
Dim table As String = ""
```

```
If ([String].IsNullOrEmpty(s1.CurrentCell.FormattedValue.ToString) = False) Then
```

```
    If (s1.Name.Equals("dgFinancials")) Then 'Checking if the user clicked the Financial Table to view the financial IP breakdown
```

```
        table = "Financial"
```

```
    ElseIf (s1.Name.Equals("dgLabor")) Then 'Checking if the user clicked the Labor Table to view the labor IP breakdown
```

```
        table = "Labor"
```

```
    End If
```

'Creating an instance of the drill down screen based on the current settings, information displayed, and which table the user clicked

```
Dim d1 As frmDrillDown = New frmDrillDown(dgIP.Item(0, s1.CurrentRow.Index).Value.ToString, dgIP.Item(1, s1.CurrentRow.Index).Value.ToString, dtIP, timeFrame, cboMonth.SelectedItem.ToString(), table)
```

```
d1.Show() 'Displaying the drill down screen
```

```
End If
```

```
End Sub
```

```
End Class
```

'Class that represent each dynamically added button on the Main Screen

```
Public Class MyButtonMain
```

```
Inherits System.Windows.Forms.Button
```

'This sub handles the third and fourth step of Use Case 3.3 where the user wants to see a new view of business lines

'aggregated by BDVP. Depending on which BDVP's button the user clicks the system goes through the Business Line

'table to find the business lines owned by that BDVP. These business lines are then stored in an array

'so that their relevant information can be used to update the information displayed on the main screen

```

Private Sub MyButton_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Click
    listBL.Clear()
    nameGraph = MyBase.Name.Substring(3)

    'Checking if the user checked any business lines in the list box before clicking on the button
    If frmMain.clstboxBL.CheckedItems.Count <> 0 Then
        For count = 0 To frmMain.clstboxBL.Items.Count - 1
            frmMain.clstboxBL.SetItemChecked(count, False) 'Clearing all the checked items
        Next
    End If

    'Finding the business lines that are owned by the user whose button was clicked
    For Each frmMain.userRow In frmMain.ERD_MQPDataSet.Users.Rows
        If frmMain.userRow.Last_Name = MyBase.Name.Substring(3) Then
            For Each frmMain.blRow In frmMain.ERD_MQPDataSet.Business_Line.Rows
                If frmMain.blRow.User_ID = frmMain.userRow.User_ID Then
                    listBL.Add(frmMain.blRow.Business_Line) 'Adding the business line to the array
                End If
            Next
        Exit For
    End If
    Next
    frmMain.btnUpate_Click(sender, e) 'Calling the btnUpdate click event handler to update the
information displayed on the main screen
End Sub
End Class

```

Drill Down Screen

```
Imports System.Data.OleDb
```

```
Public Class frmDrillDown
```

```
' declared to get the values of ipnumber, timeframe and ip desc from main form
```

```
Dim IPnum, IPdesc, timeframe As String
```

```
Dim myConnection As OleDbConnection = New
OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data
Source=|DataDirectory|\ERD_MQP.accdb")
```

```
Dim cmdFin, cmdLab As OleDbCommand
```

```
Dim daFin, daLab As OleDbDataAdapter
```

```
Dim MAINsc As DataTable = New DataTable 'declared to get the ipnums from main form
```

```
Dim projSc As DataTable = New DataTable ' declared to get the project names from 1st drill
down
```

```
Dim SelectedNode As TreeNode = New TreeNode 'the value selected in the treeview
```

```
Dim SelectedChild As PullDownDataGrid = New PullDownDataGrid ' the datagrid view that comes up when a node is selected
```

```
Dim Month As String ' the selected month from the previous form
```

```
Public TableName As String ' the table that the user clicked on the main form
```

```
Dim pTEmp As PullDownDataGrid = New PullDownDataGrid 'temporary variables used to store datagrids
```

```
Dim NTemp As TreeNode = New TreeNode 'temporary variables used to store datagrids
```

```
Dim pTEmp2 As PullDownDataGrid = New PullDownDataGrid 'temporary variables used to store datagrids
```

```
Dim NTemp2 As TreeNode = New TreeNode 'temporary variables used to store datagrids
```

```
Dim SQLq As String 'Queries to pull actuals data from the database
```

```
Dim SQL2 As String 'Queries to pull approved/commitments data from the database
```

```
Dim SQL3 As String 'Queries to pull variance data from the database
```

```
Public Sub New(ByVal ipnum As String, ByVal ipdesc As String, ByVal dt As DataTable, ByVal tf As String, ByVal Mth As String, ByVal Table As String)
```

```
' constructor which passes ipn number,ip desc,timeframe,month from mainform
```

```
InitializeComponent()
```

```
MAINsc.Clear()
```

```
projSc.Clear()
```

```
Me.IPnum = ipnum 'give the local IPnum value of ip number passed from the main form
```

```
Me.IPdesc = ipdesc
```

```
MAINsc = dt ' the selected table ( either financial or labor) is passed from mainform to get all the ip numbers in the table
```

```
timeframe = tf ' initiliazing the local variables with the past values
```

```
Month = Mth ' initiliazing the local variables with the past values
```

```
TableName = Table ' initiliazing the local variables with the past values
```

```
End Sub
```

```
Public Sub New()
```

```
' This call is required by the Windows Form Designer.
```

```
InitializeComponent()
```

```
' Add any initialization after the InitializeComponent() call.
```

```
End Sub
```

```
Dim Tb2 As TabPage = New TabPage 'Initialize variable for 2nd tab
```

```
Public Sub frmDrillDown_Load(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles MyBase.Load
```

'TODO: This line of code loads data into the 'ERD_MQPDataSet.Monthly_Labor' table. You can move, or remove it, as needed.

```
Me.Monthly_LaborTableAdapter.Fill(Me.ERD_MQPDataSet.Monthly_Labor)
```

'TODO: This line of code loads data into the 'ERD_MQPDataSet.IP' table. You can move, or remove it, as needed.

```
Me.IPTableAdapter.Fill(Me.ERD_MQPDataSet.IP)
```

```
If (TableName.Equals("Labor")) Then
```

TabPage1.Text = "Labor Data" ' specify the labor header text in the tab page according to the table selected

```
lblDrillTitle.Text = "Labor Drill Down for Each IP"
```

```
lblDrillBreak.Text &= " Project"
```

```
Else
```

TabPage1.Text = "Financial Data" ' specify the financial header text in the tab page according to the table selected

```
lblDrillTitle.Text = "Financial Drill Down for Each IP"
```

```
lblDrillBreak.Text &= " EPO Category"
```

```
End If
```

```
Tb2 = TabPage2
```

```
Dim i As Integer
```

For i = 0 To MAINsc.Rows.Count - 1 ' create treeNode elements for each IPnumber row in the table

```
Dim dtF As DataTable = New DataTable "Table created to store actuals"
```

```
Dim dtF2 As DataTable = New DataTable "Table created to store approved/commitments"
```

```
Dim dtF3 As DataTable = New DataTable "Table created to store variance"
```

```
Try
```

```
' create tree node element with name of IPnumber and IP description
```

```
Dim parentNode As TreeNode = New TreeNode((MAINsc.Rows(i).Item(0)) & " " & (MAINsc.Rows(i).Item(1)))
```

```
TreeView1.Nodes.Add(parentNode) ' add this node to the treeview
```

'Since a treeview can have only a TreeNode as child element and we need a table as a child node, we declare a class which is of type TreeNode ,inside which has a datagridview..

'so the treeView is actually made to believe it has a treeNode as child ,but the child has a datagridview within

```
Dim childNode As PullDownDataGrid = New PullDownDataGrid()
```

If (TableName.Equals("Labor")) Then ' add a cell click event to the Labor Drill Table only

```
AddHandler childNode.dg1.CellDoubleClick, AddressOf LaborViewFirstDrill_CellContentClick
```

```
End If
```

```
TabControl1.TabPages.Remove(TabPage2) ' remove tabPage2 from the tabControl
```

parentNode.Nodes.Add(childNode) ' add the childNode declared above to the parentNode

If parentNode.Text.Equals(IPnum & " " & IPdesc) Then

SelectedNode = parentNode ' find out the node selected by the user by comparing the name of the parentNode to the passed value of IPNum and IPdesc

SelectedChild = childNode ' Compare each node in the treeview with the node selected by the user and assign that node to the selected node

End If

'SQL Statements based on the table selected

If (TableName.Equals("Financial")) Then

'SQL Statements to break down the selected IP into EPO Categories

SQLq = "SELECT [EPO Category.EPO Category ID] AS [EPOCategory ID], [EPO Category.EPO Category] AS [EPO Category], [Monthly Financials." & timeframe & "] As Actuals FROM [Monthly Financials] INNER JOIN [EPO Category] ON [EPO Category].[EPO Category ID] = [Monthly Financials].[EPO Category ID] WHERE [Monthly Financials.IP Number]=''" & MAINsc.Rows(i).Item(0).ToString() & "' AND [Monthly Financials.Month]=''" & Month & "' AND [Monthly Financials.Financial Measure ID]=1"

SQL2 = " SELECT [EPO Category.EPO Category ID] AS [EPOCategory ID], [Monthly Financials." & timeframe & "] As Approved FROM [Monthly Financials] INNER JOIN [EPO Category] ON [EPO Category].[EPO Category ID] = [Monthly Financials].[EPO Category ID] WHERE [Monthly Financials.IP Number]=''" & MAINsc.Rows(i).Item(0).ToString() & "' AND [Monthly Financials.Month]=''" & Month & "' AND [Monthly Financials.Financial Measure ID]=2"

SQL3 = " SELECT [EPO Category.EPO Category ID] AS [EPOCategory ID],[Monthly Financials." & timeframe & "] As Variance FROM [Monthly Financials] INNER JOIN [EPO Category] ON [EPO Category].[EPO Category ID] = [Monthly Financials].[EPO Category ID] WHERE [Monthly Financials.IP Number]=''" & MAINsc.Rows(i).Item(0).ToString() & "' AND [Monthly Financials.Month]=''" & Month & "' AND [Monthly Financials.Financial Measure ID]=3"

Else

'SQL Statements to break down the selected IP into Projects

SQLq = "SELECT [Project.Project ID] AS [Project ID], [Project.Project Name] AS [Project Name], SUM([Monthly Labor." & timeframe & "] As Actuals FROM [Monthly Labor] INNER JOIN [Project] ON [Project].[Project ID] = [Monthly Labor].[Project ID] WHERE [Monthly Labor.IP Number]=''" & MAINsc.Rows(i).Item(0).ToString() & "' AND [Monthly Labor.Month]=''" & Month & "' AND [Monthly Labor.Labor Measure ID]=1 GROUP BY [Project.Project ID], [Project.Project Name]"

SQL2 = "SELECT [Project.Project ID] AS [Project ID], [Project.Project Name] AS [Project Name], SUM([Monthly Labor." & timeframe & "] As Commitments FROM [Monthly Labor] INNER JOIN [Project] ON [Project].[Project ID] = [Monthly Labor].[Project ID] WHERE [Monthly Labor.IP Number]=''" & MAINsc.Rows(i).Item(0).ToString() & "' AND


```
[Monthly Labor.Month]=" & Month & "" AND [Monthly Labor.Labor Measure ID]=2 GROUP BY [Project.Project ID], [Project.Project Name]"
```

```
SQL3 = "SELECT [Project.Project ID] AS [Project ID], [Project.Project Name] AS [Project Name], SUM([Monthly Labor." & timeframe & "]) As Variance FROM [Monthly Labor] INNER JOIN [Project] ON [Project].[Project ID] = [Monthly Labor].[Project ID] WHERE [Monthly Labor.IP Number]=" & MAINsc.Rows(i).Item(0).ToString() & "" AND [Monthly Labor.Month]=" & Month & "" AND [Monthly Labor.Labor Measure ID]=3 GROUP BY [Project.Project ID], [Project.Project Name]"
```

```
End If
```

```
' declare oledb command and adapter objects and fill the datatable using the adapter object
```

```
cmdFin = New OleDb.OleDbCommand(SQLq, myConnection)  
daFin = New OleDbDataAdapter(cmdFin)  
daFin.Fill(dtF)
```

```
cmdFin = New OleDb.OleDbCommand(SQL2, myConnection)  
daFin = New OleDbDataAdapter(cmdFin)  
daFin.Fill(dtF2)
```

```
cmdFin = New OleDb.OleDbCommand(SQL3, myConnection)  
daFin = New OleDbDataAdapter(cmdFin)  
daFin.Fill(dtF3)
```

```
' based on the table name ,select primary keys.
```

```
If (TableName.Equals("Financial")) Then
```

```
dtF.PrimaryKey = New DataColumn() {dtF.Columns("EPOCategory ID")}
```

```
Else
```

```
dtF.PrimaryKey = New DataColumn() {dtF.Columns("Project ID")}
```

```
End If
```

```
' Merge approved and variance table with the actuals table
```

```
dtF.Merge(dtF2)
```

```
dtF.Merge(dtF3)
```

```
childNode.dg1.DataSource = dtF ' since the childnode has a datagridview ,fill the datasource property of the datagridview with the table
```

```
Dim i2 As Integer
```

```
Dim H As Integer = 0
```

```
' find out the height of the final datagridview
```

```
For i2 = 0 To dtF.Rows.Count + 2
```

```
H += childNode.dg1.ColumnHeadersHeight
```

```
Next
```

```
' using the height calculated above,set the position and the height and width of the datagridview
```

```
SelectedChild.dg1.SetBounds(230, SelectedNode.Index * 15, 500, H)
```

```

Catch ee As Exception
    'If Error catch as exception
End Try

```

```

Next

```

```

' highlight the selected node on the treeview and expand it
TreeView1.SelectedNode = SelectedNode
TreeView1.SelectedNode.Expand()
' add the datagrid view to the treeview
TreeView1.Controls.Add(SelectedChild.dg1)
dgvAppearance(SelectedChild.dg1) ' Colors the datagridview depending on certain
parameters and criteria

```

```

pTemp = SelectedChild 'Saving the values of temp node and temp child for future use
NTemp = SelectedNode

```

```

End Sub

```

```

Private Sub LaborViewFirstDrill_CellContentClick(ByVal sender As Object, ByVal e As
DataGridViewCellEventArgs)

```

```

' remove the previous tab
TabControl1.TabPages.Remove(Tb2)
' add a new tab page
TabControl1.TabPages.Add(Tb2)
'clear the treeview in the second tab page
TreeView2.Nodes.Clear()
' the code below is same as the code for the main drill view
If (TableName.Equals("Labor")) Then

```

```

    Dim s1 As DataGridView = sender

```

```

    projSc = s1.DataSource

```

```

    Dim i As Integer

```

```

    Dim SelectedNode2 As TreeNode = New TreeNode

```

```

    Dim SelectedChild2 As PullDownDataGrid = New PullDownDataGrid

```

```

    For i = 0 To projSc.Rows.Count ' create treeNode elements for each project row in the
table

```

```

        Dim dtF As DataTable = New DataTable "Table created to store actuals

```

```

        Dim dtF2 As DataTable = New DataTable "Table created to store commitments

```

```

        Dim dtF3 As DataTable = New DataTable "Table created to store variance

```

```

        Try

```

```

            Dim parentNode As TreeNode = New TreeNode((projSc.Rows(i).Item(1)))

```

```

            TreeView2.Nodes.Add(parentNode)

```

```
Dim childNode As PullDownDataGrid = New PullDownDataGrid()
```

```
parentNode.Nodes.Add(childNode)
```

```
If parentNode.Text.Equals(s1.Item(1, s1.CurrentRow.Index).Value.ToString) Then
```

```
    SelectedNode2 = parentNode
```

```
    SelectedChild2 = childNode
```

```
End If
```

```
'SQL Statement for drilling down from project into practice center
```

```
If ([String].IsNullOrEmpty(s1.CurrentCell.FormattedValue.ToString) = False) Then
```

```
    SQLq = "SELECT [Practice Center].[Practice Center ID] AS [Practice Center ID], [Practice Center].[Practice Center], SUM([Monthly Labor." & timeframe & "]) AS Actuals FROM Project INNER JOIN ([Practice Center] INNER JOIN [Monthly Labor] ON [Practice Center].[Practice Center ID] = [Monthly Labor].[Practice Center ID]) ON Project.[Project ID] = [Monthly Labor].[Project ID] WHERE [Monthly Labor].[Labor Measure ID] = 1 AND [Monthly Labor.Month] = '" & Month & "' AND [Monthly Labor].[IP Number] = '" & MAINsc.Rows(TreeView1.SelectedNode.Index).Item(0) & "' AND [Monthly Labor].[Project ID] = '" & projSc.Rows(i).Item(0).ToString() & "' GROUP BY [Practice Center].[Practice Center ID], [Practice Center].[Practice Center]"
```

```
    SQL2 = "SELECT [Practice Center].[Practice Center ID] AS [Practice Center ID], [Practice Center].[Practice Center], SUM([Monthly Labor." & timeframe & "]) AS Commitments FROM Project INNER JOIN ([Practice Center] INNER JOIN [Monthly Labor] ON [Practice Center].[Practice Center ID] = [Monthly Labor].[Practice Center ID]) ON Project.[Project ID] = [Monthly Labor].[Project ID] WHERE [Monthly Labor].[Labor Measure ID] = 2 AND [Monthly Labor.Month] = '" & Month & "' AND [Monthly Labor].[IP Number] = '" & MAINsc.Rows(TreeView1.SelectedNode.Index).Item(0) & "' AND [Monthly Labor].[Project ID] = '" & projSc.Rows(i).Item(0).ToString() & "' GROUP BY [Practice Center].[Practice Center ID], [Practice Center].[Practice Center]"
```

```
    SQL3 = "SELECT [Practice Center].[Practice Center ID] AS [Practice Center ID], [Practice Center].[Practice Center], SUM([Monthly Labor." & timeframe & "]) AS Variance FROM Project INNER JOIN ([Practice Center] INNER JOIN [Monthly Labor] ON [Practice Center].[Practice Center ID] = [Monthly Labor].[Practice Center ID]) ON Project.[Project ID] = [Monthly Labor].[Project ID] WHERE [Monthly Labor].[Labor Measure ID] = 3 AND [Monthly Labor.Month] = '" & Month & "' AND [Monthly Labor].[IP Number] = '" & MAINsc.Rows(TreeView1.SelectedNode.Index).Item(0) & "' AND [Monthly Labor].[Project ID] = '" & projSc.Rows(i).Item(0).ToString() & "' GROUP BY [Practice Center].[Practice Center ID], [Practice Center].[Practice Center]"
```

```
' declare oledb command and adapter objects and fill the datatable using the adapter object
```

```
cmdFin = New OleDb.OleDbCommand(SQLq, myConnection)
```

```
daFin = New OleDbDataAdapter(cmdFin)
```

```
daFin.Fill(dtF)
```

```
cmdFin = New OleDb.OleDbCommand(SQL2, myConnection)
daFin = New OleDbDataAdapter(cmdFin)
daFin.Fill(dtF2)
```

```
cmdFin = New OleDb.OleDbCommand(SQL3, myConnection)
daFin = New OleDbDataAdapter(cmdFin)
daFin.Fill(dtF3)
' based on the table name ,select primary keys.
dtF.PrimaryKey = New DataColumn() {dtF.Columns("Practice Center ID")}
' Merge commitments and variance table with the actuals table
dtF.Merge(dtF2)
dtF.Merge(dtF3)
```

childNode.dg1.DataSource = dtF ' since the childnode has a datagridview ,fill the datasource property of the datagridview with the table

```
Dim i2 As Integer
Dim H As Integer = 0
' find out the height of the final datagridview
For i2 = 0 To dtF.Rows.Count + 2
    H = H + childNode.dg1.ColumnHeadersHeight ' using the height calculated
    above,set the position and the height and width of the datagridview
Next
SelectedChild2.dg1.SetBounds(230, SelectedNode2.Index * 15, 500, H)
```

```
End If
Catch eee As Exception
    'If Error catch as exception
End Try
Next
' highlight the selected node on the treeview and expand it
TreeView2.Controls.Add(SelectedChild2.dg1)
TreeView2.SelectedNode = SelectedNode2
TreeView2.SelectedNode.Expand()
dgvAppearance(SelectedChild2.dg1) ' Colors the datagridview depending on certain
parameters and criteria
```

```
pTemp2 = SelectedChild2 'Saving the values of temp node and temp child for future use
NTemp2 = SelectedNode2
```

```
End If
```

```
TabControl1.SelectedIndex = 1 'Selects the second tab
End Sub
```

```

Private Sub TreeView1_NodeMouseClicked(ByVal sender As System.Object, ByVal e As
System.Windows.Forms.TreeNodeEventArgs) Handles
TreeView1.NodeMouseClicked, TreeView2.NodeMouseClicked
    'Click event for the treeview node
    Dim tv As TreeView = sender
    pTEmp.dg1.Hide()
    NTemp.Collapse()
    pTEmp2.dg1.Hide()
    NTemp2.Collapse()
    Dim p2 As PullDownDataGrid = New PullDownDataGrid
    Dim p1 As TreeNode = New TreeNode
    ' convert the clicked node to the pulldowndatagrid type,without doing this,we cant get the
value of the clicked node
    p2 = CType(e.Node.FirstNode, PullDownDataGrid)
    p1 = CType(e.Node, TreeNode)

    Try
        tv.Controls.Add(p2.dg1) ' add the clicked node to the treeview
        Dim i2 As Integer
        Dim H As Integer = 0
        For i2 = 0 To p2.dg1.RowCount + 1
            H = H + p2.dg1.ColumnHeadersHeight ' find out the height of the table
        Next
        p2.dg1.SetBounds(230, e.Y, 500, H) 'Specifying size of datagrid view
        e.Node.Expand()
        p2.dg1.Show()
        dgvAppearance(p2.dg1)

        pTEmp = p2
        NTemp = p1
    Catch eee As Exception

    End Try

End Sub

Private Sub TreeView1_AfterCollapse(ByVal sender As System.Object, ByVal e As
System.Windows.Forms.TreeViewEventArgs) Handles
TreeView1.AfterCollapse,
TreeView2.AfterCollapse
    'Event handler for treeview collapse
    pTEmp.dg1.Hide()
    pTEmp2.dg1.Hide()
End Sub

```

```

Private Sub IPBindingNavigatorSaveItem_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs)
    Me.Validate()
    Me.IPBindingSource.EndEdit()
    Me.TableAdapterManager.UpdateAll(Me.ERD_MQPDataSet)

```

```
End Sub
```

```

Public Sub dgvAppearance(ByRef dgv As DataGridView) ' Colors the datagridview
depending on certain parameters and criteria

```

```

    Dim critRed As Integer = 10
    Dim critYellow As Integer = 5
    If (TableName.Equals("Labor")) Then
        critRed = 20
        critYellow = 10
    End If
    dgv.BackgroundColor = Color.White
    dgv.BorderStyle = BorderStyle.None
    dgv.ColumnHeadersDefaultCellStyle.Font = New Font("Arial", 9, FontStyle.Bold)
    dgv.RowHeadersVisible = False
    dgv.RowsDefaultCellStyle.Font = New Font("Arial", 8, FontStyle.Bold)
    dgv.AutoSizeColumnsMode()
    dgv.AutoSize = True
    Dim dgvRow As DataGridViewRow
    For Each dgvRow In dgv.Rows
        If Math.Abs(dgvRow.Cells.Item(4).Value) / dgvRow.Cells.Item(3).Value * 100 >
critRed Then
            dgvRow.DefaultCellStyle.BackColor = Color.Red
        ElseIf Math.Abs(dgvRow.Cells.Item(4).Value) / dgvRow.Cells.Item(3).Value * 100 >
critYellow Then
            dgvRow.DefaultCellStyle.BackColor = Color.Yellow
        Else
            dgvRow.DefaultCellStyle.BackColor = Color.Green
        End If
    Next

```

```
End Sub
```

```
End Class
```

```

Public Class PullDownDataGrid ' the class which inherits from treenode class

```

```
Inherits TreeNode
```

```
' it has a variable to type datagridview
```

```
Private dgv As DataGridView = New DataGridView()
```

```
'set the value of dg
Public Property dg1() As DataGridView
    Get
        Return Me.dg
    End Get
    Set(ByVal value As DataGridView)
        Me.dg = value
    End Set
End Property
```

End Class

Differences in Final system

After viewing the prototype and its documented code it is important to note that the following will be different in the recommended system:

- The system will be built in Hyperion, not Visual Basic
- Hyperion is made by Oracle and will be implemented on an Oracle OLAP Cube (the cube helps with data processing)
- The Common Views tab will be implemented, allowing Business Delivery Vice Presidents to select the most common views of the strategic forecast and time tracking report so that they can view them whenever they log in without having to adjust a pivot table. This can either be customized for each user (recommended at the presentation), or all users can share common views.
- The My Account page will be implemented, allowing the Business Delivery Vice President to change their passwords, as well as edit the business lines that they own. A link to the My Account page will be available on the View Options Menu and every menu after.
- The user will be able to drill down to both the role and employee level to further investigate the labor data.