INDEPENDENT STUDY - EXECUTIVE COURSE SUMMARY
USER DASHBOARD FOR BUSINESS KEY SUCCESS FACTORS

PREPARED BY JODY GILLETTE

As of 7/30/2009
REVISION HISTORY

<table>
<thead>
<tr>
<th>NAME</th>
<th>DATE</th>
<th>VERSION</th>
<th>SUMMARY OF CHANGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jody Gillette</td>
<td>3/25/09</td>
<td>1.0</td>
<td>Set up initial document</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>4/5/09</td>
<td>1.1</td>
<td>Expanded content - business accounting themes</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>4/12/09</td>
<td>1.2</td>
<td>Expanded content – interview results</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>4/17/09</td>
<td>1.3</td>
<td>Expanded content – interview results</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>5/5/09</td>
<td>1.4</td>
<td>Expanded content – human computer interaction themes</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>5/7/09</td>
<td>1.5</td>
<td>Expanded content – business intelligence themes</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>5/8/09</td>
<td>1.6</td>
<td>Expanded content – summarize interview findings</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>5/10/09</td>
<td>1.7</td>
<td>Expanded content – summarize design themes</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>5/15/09</td>
<td>1.8</td>
<td>Expanded content – incorporate professor suggestions (miscellaneous)</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>5/28/09</td>
<td>1.9</td>
<td>Expanded content – architecture design and principles</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>6/2/09</td>
<td>1.10</td>
<td>Expanded content – new direction on architecture design</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>6/3/09</td>
<td>1.12</td>
<td>Make final updates</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>6/15/09</td>
<td>1.13</td>
<td>Expand miscellaneous uncompleted sections</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>6/18/09</td>
<td>1.14</td>
<td>Rework architecture</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>7/1/09</td>
<td>1.15</td>
<td>Complete architecture</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>7/3/09</td>
<td>1.16</td>
<td>Polish; make final updates</td>
</tr>
<tr>
<td>Jody Gillette</td>
<td>7/28/09</td>
<td>1.17</td>
<td>Incorporate feedback – architecture design, intro, conclusion</td>
</tr>
</tbody>
</table>

CONTENTS

About this document 3
Abstract and Process 3
Preparation and Research 4
Investigating a Business Solution 7
Findings 7
Screen Shots of the Prototype 11
Architecture Strategy and Specification 16
Conclusion 20
Appendix 22
Works Cited 31
ABOUT THIS DOCUMENT

IN THIS GUIDE

The contents of this document will focus on the overall strategy, goals and outcomes for an independent study of an accounting informatics solution. It will explain the reasons for its inception (the problem to be solved), the key research and discovery points as a solution is being developed, the features and content required of the end-users, and ultimately a documented design and prototype. Finally, a brief overview of the application, a high-level overview of the technical aspects, and how a user would use the application will be included.

ABSTRACT AND PROCESS

COURSE OBJECTIVE

Whether it’s the high-end analyst or the casual business user, the ability to make informed decisions based on solid data and analysis is critical. In a time when data is plentiful, most users still lack the ability to aggregate the data that is at their disposal, analyze it in terms pertinent to them, report on it, and see the information in a visually-appealing and meaningful way that enables them to make informed and timely decisions.

Informatics, or Business Intelligence, is the ability to empower decision makers to access, analyze, and view information in a form that is valuable to them. Business Intelligence can take many forms, to include: advanced analytics, dashboards and visualizations, queries, reporting, search and navigation functionality, and more.

This independent study will focus on the topic of accounting informatics, the ability to provide decision makers with information on the financial health of their business. This research study will focus on small-size companies, the key financial indicators for the small business stakeholder, a dashboard or similar presentation that meets their needs, and the resulting architecture that supports the dashboard to be built. The work will involve understanding key financial and accounting concepts, meeting with business personnel to understand their requirements, researching HCI design and informatics concepts, designing and mocking up a possible presentation, and recommending an appropriate architecture to support the system.

Guidelines

- Professor Zilora will assist in identifying the interview subjects; Jody will supplement with interview subjects as well.
- Visual representation of indicators must be new or cutting edge.
- Dashboard design must satisfy presenting user’s key financial indicators and reflecting the requirements of the stakeholders.
- An architecture diagram and rationale must be proposed that supports the future system.

Learning Outcomes

- Conduct interviews and research to become conversant in accounting principles.
- Describe current research and practices regarding HCI as it pertains to informatics.
- Design a business intelligence solution.
- Design a supporting architecture.

Deliverables

- Report detailing the results of the research
- Design of a visual representation of key financial indicators
- Recommendation on supporting architecture
APPROACH AND TIMELINE

Work for this independent study will progress generally with the following activities. The information, activities, and discoveries that evolve will be captured in this executive summary, ultimately culminating as a brief journal of the major milestones of work.

<table>
<thead>
<tr>
<th>Week(s)</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>Review business accounting principles. Interview decision makers.</td>
</tr>
<tr>
<td>3-4</td>
<td>Research informatics HCI.</td>
</tr>
<tr>
<td>5-6</td>
<td>Develop possible visualizations and review with decision makers.</td>
</tr>
<tr>
<td>7</td>
<td>Design prototype.</td>
</tr>
<tr>
<td>8-9</td>
<td>Design supporting architecture</td>
</tr>
<tr>
<td>10</td>
<td>Document all.</td>
</tr>
<tr>
<td>11</td>
<td>Submit all deliverables.</td>
</tr>
<tr>
<td>*</td>
<td>Meet with Professor Zilora during agreed upon times to discuss progress.</td>
</tr>
</tbody>
</table>

DELIVERABLE

This document serves as the report-out of the study.

PREPARATION AND RESEARCH

THE REVIEW OF BUSINESS ACCOUNTING PRINCIPLES

This independent study begins with the review of accounting definitions, concepts, and best practices as an important means to understand and relate to the user of financial information. Only highlights of the research that was done will be commented in this report. However, the research was focused with an eye for information and concepts regarding how business owners and users assess and manage financial health, to include:

- Accounting methods (cash accounting method versus accrual method for recording income and expenses) and GAAP – Generally Accepted Accounting Principles
- A company’s use of financial records (e.g. general ledger, profit and loss statement, balance sheet, etc.)
- Key accounting ratios
- Cash flow, cash flow forecasting
- Measuring profitability and business assessment checklists
- Key performance indicators
- Important business elements for representing financial data

Measuring Profitability

Regarding profitability, research revealed that most small businesses are ultimately targeting the growing of profits for their business, and key measures they use typically are:

- **Gross profit margin** – profit made after direct costs of sales are considered
- **Operating margin** - profit made after direct costs of sales and overhead costs are considered. This is also known as the EBIT (earnings before interest and taxes) margin.
- **Net profit margin** - profit made after costs are considered, to include direct and indirect costs, as well as interest and tax payments.
- **Return on capital employed (ROCE)** - net profit as a percentage of the total capital in a business, in order to see how well the money invested in a business is performing compared to investments that could be made.
Other key ratios to note when measuring the performance of a business:

- **Liquidity ratios** – measures the ability to meet short-term financial obligations
- **Efficiency ratios** – measures how well businesses are using available business assets
- **Financial leverage or gearing ratios** – measures how sustainable a business’ exposure to long-term debt is

Cash flow was also deemed to be an important business tool in reviewing the health of the business. Cash flow forecasting allows a business to assess the amount of cash flowing into and out of their business for a given time period. Reviewing cash flow helps a business manage the peaks and valleys of their business, ensuring they have sufficient cash on hand in order to meet financial commitments, plan sales and purchases, and help determine whether financial growth opportunities are prudent.

**Key Performance Indicators (KPI)**

Key Performance Indicators (KPI’s) are quantifiable measurements, tied to a company’s goals that reflect what an organization considers the critical success factors of their business. Key Performance Indicators can be different for each business: A school district may measure graduation rate or the percentage of students that go on to college, while a ice cream shop may base its KPI on return customers or revenue goals. But the use of KPI’s are consistent in that they’re determined in advance, align with the goals of the organization, and are quantifiable so that success can be measured.

**Presenting Business Accounting Information**

Speaking more generally of financial data rather than the host of ratios, indicators, and other measurements that can be taken, it’s important to note that raw accounting data by itself is not alone valuable. The information must be time-bound, available at the right time to provide value in making decisions, reliable, and able to be interpreted with enough context and understanding to accurately assess what the data reveals. It is these important business accounting elements that, taken in concert with the raw data available, will lead to the sound and valuable representation of financial information. Thus, as research is conducted on what information is important to provide in a software/dashboard solution, the following concepts related to the value of data were kept top of mind as important in business accounting analysis:

- **Relevance** in accounting pertains to how useful a bit of information is to a company. The potential uses will depend on the type of company and each company may be looking to learn something different. Accounting information that is relevant has a predictive value that helps the business make sound predictions about the future direction of the market and their company. The information can give valuable feedback as well by confirming theories and examining why events took place.

- **Timeliness** is an aspect of relevance, which deals with having information available to decision makers when that information still has significance to sway the decision. Reliability is determined by how verifiable and accurate the accounting measurement is in the business. The neutrality of information also plays a role in how useful accounting figures are for determining reliability.

- **Verifiability** is a type of double checking the accuracy of calculations. Multiple people or groups will use the same method of calculation and agree that the measurement originally taken is correct. Accuracy is known when all the numbers check out. Accuracy is high when each part of an equation confirms that the answer is correct and it represents the company’s resources.

- **Neutrality** means not worrying about the outcome of the calculations, but concentrating on the information being reliable and relevant. Comparability, which includes consistency, is the third quality that interacts with relevance and reliability to contribute to the usefulness of business accounting as well.

- **Comparability** looks at the similarities and differences of two different companies, markets, or time periods. Information about a particular enterprise is very useful when compared with similar information about other enterprises. It can also be useful to one business for comparison of different time periods. Comparability between enterprises and consistency in the application of methods over time increases the informational value of comparisons of economic opportunities.” (Coffee, 2008)
THE RESEARCH OF INFORMATICS HCI

Research was conducted in the field of Human Computer Interaction (HCI). Specifically, the goals associated with Business Intelligence (BI) for accounting/financial systems or Accounting Informatics, were researched and closely kept in mind through the design and development of a dashboard solution. Concepts top of mind in the development of business dashboards are:

- **A good informatics solution (e.g. dashboard) delivers information quickly.**
  
The dashboard will deliver to business users the information they need to assess the health of their business so they can make timely decisions that course correct. In this regard, its imperative the information be made available quickly in order for the user to make timely decisions that improve business performance.

- **A good accounting informatics solution is able to consolidate financial data from multiple systems to a centralized view.**
  
Business users often maintain a variety of proprietary and third-party systems that house data pertinent to their business. A sound Informatics solution is able to aggregate data from disparate repositories and is able to create a holistic presentation for the user.

- **A robust solution alters the presentation of information catered to different user types.**
  
Whether the user is a VP interested in overall performance or operations information, a sales rep interested in revenue indicators, or a finance user interested in financial indicators, a good Business Intelligence solution is able to customize the view for the needs of different types of stakeholders or provide information in alternate views.

- **The visual displays in place complement the type of information being presented.**
  
The various visual aids implemented in the solution should well match the type of information being served. For example, various chart styles can be used for comparative data displays, gauges can be used for assessments against benchmark, and style and color variations can be used to provide differentiation and clear meaning to results.

- **The system should help interpret results.**
  
Accounting informatics is about serving up information in a way that provides value to the user. A good business intelligence solution goes beyond showing raw data, but rather manipulates financial data to interpret and communicate results. “Tasks should be simple in structure, minimizing the amount of planning or problem solving they require” (Norman, 1988). The use of indicators, alerts, comparisons, showing trends, ranks, and/or relationships all are ways in which raw data becomes meaningful information that a user can review in order to take action that improves performance.

- **The system should be perceived as usable. Create a user-centered design.**

This will be accomplished via contextual inquiry. That is, interviewing (and if possible, observing) target users of the dashboard to be developed in order to help define what the system will do and what their work process is in relation to this dashboard. In this case, a variety of target users will be interviewed to understand requirements and to obtain feedback on the prototype(s) developed. It will also help set context to learn of the target user’s domain.

The design of the dashboard will be driven by the requirements that evolve and not by a particular technology or implementation preferred by the developer.

- **A robust dashboard gives the ability to drill down deeper into information presented.**

A dashboard will provide cursory information and indicators that allow them to make decisions. A more robust Business Intelligence solution offers functionality that permits users to delve deeper into a particular financial topic through additional queries, screens, or reports.
There are a variety of categories of business intelligence tools, to include spreadsheets, dashboards, and a variety of querying/reporting software packages that extract, summarize, and present data to users. An ever-growing business, tools continue to be developed to provide information-rich, visually appealing displays for key business stakeholders to use in evaluating their financial health.

INVESTIGATING A BUSINESS SOLUTION

THE INTERVIEWING OF DECISION MAKERS

Six subjects were interviewed. These individuals were either the owner or key stakeholder (current or former) for small-businesses in Rochester and surrounding areas, providing either services, products, or mixed product/service offerings:

- **Creative Scanning Solutions** – Provides services to include: Teleform solutions to health care companies, conduct secure elections for professional societies, scan/analyze performance data for telecomm companies, custom software.
- **American Red Cross / Local Chapter** – Local chapter of a national not-for-profit but with some profit-bearing products. Provides services for disaster victims, meals on wheels recipients, those needing heating assistance, and various other locally-distributed products and services.
- **Horizon Fun F/X** – Entertainment facility in Greece, NY. Services include roller skating, laser tag, jungle gym, rock-climbing, hosting children’s events (birthdays, etc.). Client base mostly children, with some corporate team-building events.
- **Bob Gillette Enterprise** – Small-business enterprise, consisting of five bowling centers in rural/suburban communities in the Upstate, NY area. Services include open bowling, league play, tournaments, banquet hosting, events and catering, pro-shop supplies. Client base children and adults in the community.
- **Fournier Enterprise** - Small-business enterprise, consisting of nine bowling centers in rural/suburban communities in the Upstate, NY area. Services include open bowling, league play, many large tournaments, banquet hosting, events and catering, pro-shop supplies. Client base children and adults in the community.
- **Northeast Industrial Technologies** – Small-business enterprise, providing the distribution and/or manufacturing of mechanical parts. Client base are manufacturers, maintenance, and reorder clients.

(Worksheets were filled out for all but one of the interviews. These worksheets detail the feedback received during the conversations and are available in Appendix A at the end of this report out.)

FINDINGS

OBSERVATIONS FROM USER INTERVIEWS

General observations

The following are general observations and summary of points that surfaced from the interviews with the small-business owners:

1) Users generally feel their data is not tied together. Different data, often from disparate sources, must be manually tied together or copied from one source to another, in order for them to find value in the information or to draw conclusion from it. Users would like the data fed and displayed to one place for ease in use and viewing.

2) The frequency that stakeholders and users review this information is varied. The indicators primary to their business were generally reviewed anywhere from daily, weekly, or every few week. Secondary indicators were generally reviewed on a weekly, every other week, monthly, or quarterly basis.

3) None of the business stakeholders had any compelling visual aid they used nor cared about, nor did they have strong opinions about what they’d like visually for the future. Virtually all of the subjects used and were happy with simple spreadsheets providing dollar value and percentage outputs. Others suggested very simple visual presentations would be helpful, such as pie charts, graph lines, and stack bars. This suggests that either they have fairly simplistic needs regarding the visual representation of the information they use, or that they don’t know what is possible and need to be shown ideas for possible visualizations they’d like better.
4) Comparison information is quite valuable to the users. The most important comparisons are in (1) comparing information to the benchmark they’ve established and (2) comparing the same information (ratio’s, profit margin, costs) to other timeframes.

5) Users require that information is broken down by relevant categories. For example, they want information by business (how various locations were doing), by service area or product offering (the bar, restaurant, billiards hall, games bowled), the offerings within each product or service area (e.g. within the bar offering, the breakdown of bottled beer, alcohol, and drafts), or within components of the business (e.g. payroll).

6) It would be nice for users if the data visually gave them conclusion or analysis in order to avoid errors or misinterpretations. For example, trend lines that visually show direction would be more valuable than raw data in which the user reviews the individual numbers to come to conclusion on whether it’s an upward, downward, or lateral trend. Similarly, data benchmark information (e.g. a profit ratio) described in a creative visual would be more valuable than calculating on their own.

7) Current systems they use tend to provide pure accounting data. More robust features and functionality would be nice, though they didn’t have specific features in mind.

8) Users felt a fair amount of frustration that they couldn’t easily connect external information to their business and felt strongly that knowing and connecting external information and events with how it would affect their business would be extremely valuable.

9) Users felt some frustration that they didn’t have the ability to collect demographic information for their customers. They felt strongly that they may have been able to alter services or create new offerings had they been able to not only analyze current customers but to see how their clientele was changing.

10) Most users wanted very simple displays. They considered themselves small business and didn’t want cluttered and “fancy” or “busy” software but rather simple visual representations and straightforward presentation of information.

11) A common theme is to translate financial data into simple benchmark information that they used to evaluate the health of the numbers they were reviewing. For example, in the bowling businesses, much was translated to a set target for a single unit of their business, or a bowling game. Thus, net profit from all sources was translated to the net profit per bowling game (for example, one business considers $4.00 per game their target) or a target of 30% net income before taxes. They often translate financial data to a few simple targets that interpret on a frequent basis how they’re doing.

12) For the larger companies with varying levels of management, users have interest in the ability for different views based on whether the leader was from an operational, financial, or sales/marketing viewpoint.

13) Those with various locations would love a “mobile solution” in order to review the day’s numbers while on the road.

14) There’s no one dominant visual solution in the marketplace for the small businessman that a common look and feel would be a strong requirement in a solution. Also, there’s no “dashboard” or simple scorecard solution in place for this market base that they know about. Most of what they have is a mix of proprietary and third-party software for daily inquiry and reporting needs for financial data. The information typically comes from multiple sources.

15) There’s little functionality that converts raw data to information. They do the interpreting and manipulating of this raw data on their own to turn it information that is meaningful and with context.

**Information that users review to gauge the health of their business**

Generally, and excluding the discussion of specific proprietary information that is relevant to them, the most important financial data to these small-business customers is:

<table>
<thead>
<tr>
<th>Revenue</th>
<th>Dollar value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total revenue</td>
<td></td>
</tr>
<tr>
<td>Revenue by relevant categories</td>
<td></td>
</tr>
<tr>
<td>How much of revenue is the best customers (80/20 rule)</td>
<td></td>
</tr>
<tr>
<td>Revenue amount of percentage by main product line (e.g. All sources of income across number of games bowled for day = average $4.00/bowling game gross)</td>
<td></td>
</tr>
</tbody>
</table>

Year to date, by quarter. Ability to compare YTD vs. last year, previous quarters, etc.

<table>
<thead>
<tr>
<th>Inventory</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting and ending physical inventory numbers (e.g. starting/ending shots from Number of units bar poured drinks).</td>
<td></td>
</tr>
</tbody>
</table>

30-60-90 age breakdown would be of interest.
| **Cost of Goods** | • Physical inventory used against how much revenue was made, by category (e.g. beer 72%, alcohol 80%, payroll 25%, locationA 24%, etc.)
• Cost of goods at various times of year or other categorizations (e.g. revenue for man hours: summer 40%, in season 18-19%, snack bar 35%) | Dollar value |
| **Receivables** | Users want to understand the number, dollar amount of invoices, and total outstanding receivables. 30-60-90 age breakdown would be of interest. | Dollar value |
| **Net Profit** | Revenue minus expenses. Total and by relevant categories. As a dollar amount (e.g. all sources of income = $4.00/game) or percentage (e.g. goal 30% net profit for business, rent 10%, utilities 15%, etc.) | Dollar value or percentage |
| **Expenses** | Total expenses, expenses by relevant categories, overhead (electric, cable, etc.) versus other expenses | Dollar value or percentage |
| **Bank Balances** | Checking, savings, transfers | Dollar value |
| **Customer Service Ratings** | Numeric value (1 through 10) obtained through secret shoppers. Overall rating and then by each service area | Numeric rating |

**User “wish-list” items**

Generally (and excluding proprietary information that isn’t being outlined in the report-out), information that users wish they had in managing the health of their company but currently don’t are:

| **External Influences to business** | News alerts or feeds from industry or community to know how their business might be impacted. For example:
• large layoffs of nearby businesses that would affect sales
• customer information that would reveal change in customer demographics that might require new offerings or a change to existing offerings
• information on new product offerings or trends that are emerging (e.g. what are the young people doing for recreation)
• information for new product offerings or trends that are emerging in their own industry(e.g. electric bowling scoring, moonlight bowling, lazer shows, etc.)
• barometer of causes (e.g. sales down last week because of snow storm)
• insights from others in similar roles (e.g. avoiding pitfalls such as too much modernizing that doesn’t generate new business) | News stream |
| **Forecasting or Scenario-Based Information** | Ability to enter different scenarios for potential effect (e.g. could the bowling establishment have created a new revenue source, could they have reduced overhead by using less bowling lanes or closing a section of the building) | Various values |
| **Different Views based on User** | Provide different views based on user groups. For example, ability to select a president’s view (evaluating new sources of revenue), a controller’s review (financial data), a manager’s view (data for daily operations) | Tailored views |
| **Views Available on Handhelds Quick Indicators** | Ability to see information while on the road or at various locations | Various values |
| **Industry news and alerts** | Quick access to basic indicators. Revenue per main product line, quick cost-of-goods calculation, payroll percentages, compared to previous week or month. | Various values |
| **Aging of receivables** | Insights into pitfalls, trends in neighboring businesses or others in the industry. Ability to track the aging of receivables would be valuable (e.g. 30/60/90). The total dollar amount and how many invoices outstanding would be valuable. | News stream |
Sales and Renewal Information related to sales. Most requested was: total sales information, Dollar values
Information how much was renewals, how much of that is the best customer (80/20 rule)
Ordering Information Information related to marketing and ordering (e.g. quotes made to Dollar values
Information customers)

THE DEVELOPMENT OF POSSIBLE VISUALIZATIONS/FEEDBACK ON DESIGN

Themes to pursue in the design:

1) Present different data, from disparate sources, to a common view.
2) Provide a dashboard or scorecard that gives quick, one-stop view of the various key financial indicators of their business.
3) Provide cursory information in a visually-interesting way.
4) Provide a visual means that draws conclusion or provides analysis without the user needing to do it (e.g. generate a trend line that visually shows direction rather than the user having to review numbers to come to conclusion on the direction of the trend, users different colors to show positive/negative/neutral movement).
5) Different types or categorizations of revenue (e.g. various types of revenue, by area) would be valuable. For example, pies or stack bars of various types, by area.
6) Build additional features beyond just review of data.
7) Keep the displays simple.
8) Give them ideas for display. They don’t have exposure to varied products and don’t know what’s possible visually.

Visual considerations said by some of the users:

1) Some type of gauge for profit numbers would be good.
2) Accounting people like graphs. Graph-related is effective.
3) Show various types of revenue, by area, via pie charts or stacks.
4) They don’t need a lot of information and don’t want busy visuals. Keep it simple, simple, simple!

Considerations ultimately left out of scope:

The solution developed was narrowed to a visual aid for understanding the health of a company, with some links to additional information. However, items not incorporated, to include:

- No ordering system
- Aging of receivables
- A scenario-based, interactive element to the application that allows variables to be modified in order to see consequence

PROTOTYPE DESIGN AND THE FINAL SOLUTION

Based on the feedback of the sample of users, a proposed dashboard was designed for small-business stakeholders.

The dashboard provides a variety of the most critical performance indicators that a small-business stakeholder finds valuable in assessing the company’s financial health. It first satisfies the overall question of how the business is doing. It gets information in the hands of small-business executives regarding how the business is running today and whether corrective action is required in any particular area. This message is consistent with the users polled as it has been widely discussed in the need for accounting dashboards for small-business professionals: “The technology is particularly valuable to small companies, since most of them couldn’t afford sophisticated software in the past” (Business Week, 2009)

The dashboard interprets raw data and provides information in visually-interesting ways. For example, meters and gauges translate raw ratios and data and compare it to previously-defined standards for what would be excellent, good, average, fair, or poor performance. The user doesn’t need to interpret the data, and the dashboard does that for him and displays the evaluation in way that is easy to see and take in.
A structure is well defined in advance. The site is organized to reveal to the user what offerings and opportunities the site provides. In addition, units are connected to and relate to other items, so that the user can seamlessly navigate to various locations and tabs to build on the information he extracts from the visit.

Pages are clearly labelled and described simply so that users can easily understand the site’s scope and offerings. Navigation options are also clearly labelled so that a user’s options are readily available and consistent in how they’re presented.

The home screen provides an overall health meter that incorporates the analysis from a variety of predetermined factors (expenses, net income, cost of goods, etc.) and provides an overall financial health assessment. This screen also provides key performance indicators on each of the main categories the small-business owner defines as important to the business. Simple “gas-gauge” style meters offer consistent display. The left pane of the home screen offers the user the ability to click on a link that takes the user to more specific information on the key performance indicator. A variety of screens are available that display more detailed information.

Screens are kept simple, uncluttered, and visually interesting, as has been widely communicated as an important element for the small-business stakeholder.

This dashboard solution easily permits the customization for meeting individual business owner needs and provides only a sampling of the types of information users may want to see. For example, some users may want to see budget vs. actual information for every category (e.g. sales, expenses, cost of goods) or original budget/latest budget estimate/actuals as they progress through the year and provide revisions to forecasts based on internal and economic factors. Others may want to see year-to-year trend lines. Still others may want more categorization information that breaks down actuals without necessarily having budget-to-actual analysis in every view. These customizations can be implemented with each user installation.

**SCREEN SHOTS OF THE PROTOTYPE**

The following are screen samples of a mocked-up dashboard design that fulfils the requirements of these users:

**Screen #1 – Home Page**
Screen #8 – Bank Balances Page

Bank Balances

Chase Manhattan.com
Checking $15,355.87
Savings $65,890.99

CitiBank.com
Mortgage Bal $400,350.76

Screen #9 – News Page

News

Democratandchronicle.com
+ Kodak layoffs in Qtr1
+ Snow expected by weekend
+ Ferry brings tourism to Roch

Bowlersworld.com
+ New scorers a hit in Iowa
+ Candlestick bowling back

USAToday.com
+ Obama budget cuts funds for education
+ U.S. stimulus to save 3.5 million jobs by 2010

RecreationUSA.com
+ Paddle Tennis boom
+ Bluetooth makes laser tag possible
A good architecture strategy needs to support the business strategy and it must explain the technical strategy to be implemented. In this section, the business objectives to be realized will be tied to the architecture design decisions that have been made, as well as to architecture principles. That is, a rationale for why the technical strategy is sound and how the design selected meets the overall business objectives.

**DESIGN CONCEPTS IMPLEMENTED**

A good architecture supports the business model that has been defined, and it provides the roadmap for the technical solution that will be built and implemented. A good architecture for accounting informatics applications will reflect that pertinent business and financial priorities were considered in the design and that sound architecture principles were applied.

Here are some of the many concepts and principles considered as the design and architecture were solidified:

The design for an informatics application can be kept simple. Assuming that the dashboard may grow or change with time, the functions, layers, and integration points are compartmentalized, so that as expansion of the system with existing or new business layers occur, there isn’t a need to rewrite the entire system.

The application was designed in a way that the application would scale in the future. Scalability of the application for its initial implementation likely isn’t a high-priority factor as the dashboard is quite simple. It’s anticipated that a small business with a small number of users and requirements would likely not tax the application. However, scalability may be an issue as the business requirements and robustness of the system increases. Keeping in mind what the needs of the users might be in three or five years, the
application was built in a way where subsequent pages and queries could exist, or where the user could navigate to a place where more business functions were available.

“As the Internet and its related technologies grow, and organizations seek to integrate their systems across departmental and organizational boundaries, a services-based approach to building solutions has evolved.” (MSDN, 2009)

The design proposed is a service-based implementation:

- A service-based solution provides multiple services that are logically grouped by the unique functions they perform. Each service consists of the business logic that must exist and its own data source. Except for the main application that has the user interface, the other services have no user interface directly associated with it and instead are invoked by the main “home” application that is querying for information requested of the user.

- In this model only the home application (and potentially the history service) has the ability to query the individual services directly. The home service requests information, which is returned directly to the home service. Should the business logic of any one service require services or information from another service (e.g. the history service calls each service directly instead of getting information from the home service), that messaging could easily be implemented.

- Each service in this architecture is a standalone service that benefits from the established principles in dividing the system into presentation (as applicable), business, and data tiers. This distributed design groups similar functions in technologies that deliver those functions well and that keep them organized for potential reuse. The thought is that as the application is expanded, a distributed design will better allow for keeping functions and services organized.

- Another key principle is in the separation of functions in tiers to allow for “swap out” of a particular technology as new solutions become attractive. If the user interface needs to be changed, for example because of the need for web access or mobile/pda access, the presentation layer can be swapped with minimal impact to the business tier. Should data access needs change, again a new database management service could be implemented with minimal changes to the data aggregation layer and with no affect on the business or presentation tiers.

- The business logic of the main “home” application in the presentation tier collects information from the other services and determines what view will be returned to the user based on the menu item selected.

Another driving principle in selecting this architecture is that it accommodates the distributed sources of data that are typical of accounting informatics environments. The small business owner in particular lacks an enterprise-wide financial system and instead has financial information distributed in a variety of places (e.g. proprietary systems, excel files, accounting-software databases, etc.). A service-based approach that acquires and processes data from different sources permits the quick update as certain information types are moved to new data sources.

Given the relative simplicity of this informatics solution, the architecture can be quite simple. Additional components that manage complex business workflows or user processes are not necessary.
PROPOSED ARCHITECTURE

Front End

- User Interface
- Reports

Data Acquisition

- BI Customer Analytics Layer
- Data Aggregation Layer

- News
  - Business Layer
- History
  - Business Layer
- Financials
  - Business Layer
- Sales
  - Business Layer
- Bank Balances
  - Business Layer
- Inventory
  - Business Layer
- Customer Service
  - Business Layer

3rd Party Application Systems

- News Feeds
- Accounting System
- Excel
- Sales System
Services

Though not overly complex, this application will require the use of services to communicate with peripheral systems holding data (e.g. the any proprietary financial system, excel files, or tax software database) and mapping data exposed by the service to a format that the dashboard application can work with.

The presentation layer (front end)

For an informatics application, a simple presentation layer will exist to provide users the ability to interact with the dashboard. This will include the ability to interpret what visual display should be presented, display the data to the user, and react to tab and link selections made by the user. In this prototype as an example, overall company health data is be offered in “fuel gauge” display, revenue data in bar chart form, expenses information in line graph form, and more. Code in the presentation layer can also alter the information displayed based on the user role that is selected so that the display can be tailored to the needs of VP roles, sales roles, operations roles, or financial roles. Selections made by the user will invoke the business functions that exist, and return that information for display. If reports are available with the dashboard, they would be part of this layer as well.

The user interface can be implemented as a Windows application. This would permit the user to access information when working offline, to deploy to only those users who will need it (versus as a web application, in which security must be implemented).

The BI customer analytics layer

This layer represents business-intelligence computations, measurements, and tables. Similar to a business layer but focused in fulfilling processing specific to informatics solutions, key business rules in this dashboard might include:

- The interpretation of various pieces of financial data to determine whether it should be categorized as “poor,” “fair,” “average,” “good,” or “excellent” as predefined in the user requirements. This information will be passed to the home service so that it can be displayed in visual form or available for reporting.
- Computational logic for values that may not be available from the source applications, such as the calculation of net profit from all sources, cost of goods from all sources, and revenue percentages across all business units or product lines.

Analysis and calculations specific to this analytics application is possible because information across the business owner’s systems have been consolidated and made available in the data aggregation layer, as discussed below.

The data aggregation layer

In a business intelligence architecture, it’s important to provide a single place to locate, inter-relate, and access aggregate information. Data is often distributed across multiple repositories inconsistently, particularly in a small business, which likely has multiple sources for the data they maintain. The existence of a data aggregation layer addresses the need to have disparate information connected in a way that permits business intelligence and trend analysis across all of the pertinent information, an essential element in providing informatics solutions.

The business layer

Within each service, the business layer will handle the business rules for analyzing data for that particular topical area of the system. This layer purposefully doesn’t contain user interface functionality. The advantage beyond the organization of the function is the flexibility it affords should the presentation of the data changes. Should a new client interface replace the one that is being built, for example to accommodate mobile/pda access or a change to web access, the new presentation layer is built and sits on top of the existing business tier and data acquisition tiers for the main service.

Data repositories (3rd party application systems)
Each application requires a data store. The applications retrieve data that exist in database files, in this case excel files, the customer’s third-party financial system (e.g. Quicken) and any proprietary systems supporting customer data. These repositories supply data to the application, which in turn stores aggregate information for informatics logic.

Again, given the relatively simple data formats being used for this system, a similarly-simple database management system is sufficient.

**Layers not included in this architecture**

A variety of other tiers and functions were considered in the architecture, but were deemed unnecessary given the relative simplicity of the system.

For example, given the simplicity of the information in the dashboard and the limited amount of sensitive data, a component for security was not included. If circumstances change that require authentication or authorization of users or transactions, a component will be added. This component would be kept separate from the other layers.

Given the dashboard is a viewing mechanism only and no order of viewing the various tabs is required, the architecture does not include user workflow components.

**CONCLUSION**

Business Intelligence can take many forms to empower decision makers to access and analyze data, to include providing: advanced analytics, dashboards and visualizations, queries, reporting, search and navigation functionality, the set up of an information infrastructure, and more. A relatively young field of study in general, there is much opportunity still to provide accounting informatics solutions for small-business stakeholders. In particular, there are a couple of key summary questions and many conclusions to be drawn from this particular study:

*Is there a need for an Accounting Informatics Solution for this demographic?*

There is a strong and currently-unmet need for a solution as the small-business stakeholder has many challenges in the area of informatics. It’s been difficult for these users to aggregate the financial data they have, to define it, and to analyze it in ways that help them make timely decisions. Even when financial systems exist for them, these applications don’t deliver information in the way a user wants to see it and usually without the means to customize what analysis is performed. For all of the stakeholders interviewed, most of their important analysis was manually calculated and was reduced to simple ratios and price benchmarks that correlate to financial health. They often don’t have a way to easily consolidate information from disparate sources, which is typical of small-business owners without enterprise-wide systems like their large-company counterparts. They also don’t typically have the requisite technical skills to build what they want on their own, nor do they have resources or funding for custom-built solutions that can continually evolve with their needs and their business. Though certainly business intelligence software solutions are emerging in the marketplace, this particular demographic isn’t aware of what’s available, and when they look into it, they don’t see alternatives for the user who wants simple functionality, uncluttered displays, easily-customizable benchmarks, and a modest price tag.

*What’s the solution?*

In evaluating the software needs this case study has revealed, the solution the small-business owner desires is well within the capacity of the accounting informatics community to deliver. The solution needs to define key financial indicators indicative of those in a small-business setting, focused on accounting and financial ratios of the finance and business-owner mindset, and customizable to capture measurements of a proprietary nature. An accounting informatics solution needn’t (and shouldn’t) be complex, as the information they glean from the data is fairly simplistic (e.g. simple benchmarks and ratios) and their desire is that it be displayed in a simplistic and uncluttered way. Regardless, these indicators need to be something they can define for what makes sense for their business or industry (e.g. cost per game) as these users want to be able to define key performance indicators that are meaningful to them. These key financial indicators also need to be available in a timely manner, often daily or weekly, in order to use the information to make meaningful course corrections that help them keep their business healthy.
Regarding the technology aspect, it’s clear that many small companies are still struggling to incorporate technology in any innovative or sophisticated way. Their needs aren't overly sophisticated, but it’s also clear that small-business users don’t understand what technological solutions are possible and don’t have much in place today to provide a frame of reference. An overwhelming conclusion from this study is that this particular user group isn’t reaping the benefits of technological innovation in the marketplace. On the contrary, most are only exposed and accustomed to working with old-style spreadsheets and financial tables, usually with only the most simplistic of graphs and visual aids. Thus, there’s an incredible opportunity to introduce this user group to visually-interesting, innovative solutions that take the guess work and lack of clarity from their analysis. There’s also great opportunity to connect broad enterprise-wide data that’s never been possible before, providing them information and analysis they haven’t yet had at their fingertips.

As for infrastructure, here again the solution can be relatively simple in order to meet the needs of a well-designed informatics application. This user group isn’t dealing with overly complex or large, distributed architectures that need to service many. The number of physical locations is usually small (from one to a half dozen locations typically), the number of data points from systems are small (e.g. MS-Excel, an accounting or tax product database, cash register systems or other simple repositories), and the number of users may be only the owner of a selected few dealing with the accounting aspects of business. Many times, the need is the application to be available on a single laptop. Thus, an architecture for this type of dashboard solution can be a simple presentation layer, an analytics layer that provides business logic and computation capabilities indicative of a business intelligence system, and an aggregator layer that pulls information from a few disparate sources to allow enterprise-wide analysis capabilities.

Surely one of the bigger challenges in serving this market is not in providing the solution, but in connecting with the user. The small-business owner has an informatics void. But, he isn’t necessarily seeking accounting informatics solutions, doesn’t know they are emerging, doesn’t know what’s technologically possible, and isn’t thinking about product features far beyond what Microsoft Excel, their accounting system, or their tax product currently offer them. Thus, one of the challenges going forward is in articulating this need for them and illuminating the void, and better yet finding a marketing and advertising strategy that reaches this audience, and let’s them know there are reasonably-priced products available to help.

In summary, there is an incredible voic to be filled in accounting informatics to help stakeholders evaluate their business and tackle real-world financial challenges. This independent study has presented one accounting informatics solution aimed at one user group in the market. Yet many more solutions can ultimately be developed for business users of all kinds in helping to assess key performance indicators. The takeaway is in the realization that there is grand need for the small-business user of financial data, there is currently missing or underdeveloped solutions in the marketplace, and great challenges that an accounting informatics approach can help tackle. Lastly, there will be the challenge for the industry in communicating with this market, and finding ways to connect with them to build and sell alternatives for use.
Appendix A
Interview Worksheets

Worksheets have been removed from the public copy of this document.
WORKS CITED


