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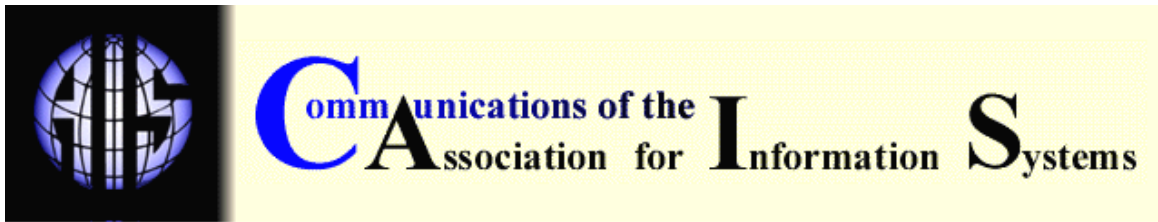
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INNOVATION IN INFORMATION SYSTEMS EDUCATION-IV MUTUAL FUND MANAGEMENT INFORMATION SYSTEM: AN INTEGRATED PROJECT FOR THE INTRODUCTION TO MIS COURSE

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ABSTRACT

Business students often find it difficult to understand the relevance of the traditional core MIS course taught as part of most business curricula. To address this problem, we made several changes to how we teach IS to business students. One of those changes consists of using cross-course projects that require the application of IS tools and concepts. This article explains one such project that is jointly assigned in an IS course and in a Finance course. In this project, students apply their understanding of financial markets and investments by selecting a set of company stocks that they then manage as a mutual fund. They must build an information system both to track their fund performance and to allow entering of buy and sell transactions. The project is popular among the students, and it reinforces numerous IS concepts and skills.

Keywords: Curriculum, course integration, student projects

Editor's Note: The article is one of the prize winning papers in the AIS 2004 Innovations in IS Education competition chaired by AIS Vice President M. Lynne Markus. An overview of the competition is presented in CAIS Volume 15, Article 16, February, 2005.

I. INTRODUCTION

Like many IS departments, our core (taken by all business majors) MIS course generally was not well accepted by students. The content of this course most closely followed IS 2002.1 from the 2002 model curriculum [Gorgone, et al., 2002], and included such topics as basic organizational and strategic uses of IS and brief overviews of various technologies such as networks and databases. One of the major reasons for this dissatisfaction is that students don't seem to see the

relevance of the content. Because many students take the course early in their junior year, they do not yet view business broadly either operationally or strategically. In addition, although students come into the course with a basic understanding of how to use technology to solve problems by using personal productivity software, it is difficult to build on those skills while simultaneously providing the students with an understanding of the organizational uses of IT.

In the article, "What Every Business Student Should Know About Information Systems" [Ives, et. al., 2002], the authors make the case that "tools expertise" is only "tangentially related to the strategic role that information systems play in organizations today." [Ives et al., 2002, p. 470]. The authors then go on to recommend that certain core concepts related to the use, development, and management of information systems be part of the core business curriculum. They describe the ten specific key information systems concepts that they recommend be taught to every business student:

1. What are information systems?
2. How do information systems influence organizational competitiveness?
3. Why have databases become so important to modern organizations?
4. Why are technology infrastructures so important to modern organizations?
5. What is the role of the Internet and networking technology in modern organizations?
6. What are the unique economics of information systems?
7. How do information systems enable organizational processes?
8. How do organizations develop, acquire and implement information systems?
9. What is the nature of IS management?
10. What ethical, legal, and security issues do organizations face when using information systems?

In 2003 we redesigned our curriculum to resolve the disparity between students' lack of ability and desire to learn these topics and our desire to help them understand the importance of these topics and to teach them effectively. The new curriculum includes three separate IS courses offered in sequence.

1. First, students take a course focused on building intermediate and advanced spreadsheet and database skills that build on the basic spreadsheet skills gained in the introductory accounting courses. Students see value in gaining these skills, and our colleagues in other departments also feel that this course adds value to the College of Business core curriculum.
2. We designed a second course to focus on all but concepts two, six, and nine listed above. However, this course is not just lecture-based. It includes a significant group semester project that requires students to build a system to manage a financial investment business. This project is described in detail in this paper.
3. Our third IS course focuses on the strategic implications of IS; namely, concepts two, six, and nine above.

We found this three-course sequence (a total of eight semester credit hours) to be a particularly effective way to teach IS content; focus on writing, presentation, group, and problem-solving skills; and provide opportunities for integrating content from other business courses. To demonstrate the integrative, skills-oriented nature of this new curriculum, this article focuses on the group project required in the second course in the sequence. This project accomplishes several objectives. Here we focus on the objectives most related to IS content and integration with other core business courses. Specifically, this project:

1. builds on the technology skills acquired earlier, including understanding which tools are best suited to particular tasks
2. reinforces content learned in other core (non-IS) courses, and builds on the students enthusiasm for learning more about financial investments
3. provides a context for understanding why databases are important to organizational functions
4. reinforces students' understanding of how systems enable organizational processes through the use of transaction processing systems and management information systems (the project requires both),
5. provides a contextual introduction to the systems development process, where the students use systems development processes, rather than just study them as abstract concepts, and
6. allows the students to learn more about the IT industry.

II. PROJECT DESCRIPTION

While system development projects are most common in courses generally taken only by IS majors (e.g., systems analysis and design), general business students are certainly capable of building small systems using personal productivity tools. However, when we began looking for a project that would accomplish the above objectives, we realized that it was difficult to find a context that was both rich enough and motivating enough for the students to encourage a high level of engagement in the process. Unlike IS majors, most of these students are not intrinsically interested in building systems.

At our university, one of our two core finance courses focuses at least partially on the operation of investment markets. As part of that course, it is common for students to develop and manage a "virtual stock portfolio," using fictitious capital given to each student. Virtual stock exchanges are available online to support these projects¹. Most students are quite enthusiastic about this project, as the virtual exchanges allow students to compete with their classmates for maximum returns. We decided to use this enthusiasm to our advantage by placing our project in the context of an investment project. Because our curriculum is designed such that students are taking both the Finance course and the MIS course in the same semester, it is relatively easy to coordinate the project across the two courses. However, the project could easily be modified to fit other curricula by simplifying the financial analysis required.

The project requires students to play various roles. They play the role of financial analysts by creating a portfolio of stocks (which we then call a mutual fund). They also play the role of a mutual fund manager, making decisions about what stocks to buy and sell. As part of this role, they also must ensure that they can provide relevant fund performance information to their customers. Finally, they play the role of a systems developer that must provide the information system required to process fund transactions and track performance.

In the first part of the project, the students conduct an analysis of a publicly traded firm. They can either choose from a list generated by the instructor, or be given the freedom to generate their own ideas. One of our objectives is for the students to learn more about the IT industry, so we focus them on companies in this sector. The students' analysis is conducted using the skills acquired in their finance course, and must include a recommendation to either buy or not buy the firm's stock.

Once the students submit their analyses and recommendations, the course instructor then builds a mutual fund based on the recommendations from the class. Allocation decisions are based on the strength of the "buy" recommendations. We also form groups of three to four students that will

¹ For example, at www.vse.com. Appendix IV lists others

work together on the rest of the project, although this work could certainly be done as an individual project.

Students are then informed of the financial details, such as the number of shares purchased and purchase price. In our case, we purchased the stocks in the virtual stock exchange, which both reflects real market prices and provides the students with an easy way to see the initial portfolio.

With the mutual fund in place, the students assume the role of mutual fund manager. Because in our situation the project spans both the finance and MIS course, the finance professor spends part of a class session leading the students through a discussion of what information is required to manage a mutual fund. Realistically, much of the information needed is forward-looking (e.g., economic issues) and unstructured (e.g., from news services, analysts). However, the students must focus on the necessary current and historical stock performance issues. This type of information, of course, is much more structured and feasible for building an information system. The data we ask the students to track can be seen in Appendix I.

This discussion serves as the basis for a set of information requirements for their system. One requirement is that their systems should be able to report the status of the mutual fund at the end of every day. This requirement implies that daily stock prices must be entered in the system (see Appendix IV for stock quote sources). Another important requirement that should arise at this time is the need to allow for the buying and selling of stocks. This component is important to the project because students must create a system that both processes transactions (TPS) and provides management information (MIS). We found it useful to give the students a week or two to work on their systems, then to devote a class period where groups share their designs with others. The students find this process to be a particularly enlightening experience because they obtain ideas from a wide variety of approaches. It also provides an excellent opportunity to discuss user interface issues.

Prototyping and Rapid Application Development are discussed as part of the topic on the systems development process. To reinforce these concepts, we ask students to turn in a second version of their system after obtaining feedback on the first version.

While the groups are developing their systems, they also must manage their mutual fund. Although the groups all started with the same portfolio in their fund, they are able to buy and sell stocks to improve their fund's performance. Each group must make a minimum number of trades, although there is no maximum. Trading implies their systems must provide mechanisms for entering transactions, while at the same time tracking historical data. They must, of course, also be able to track ongoing changes in stock prices. Building a system that must serve as both a TPS and an MIS helps reinforce the relationships between these two types of systems.

Finally, the groups make a presentation of their system, explaining its operation and their rationale for the stock trades that they made.

STUDENTS' DEVELOPMENT PROCESS

Numerous "teaching moments" rise to the surface during the course of this project. First and foremost, the students usually experience the difficulty of truly understanding the system's requirements. While they usually produce systems that can produce management information based on static data, they find it difficult to build a system that allows them to enter buy/sell transactions easily. Once they accomplish that, they struggle with the requirement to provide historical data based on the stocks previously held in the fund. These requirements are an excellent way for them to truly experience the difference between a transaction processing system and a system designed to provide management with information for decision-making.

Because the students often begin developing a system focused on analyzing the initial static fund, they tend to use a spreadsheet as their primary tool. However, when they recognize the need to capture transactions and keep historical data, they realize (or should realize) that a

database is a much more appropriate tool to use. This realization is important, as students often find it difficult to recognize the relative merits of personal database management systems and spreadsheets.

III. OUTCOMES

LEARNING OUTCOMES

We are quite pleased with the learning outcomes associated with this project. Much of the learning seems to be a direct result of the students' high level of intrinsic motivation to complete this project. The use of a semi-competitive (students informally compete for the highest returns) project set in a "real world" financial context is appealing to the students. Furthermore, the normal, ongoing changes in the financial markets provide a need to build a system that can interact with its environment. While other projects could require students to build systems capable of processing transactions and creating management information, this project is unique in that the environment of the actual financial markets creates the transactions that need to be entered. Because students actually use their information system to manage their group's mutual fund, they develop a much stronger appreciation for the importance of managing data in a well-designed database, and how information systems are used to support organizational processes.

Also, this project serves as an excellent way to reinforce both technical skills with personal productivity software and to understand when to use which tool. The project is complex enough that students begin to appreciate the value of systems development concepts, such as the need to adequately understand system requirements.

Finally, the project provides a basis for students to practice their individual writing skills, their group/teamwork skills, and their presentation skills.

EVALUATION

To obtain evidence of the effectiveness of this project, students in the first course section to complete the project were asked to answer a short survey. While this survey lacks data from students that did not complete the project for comparison purposes, the results in Table 1 do provide evidence that the students found value in the project.

Table 1. Student Responses

Survey Question	Response Mean (91% response rate)
Projects such as the mutual fund IS (MFIS) that are spread over multiple classes help me better understand the relationships of concepts in each course.	1.32
Developing the MFIS helped me better understand why it is important to carefully define the requirements for a system (i.e., what the system must be capable of doing).	1.41
The industry analysis I conducted helped me understand the factors that affect the attractiveness of a particular industry for purposes of investment.	1.59
Developing a project plan for the MFIS project increased my understanding of how to develop a project plan using Microsoft Project.	2.23
Developing a project plan for MFIS project increased my understanding of how to develop a project scope statement.	2.09
Compared to simply learning about techniques for conducting security analysis, actually conducting an analysis of a particular firm helped me better understand investment analysis techniques.	1.41
I found that seeing how other student groups solved the problem of building their MFIS was valuable.	1.45

1=Strongly Agree, 5=Strongly Disagree

IV. FUTURE CHANGES TO THE PROJECT

While the implementation of this project met with success, we are in the process of improving and expanding the assignment. For the next offering, we plan two significant changes:

1. We plan to introduce the project sooner in the course. When we used the project the first time, the students began working on it at the midpoint of the semester. In the future, we plan to introduce the project within the first few weeks of the term. This timing will allow us to use the project as the motivation for learning some of course concepts, both in the IS course and in the finance course.

2. We plan to introduce a substantial international component to the project. Students will complete a "country report," in which they summarize the investment climate of a foreign country that they will be assigned. Next, they will choose one firm based in that country to include in their mutual fund. They will incorporate that firm's trading data in their mutual fund and make any foreign exchange calculations necessary. The goal of this international component is to encourage students to learn more about the economy of at least one foreign country, and to reinforce their understanding of exchange rate risk. The planned international component is described in Appendix II.

Editor's Note: This article was received on December 29, 2004 and was published on February 24, 2005. It was fully peer reviewed

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- Ives, B., Valacich, J., Watson, R., Zmud, R, et. al. (2002) "What Every Business Student Needs to Know About Information Systems", *Communications of the Association for Information Systems* (9), pp. 467-477

APPENDIX I. ASSIGNMENT MATERIALS

This project consisted of numerous separate assigned tasks given to the students over the course of the entire project. Here they are as they were given in chronological order.

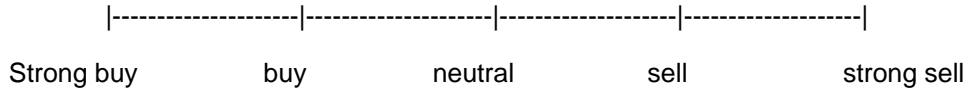
PHASE 1: INDUSTRY ANALYSIS

For this project I am going to assign each of you a technology-related industry to cover. This will allow broad industry coverage and diminish the temptation of collusion. You are to play the role of a stock analyst for a mutual fund company. For your assigned industry, write a summary (not to exceed 750 words) analyzing the industry in a way that would be useful for a mutual fund manager or other investor. Your analysis should describe important trends, events, and even some information from other industry analysts. As objectively as possible, evaluate the various pieces of information that you find. Use the Steps for Better Thinking model to help guide your analysis. You do not have to limit yourself to typical financial industry analysis. Learn about the industry by reviewing a broad range of information, including the popular press (e.g., *Fortune*, *BusinessWeek*), and IT industry publications (e.g., *CIO*, *InformationWeek*, *Computerworld*, *Datamation*, etc.). For at least one of your sources for financial industry information, I highly recommend looking at the Value Line Investment (available in print at the reference desk in the library).

Conclude your analysis with an assessment of how attractive this industry is as an investment target for purposes of long-term growth.

PHASE 2: SECURITY ANALYSIS

Select a stock from your industry. Your stock must be different from other students in the class. Post your chosen stock on WebCT in the CIS 300 discussion area. Stocks will be assigned on a first-come, first-served basis. Assess the stock’s attractiveness for investment (long-term growth), still playing the role of a stock analyst working for a mutual fund management company. Use whatever means for completing this assessment that you feel are appropriate. Summarize your analysis (less than 1,000 words), and conclude with a recommendation based on the following scale:



Once again, use the Steps for Better Thinking model to help you develop an objective, well-balanced assessment and conclusion.

Below are listed the industries and your assignments:

Industry Title	Examples of Companies in the Industry
Computers/Peripherals	Dell, EMC
Computer Software/Services	Accenture, Adobe Systems
Electronics	JDS Uniphase, Cubic Corp
Foreign Electronics	Canon, Fuji, Sony
Internet	Amazon, eBay, VeriSign
Semiconductor	Cirrus Logic, Intel
Semiconductor Equipment	Teradyne, Applied Materials
Telecom Equipment	Lucent, Scientific-Atlanta
Telecom Services	AT&T, Sprint, Verizon
Wireless Networking	Handspring, Palm

After students turn in their analyses, the “mutual fund” (i.e. portfolio of stocks) was formed, using a virtual account of \$1 million. Allocations to the various stocks are made based on the strength of the students’ recommendations. Student groups are then formed, and all groups were given the same spreadsheet showing the stocks that were purchased. Below is a partial printout of this spreadsheet:

Symbol	Company	Industry	Shares	Price	Date	ValueOf Shares
DELL	Dell	Computers/Peripherals	1480	35.63	4/9/2004	\$52,732.40
ACN	Accenture	Computer Software/Services	400	25.24	4/9/2004	\$10,096.00
MOLX	Molex	Electronics	330	32.45	4/9/2004	\$10,708.50
CAJ	Canon (CAJ)	Foreign Electronics	1160	51.8	4/9/2004	\$60,088.00
NVDA	NVIDIA	Semiconductor	2270	26.74	4/9/2004	\$60,699.80
NVLS	Novellus	Telecom Equipment	1580	34.37	4/9/2004	\$54,304.60
PCS	Sprint	Telecom Services	1080	9.71	4/9/2004	\$10,486.80

Next, an in-class discussion is used as a way to relate the systems development life cycle to this project. The outcome of this discussion is a basic description of the project in the form of a project scope statement. It includes the following:

Scope Statement and Project Objectives

Develop an information system that provides information to assist the mutual fund managers in making decisions regarding the allocation of funds. This should include:

- the current status of the mutual fund
 - asset allocation
 - current Net Asset Value
- Factors affecting future equity values
 - News about the companies held in the fund
 - Analyst reports about the companies held in the fund

Deliverables

- Specifications
- Project plan
- Logical design
- Design of business processes required to update system (enter transactions)
- First prototype
- Operational prototype

Milestones

- submit project plan for review by user
- project plan approval
- submission and approval of requirements specification
- design specifications
- prototype one
- prototype two

- final version

Technical requirements

- user must be able to view information on his computer
- must use application software that is commonly available (MS Office)

Limits and exclusions

- project does not include formal feasibility analysis (feasibility assumed)
- does not include individual stock performance history
- System does not require “automated” data entry (but may include this feature).

Next, an in-class discussion is used to brainstorm the information requirements for the system. This is where the students’ understanding of financial data and markets is useful. They typically come up with more information than they can supply with their system, given the time constraints. This is an excellent opportunity for a short lecture on managing the scope of a project, and to remind them that they can start with a simple system for their first prototype and then add functionality later.

After this discussion, we develop a list of information requirements that typically includes the following:

Requirements for First Version of MFIS

We will use a prototyping approach to develop the Mutual Fund Information System (MFIS). The first version to be submitted for review should focus only on information related to the current status of the mutual fund. Specifically, Version One must provide the following information:

Individual Stock Info

- Name of company
- Number of shares
- Market price (end of prior day)
- Total dollar value of shares of this company

Fund Info

- Total fund value (end of prior day)
- Industry allocation (end of prior day)
- Allocation by individual company (end of prior day)

Transactions

- Daily updates to stock prices (closing prices)
- Ability to buy and sell new stocks, increase or decrease holdings of existing stocks.

After a week or so, the groups submit their first prototypes. We use a class session for the some of the groups to give a short demonstration of their systems. They seem to really enjoy this, as they get to see what approaches other groups used.

Then, students begin working on the second version of the prototype.

Requirements for Second Version of MFIS

Version One of MFIS focused on providing some critical current data. Version Two begins to track performance over time. This means that historical data must be captured in the system and used in various calculations.

Version Two must provide the following information:

- Total return since fund inception (in percent)
- Total return since a particular date (in percent)
- Growth of \$10,000 since fund inception
- Growth of \$10,000 since a particular date
- Comparison of the TECC Mutual Fund performance to at least one market index

Once they realize that they have to track historical performance information (they were told earlier, but it really sinks in now) they realize that this is rather complex, given the dynamic nature of the mutual fund. Some groups that used a spreadsheet to build their initial prototype now realize that tracking historical information would be much easier if a database is used.

Finally, each group makes a fifteen minute presentation, describing both the operation of their system and the process they used to develop it. Below is a copy of the presentation assignment.

Presentation Assignment

Each group will present an overview of the project. The presentation should last 20-25 minutes. There will also be a question and answer period. Group members should each present for approximately the same time (approximately five to six minutes). You may organize the presentation however you feel is appropriate, but you must cover the following issues:

Explanation of how the system works

- Where did the inputs come from?
- What tools did you use?
- How will the user access the information?
- What limitations did you find with the tools you selected? How did you overcome those limitations?
- How would you change the system design, and why?

Group dynamics

- Did you avoid "groupthink"? If so, how?
- Did you pay attention to participation levels (e.g., low or non-participants, dominant members, etc.) and how did they deal with them?
- How, if at all, did you use confrontation/conflict resolution skills to deal with problems such as freeloaders, dominators, tangents, etc?
- How did you employ electronic communications to facilitate group interaction (e-mail, message boards, etc.)

Project management

- How did you organize the work? What tasks/roles were assigned to which members?
- How well did you estimate the work required?

- What surprises were there?

APPENDIX II. INTERNATIONALIZING THE PROJECT²

In addition to the technology-oriented industry you are assigned for the project, you will also be assigned a country or region. For your country/region, report on the following:

Country Report

Write a one-page report on the investment climate in your assigned country. You should include information on items such as economic trends, currency issues, and comparative advantages in technology, education, and labor costs. You should also describe the major firms located in the country. What are the advantages and disadvantages of international investing?

Foreign Firm Selection

Select a firm from your country/region for inclusion in the mutual fund. Describe the various ways that shares of a foreign firm are available for investment (e.g. the firm is listed on the NYSE, the firm has an American Depository Receipt (ADR) listed in the U.S., or the firm is listed on a foreign exchange). A very useful resource is the brochure *International Investing* by the U.S. Securities and Exchange Commission. Describe the advantages and disadvantages of these listing differences and what they mean to a U.S.-based investor. How are shares of your company listed?

Foreign Stock Tracking

Include the firm in your mutual fund. When necessary, include the appropriate exchange rate conversion to the firm's stock price. What are the major stock indexes used in tracking the performance of foreign firms? Which index would be most appropriate for your firm?

APPENDIX III. SAMPLE PROJECT

This Appendix shows screenshots from a sample project. They are shown on the next page.

² This Appendix presents the handouts planned for future projects.

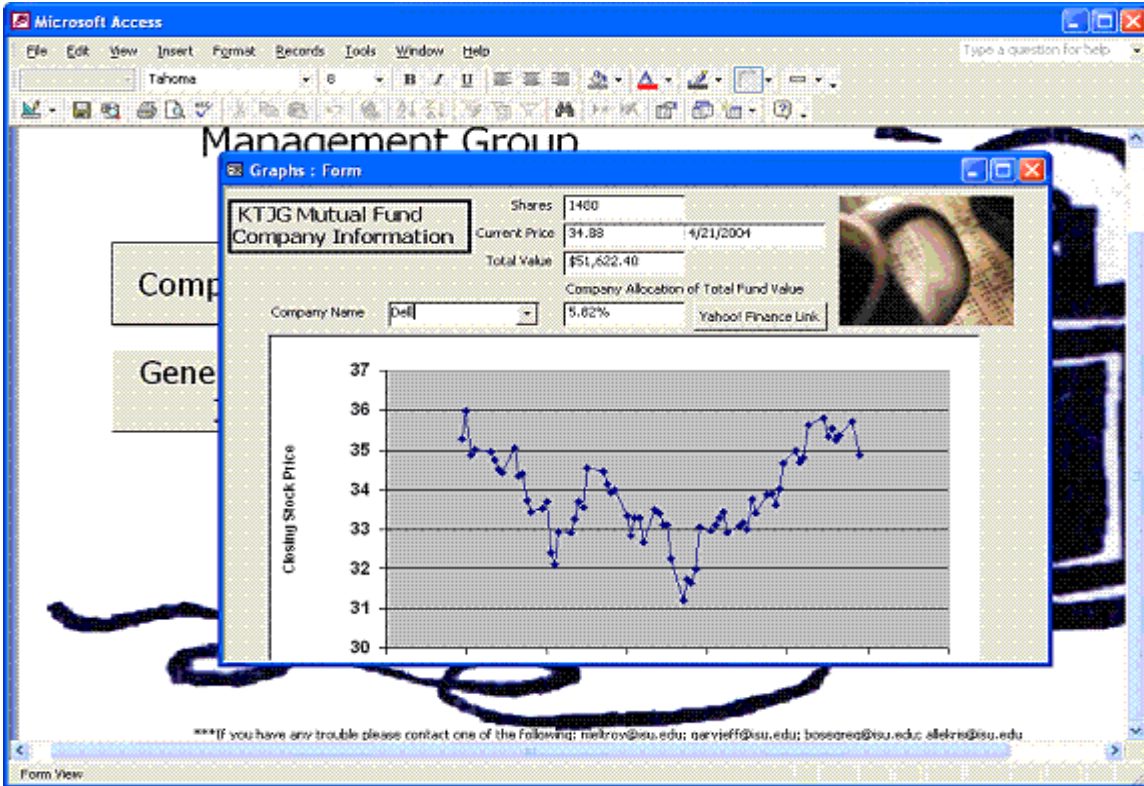


Figure 1. Individual Stock Information

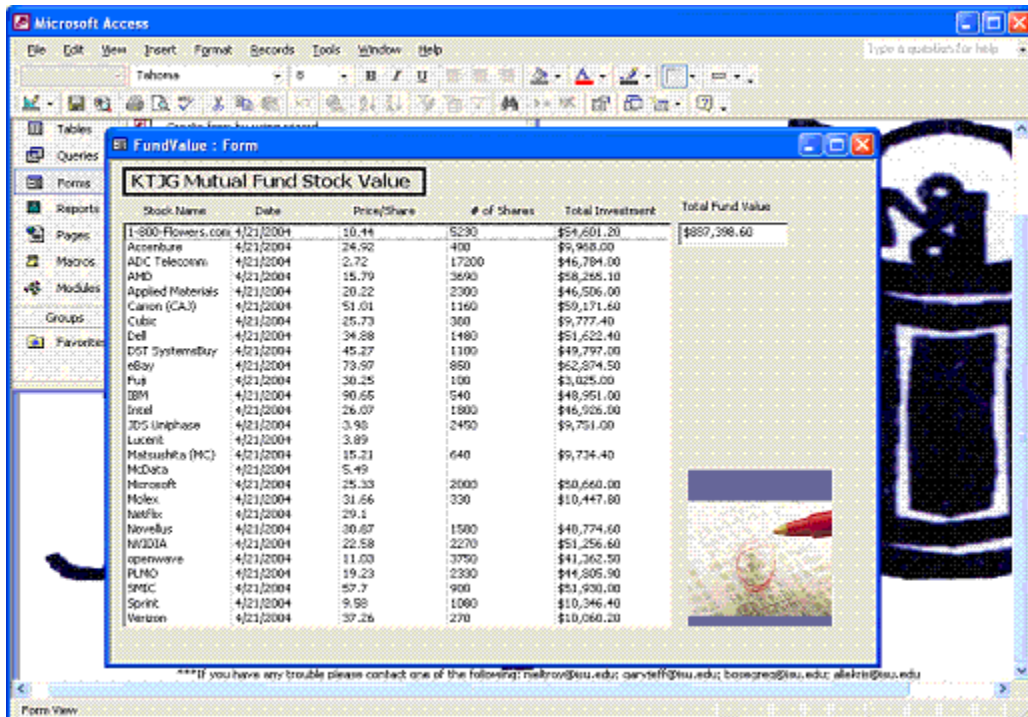


Figure 2. Stock Value

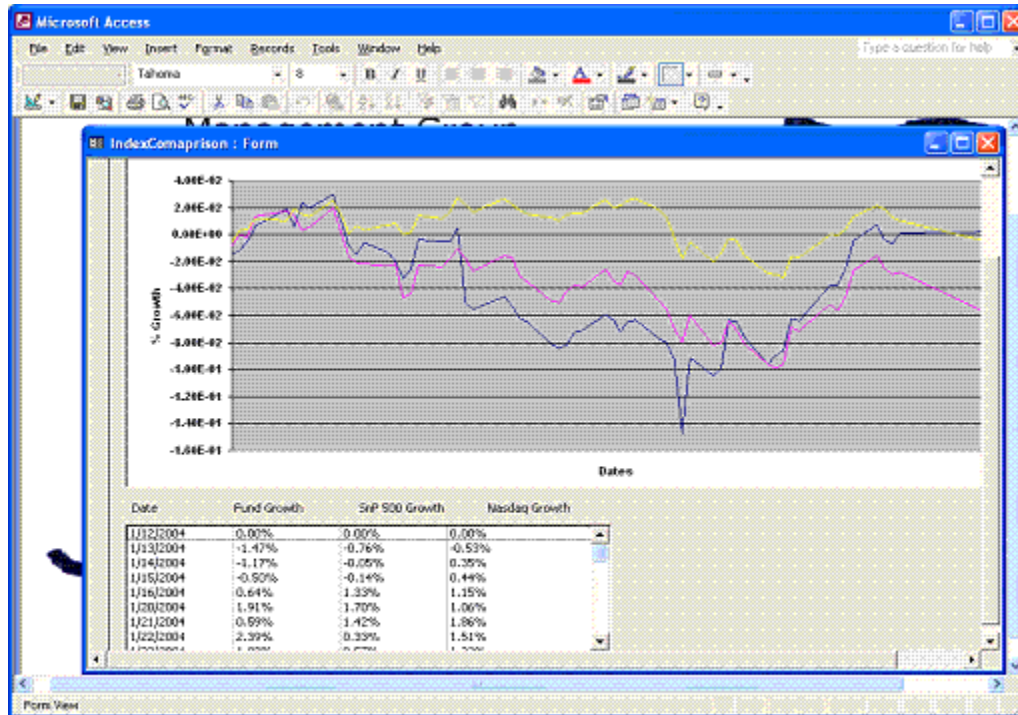


Figure 3. Comparison of Fund Performance versus Various Indexes.

APPENDIX IV. RESOURCES FOR INVESTMENTS PROJECT

Included in this exhibit are links to various resources to support this project.

ONLINE TRADING SITES

Stock-Trak: <http://www.stocktrak.com/>
 Virtual Stock Exchange: <http://game.marketwatch.com/Home/default.asp>
 The Stock Market Game: <http://www.smgww.org/>

FINANCIAL INVESTMENT SITES

Yahoo Finance: <http://finance.yahoo.com/>
 Hoovers Online: <http://premium.hoovers.com/subscribe/>
 Reuters: <http://www.investor.reuters.com/StockEntry.aspx?target=/stocks>
 Motley Fool: <http://www.fool.com/>

ADDITIONAL RESOURCES

- [American Association of Individual Investors](http://www.aaii.org/) - <http://www.aaii.org/>
- [Analyst Watch](http://aw.zacks.com/), Zacks Investment Research - <http://aw.zacks.com/>
- [Annual Reports](http://www.prars.com/), The Public Register - <http://www.prars.com/>
- [Annual Reports On-Line](http://www.annualreportservice.com/), The Public Register - <http://www.annualreportservice.com/>
- [Bloomberg](http://www.bloomberg.com/welcome.html) - <http://www.bloomberg.com/welcome.html>
- [BobBrinker.com](http://www.bobbrinker.com/index.asp) - <http://www.bobbrinker.com/index.asp>
- [Broker Reports](http://www.nordby.com/reports.asp), Nordby - <http://www.nordby.com/reports.asp>
- [Dow Jones Indexes](http://averages.dowjones.com/) - <http://averages.dowjones.com/>
- [EDGAR](http://www.sec.gov/edgarhp.htm) - <http://www.sec.gov/edgarhp.htm>

- [Financial Engines](http://www.sec.gov/edgarhp.htm) - <http://www.sec.gov/edgarhp.htm>
- [Industry Watch](http://cnfn.news-real.com/), CNNfn - <http://cnfn.news-real.com/>
- [Inside Wall Street](http://www.insidewallstreet.com/) - <http://www.insidewallstreet.com/>
- [The Internet Analyst](http://www.theinternetanalyst.com/) - <http://www.theinternetanalyst.com/>
- [InvestorGuide.com](http://www.investorguide.com/) - <http://www.investorguide.com/>
- [Investor Home](http://www.investorhome.com/), Gary Karz - <http://www.investorhome.com/>
- [The Motley Fool](http://www.fool.com/) - <http://www.fool.com/>
- [Multex Investor](http://multexinvestornetwork.com/) - <http://multexinvestornetwork.com/>
- [Quote Com](http://www.quote.com/) - <http://www.quote.com/>
- [Standard & Poor's Equity Investor Services](http://www.stockinfo.standardpoor.com/) - <http://www.stockinfo.standardpoor.com/>
- [Stockplayer](http://www.stockplayer.com/), a stock market information directory - <http://www.stockplayer.com/>
- [The Street.com](http://www.thestreet.com/) - <http://www.thestreet.com/>
- [Zacks Investment Research](http://www1.zacks.com/) - <http://www1.zacks.com/>

International Investing Resources

Securities and Exchange Commission brochure on international investing:

<http://www.sec.gov/pdf/ininvest.pdf>

Morningstar International Investing Center:

<http://www.morningstar.com/centers/global.html>

International Investing Information from Investor Home:

<http://www.investorhome.com/intl.htm>

CURRENCY CONVERSION SITES

<http://finance.yahoo.com/m3?u>

<http://www.x-rates.com/>

<http://www.xe.com/ucc/>

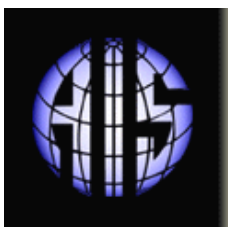
<http://moneycentral.msn.com/investor/market/rates.asp>

ABOUT THE AUTHORS

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