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Designing a Software Application to Implement the Provisions of a New Tax Regulation: A Collaborative Project for CIS and Taxation Students

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ABSTRACT

To establish greater collaboration between faculty members in the computer information systems (CIS) and accounting disciplines, and to enhance student appreciation for the integrated nature of the disciplines, an assignment is designed that allows a student from a systems analysis and design course to partner with a student from an introductory federal income taxation course. After retrieving Internal Revenue Service (IRS) Publication 600 from the IRS website, student teams are expected to design and implement a software application to incorporate the language, worksheet, and tables included within the publication. Test data is supplied to help student teams determine the success of their programming efforts. Links to sample C++ and VB.Net program solutions are also provided.

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1. PROJECT RELEVANCE

Upon graduation, students with degrees in CIS and accounting will frequently collaborate to design and implement software applications to address various tax and accounting needs, often associated with new accounting standards or tax regulations. Successful collaboration will typically involve several interviews between systems analyst/programmer and accountant to ascertain requirements and to develop the design. Project success will often hinge on the effectiveness of communication and teamwork between the systems analyst/programmer (CIS professional) and accountant. As Ferguson (2005) has noted, employers of entry-level application developers highly and increasingly value teamwork and communi-

cation skills, as well as real-world experiences. Similarly, many studies point to the value of teamwork and collaboration for students in accounting (Palmer and Ziegenfuss 2004; Beresford 2004; Meade 2002).

The primary purpose of the assignment is for CIS and taxation students to collaborate to design, build, and test a software solution to implement the provisions of IRS Publication 600. In so doing, the tax student will be challenged to articulate technical tax content in terms that a layperson can understand. The CIS student will have the opportunity to develop an application, albeit on a small scale.

This assignment was developed because it addresses a relatively recent change in the tax code with sufficient complexity to compel close and meaningful interaction between CIS and tax students. More specifically, the project challenges student teams to consider the impact of:

- multiple taxpayer residences
- the effect of various local general sales tax rates
- state and local general sales taxes paid on items specified through Publication 600
- states without state sales tax

2. PROJECT SUMMARY

IRS Publication 600 summarizes an Internal Revenue Code provision governing the deductibility of sales tax as an itemized deduction. In short, the publication describes how taxpayers can "elect to deduct state and local general sales taxes instead of state and local income taxes as an itemized deduction on Schedule A (Form 1040)." Within a classroom assignment, CIS and taxation students will be paired in teams. Each team will analyze Publication 600 and develop a software application to determine whether a taxpayer should deduct state and local sales taxes or state and local income taxes.

3. PROJECT DESCRIPTION FOR THE CIS STUDENT

In preparation for this assignment, CIS students should be required to read Publication 600 prior to meeting with students in an introductory taxation course. In an effort to mirror a real-life business setting, CIS students should prepare a series of questions or points of clarification before meeting with the tax students. The CIS instructor may invite the accounting instructor to explain to CIS students the importance of the new tax regulation and the need to develop a software application to implement its provisions.

Each CIS student is then paired with a student in an introductory taxation course. The taxation students must explain to the CIS students the nature and purpose of Publication 600 and the calculations the program must automate. The meetings between the student teams should simulate face-to-face meetings between a tax accountant and a systems analyst. Tax students must clearly articulate the process and calculations necessary to determine deductions for general sales taxes, including, if any, sales tax connected to various specified items. The CIS student should ask questions that clarify his or her understanding of Publication 600 to ensure that the application correctly handles all taxpayer situations.

Besides working together to define the program mechanics, the student teams will also work collaboratively to design the user interface and data validation requirements. The requirements analysis and design collaborative work might be considered the most important part of this assignment as it gives students the opportunity to work together to develop a solution to a real-world problem. For the project to focus on these key learning objectives, as well as to make the project manageable from a time perspective, instructors are encouraged to provide students with both the 2004 Optional State Sales Tax Tables contained in Publication 600 and state sales tax rate data. A text file containing the 2004 Optional State Sales Tax Tables is available for downloading from http://domin.dom.edu/faculty/jhelwig/Pub600/stateSalesTax.txt and a text file containing state sales tax rates is available at http://domin.dom.edu/faculty/jhelwig/Pub600/states.txt. (State sales tax rate information was obtained from http://www.taxadmin.org/fta/rate/sales.html.)

From a CIS instructor's point of view, this assignment is straightforward – CIS students would work with tax students to analyze, design, and build a software application to implement provisions of Publication 600.

Specifically, the application should accurately determine how much a taxpayer should deduct in sales taxes or income taxes on Line 5 of Schedule A (Form 1040) to maximize itemized deductions. One of the strengths of the assignment is that design decisions are left up to the student teams.

Because this project will require a series of meetings during both the analysis/design and testing phases, the project should be assigned early in the semester and instructors should facilitate team meetings throughout the semester. About two weeks should be allotted for programming and unit testing after the analysis and design has been completed. Student teams should then meet again to perform user testing. Ultimately, teams should present their application solutions to classmates and instructors.

4. PROJECT DESCRIPTION FOR THE TAXATION STUDENT

The accounting instructor should provide time in class to review Publication 600 with taxation students. In addition, he might invite the CIS instructor to class to explain to tax students their role in the systems development process. From the tax student's perspective, this project will provide him or her with the opportunity to actively participate in building a software solution to implement a new provision of the Internal Revenue Code. While the tax student isn't expected to possess the ability to create a software solution, as the content expert, (s)he is nonetheless integral to the success of the project. As such, the tax student would assume the role of a staff accountant. He or she should begin by developing an Excel spreadsheet defining various taxpayer scenarios and their solutions. Through these sample scenarios, the tax student can demonstrate to the CIS student how the deduction amount is derived. The tax student would also work with the CIS student to develop a user interface for the application. After the CIS student completes coding and unit testing, the tax student should be involved in user testing. That is, the tax student would be responsible for verifying application results when applied to a series of 'mock' taxpayers.

5. TESTING APPLICATION ACCURACY THROUGH A COMMON TEST PLAN

Once user testing has been completed, a common test plan should be used to verify the accuracy of program results. Six sample test cases (identified as Taxpayers A – F) with expected results are available for instructors at http://domin.dom.edu/faculty/jhelwig/Pub600/testCases.xls. Each test case represents a unique taxpayer profile. These test cases reflect real world scenarios that a tax preparer might encounter when preparing client tax returns. The data below corresponds to Taxpayer A in the test cases (as highlighted in Excel).

For example, assume the following variable values:

1. Adjusted gross income: $50,000 (Figure1)
2. Nontaxable items: $0 (Figure1)
3. Number of exemptions: 3 (Figure 1)
4. Days lived in New York (NY): 260 or 1/1/2004 – 9/16/2004 (Figure 2)
5. Local general sales tax rate at NY residence: 1.25% (Figure 2)
6. Days lived in Alabama (AL): 106 or 9/17/2004 – 12/31/2004 (Figure 2)
7. Local general sales tax rate at AL residence: 1.5% (Figure 2)
8. General sales taxes on Publication 600 specified items: $2,500 (Figure 3)
9. State and local income taxes: $2,500 (Figure 4)

Based on the above values, the program should instruct the taxpayer to take the sales tax deduction of $3,256.07 to maximize his/her deduction (Figure 5).

6. TEAM PRESENTATIONS

As the final project component, a class session on or after the project due date may be dedicated to presentation of each team's solution. These presentations will encourage students to finish on time and will demonstrate the variety of application designs.

7. PROJECT WRAPUP AND ASSESSMENT

As an initial step, the CIS and accounting instructors may wish to dedicate a class pe-

riod to a roundtable discussion with both CIS and tax students, evaluating the methodologies used to create a viable software program. To enhance student communication skills, both instructors may wish to schedule conferences with their respective students. Within the tax student conferences, the instructor could assess the ability of tax students to explain the provisions of Publication 600 and the strengths and limitations of their solution's design in advance of assigning a final grade. The CIS instructors may require the CIS students to articulate the challenges of working with a "client." The instructors may also request that students reflect on their collaborative efforts by keeping a journal of all team meetings.

Project grades should be based on several factors. While program accuracy when running the common test plan should be evaluated, sensibility of the user interface and design should also be considered. Additionally, instructors should assess the robustness of each team's solution in areas such as error handling and data validation. A final grade component may be based on communication and teamwork, as evidenced through meetings with instructors, roundtable dialogue, presentations, and team effectiveness, to the extent that it can be determined. At the end of the project, both CIS and tax students should receive formal feedback regarding the collaboration and system solution.

8. SAMPLE C++ AND VB.NET CODE AND EXECUTABLES

Sample software executables have been provided using both C++ (http://domin.dom.edu/faculty/jhelwig/Pub600/CplusTaxSoln.exe) and VB.Net (http://domin.dom.edu/faculty/jhelwig/Pub600/VBtaxSoln.exe). Zipped Visual Studio solutions are also provided (http://domin.dom.edu/faculty/jhelwig/Pub600/solutions.zip). Note that instructors must have the .Net framework installed to run the VB.Net program. Both programs assume that the two input files are available in the same directory as the executable under the names "states.txt" and "stateSalesTax.txt".

9. C++ VS. VB.NET

The C++ solution is a console application, whereas the VB solution provides a graphical user interface. Since most application software written today provides a graphical user interface, the VB solution most likely provides the better project direction, particularly in a systems analysis and design course. Also, a Windows application forces students to think through the user interface design. (See Figures 1 - 5 for one possible human-computer interface solution). On the other hand, for CIS instructors looking to give programmers an early exposure to systems development, the C++ console application approach could provide first year programming students a suitable collaborative project. The C++ interface is much more obvious which makes it manageable for less-experienced CIS students.

10. CONCLUSION

Students in CIS need opportunities to practice systems analysis and design in realistic situations. They benefit from listening to a user describe her needs and in working with that user to collaboratively design a solution. Having a smaller system to develop makes analysis, design, implementation and testing possible within the course of a semester. Tax students also benefit from having the opportunity to articulate a tax regulation in terms non-specialists can understand. Additionally, this particular assignment helps tax students develop an appreciation for some of the complexity associated with tax law. Most importantly, this assignment gives students an occasion to work with others outside their discipline to develop a collaborative solution to an interesting contemporary problem.

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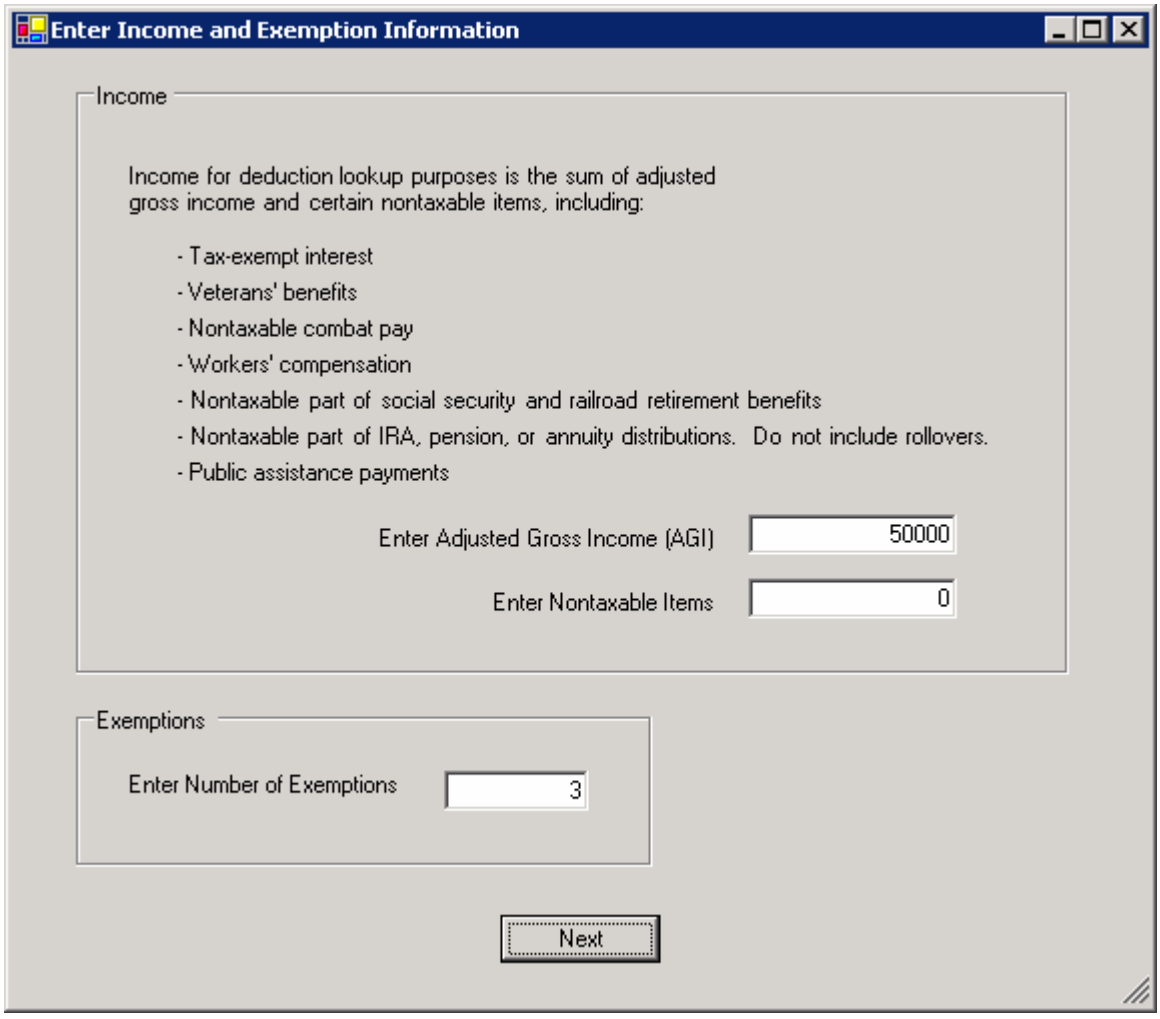

Figure 1 – Enter Income and Exemption Information

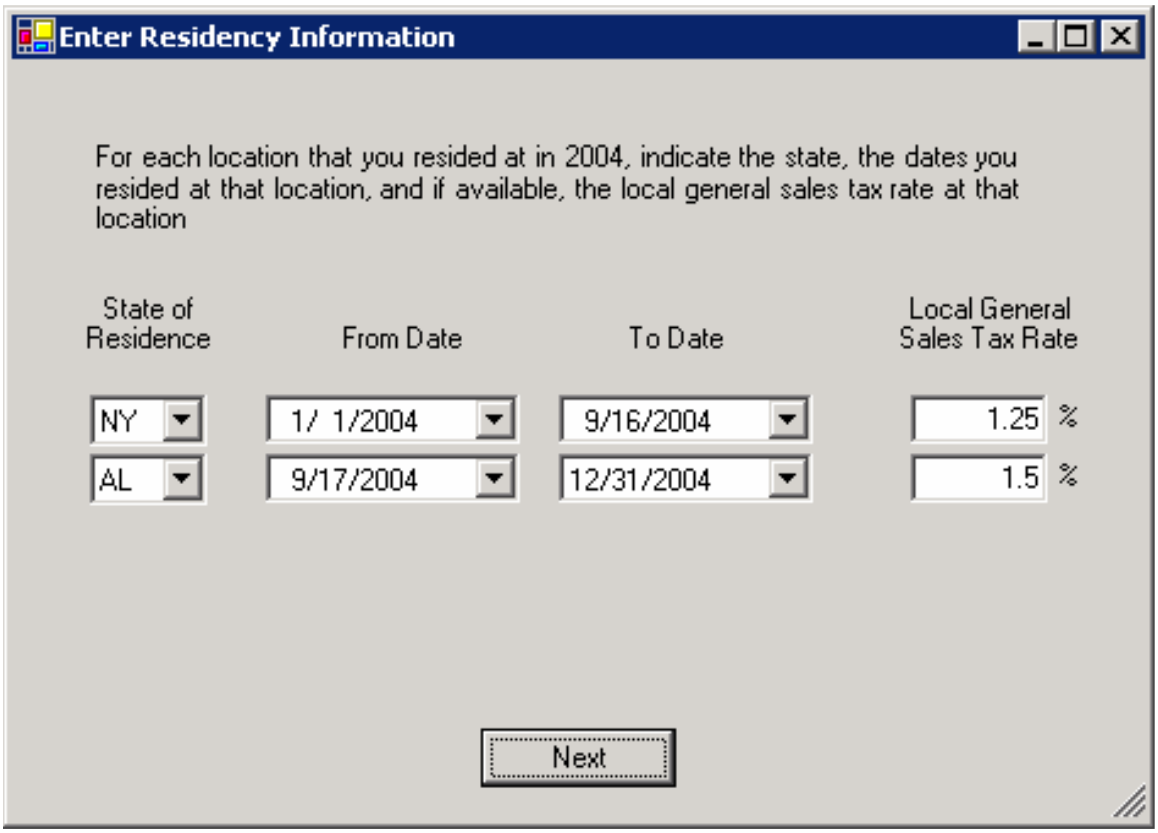

Figure 2 – Enter Residency Information

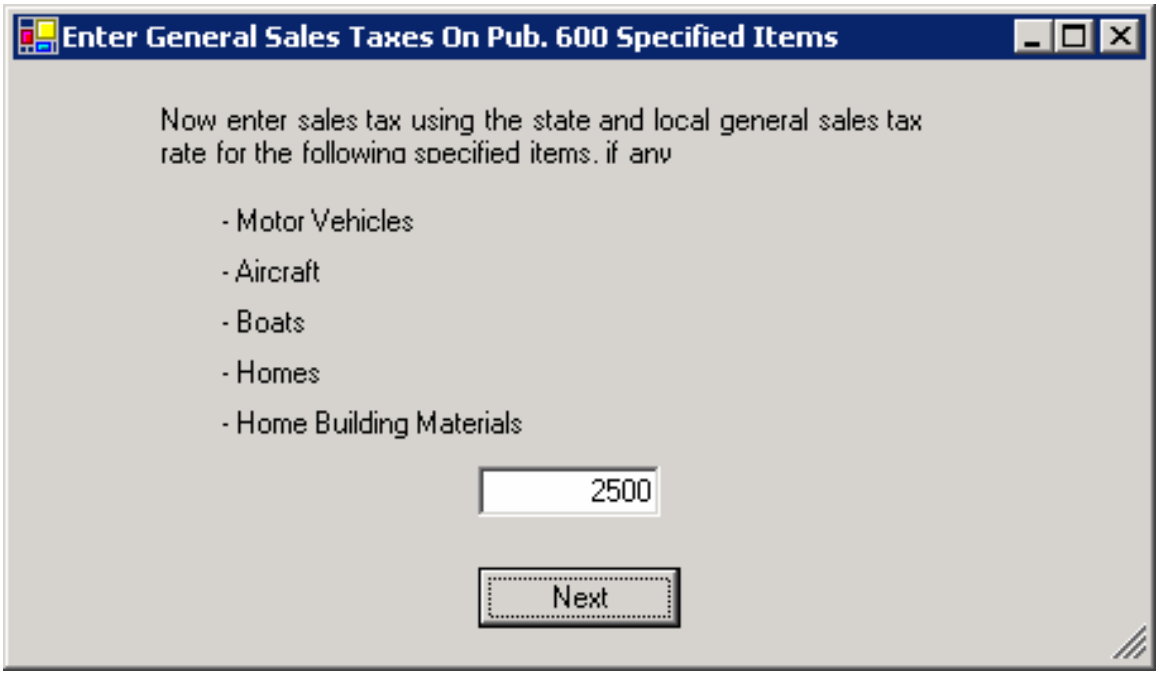

Figure 3 – Enter General Sales Taxes On Pub. 600 Specified Items

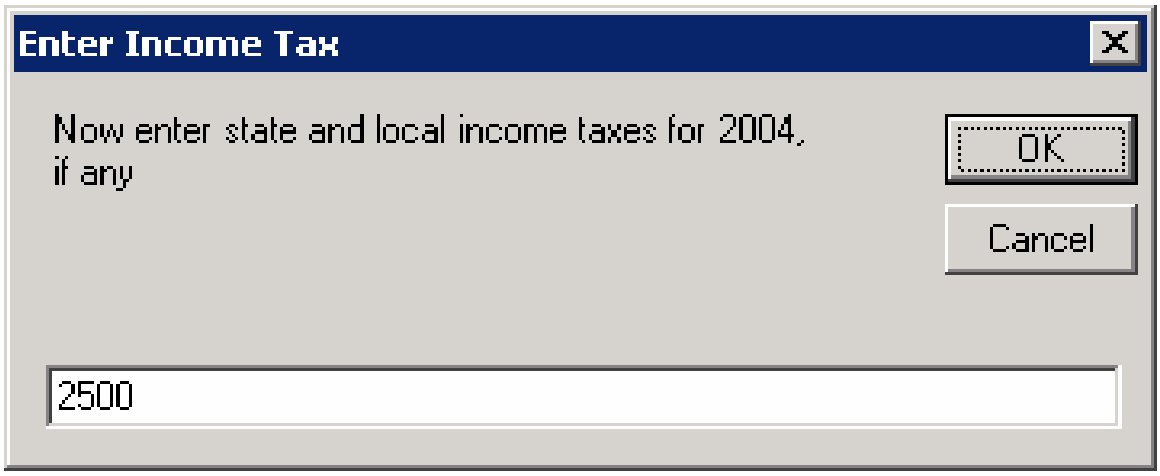

Figure 4 – Enter Income Tax

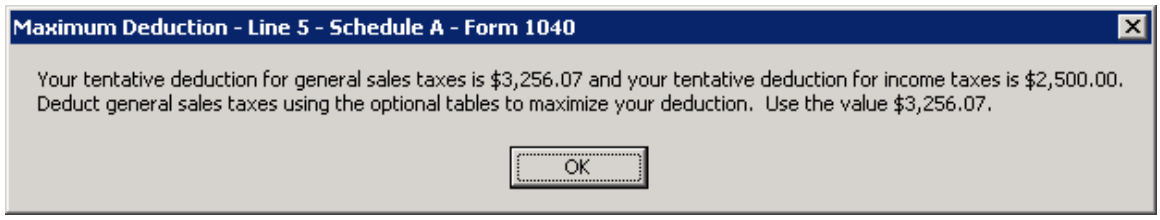

Figure 5 – Maximum Deduction – Line 5 – Schedule A – Form 1040