Communications of the Association for Information Systems

9-25-2005

Lost River Wind Riders: A Project for Teaching Database Design

Kevin R. Parker

Idaho State University, parkerkr@cob.isu.edu

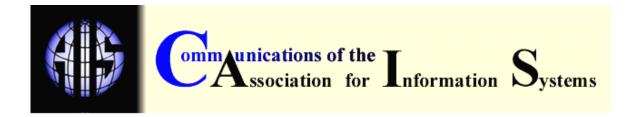Follow this and additional works at: https://aisel.aisnet.org/cais

---

Comm**A**unications of the
Association for **I**nformation **S**ystems

LOST RIVER WIND RIDERS: A PROJECT FOR TEACHING DATABASE DESIGN

Kevin R. Parker
College of Business
Idaho State University
parkerkr@cob.isu.edu

ABSTRACT

Lost River Winder Riders is a project designed to provide students with a challenging hands-on exercise in relational database design. It is extensive enough to provide a stimulating exercise, but not so large as to be overwhelming. This case can be used as an individual or team project in a database design course. It is sufficiently detailed to challenge students as they apply design concepts to a problem that closely simulates a real-world situation.

KEYWORDS: Database design, database management, normalization, entity-relationship diagrams, database project.

Editor's Note: An instructor's guide for this project is available from the author via e-mail. Requestors must be listed in the AIS Faculty Directory (http://www.isfacdir.org/default.htm)

I. PROJECT SUMMARY

Lost River Wind Riders (LRWR) is a free-flight sports shop in central Idaho that specializes in sales and service of hang gliding, paragliding, and snowkiting equipment. The customer base expanded rapidly, with many customers owning multiple pieces of free-flight equipment. With the increasing customer base and sales comes the need for accessing meaningful information rapidly. The company was experiencing problems with inventory control, missing reorder points, and experiencing inventory stock-outs that resulted in lost sales.

Company records are currently maintained using an off-the-shelf accounting program, and additional information is derived using an Excel spreadsheet program. While this use of information systems was sufficient in the company's early days when volume was lower, the rapidly increasing volume of business necessitates better information access and record keeping. Sales history and trends cannot be determined from the current system. The company needs better control of capital by ensuring that needed items are stocked and less popular items are not.

In this project, students use knowledge attained in database design lectures and exercises to develop an entity-relationship diagram that models the system. Using the entities, relationships,

and attributes that make up the E-R diagram, students next determine and specify the relational schema for each relation. Students then normalize each relation. Once normalization is complete and the design is validated, a selected-features prototype of the database is implemented to demonstrate data entry forms, sample queries, advanced multi-table forms for data entry or confirmation, and sample reports. If the database management system supports them, students may also be required to develop stored procedures and triggers.

II. PROJECT DESCRIPTION

Solitude can be found in Idaho's deep gorges, high mountains, swift rivers, and chilly lakes. King Mountain, White Bird Hill, Heaven's Gate, and the Seven Devil Mountains are just a few Idaho locations that are suited for free-flight sports. Lost River Wind Riders (LRWR) is a specialty sports shop in central Idaho that specializes in sales and service of free-flight sports equipment like hang gliders and paragliders. A hang glider is a non-motorized, foot-launched rigid frame maintaining the shape of a wing constructed of rip-stop nylon or Mylar over an aluminum frame, with the pilot suspended in a prone position from a strap connected to the glider's frame. Figure 1 shows a series of photos of hang gliders. A paraglider is a non-motorized, foot-launched inflatable canopy or wing constructed of rip-stop nylon from which the pilot is suspended by sturdy Kevlar lines called risers, and a harness. The pilot sits in a harness for maximum comfort. Figure 2 shows a series of photos of paragliders. Both hang gliders and paragliders soar on currents of air, able to stay aloft for 3 hours or more, climb to elevations up to 15,000 feet, and travel vast distances. Hang gliders offer a "cleaner" aerodynamic profile and generally are capable of flying at much higher speeds than paragliders.

Figure 1. Hang Glider Action Shots

Lost River Wind Riders was founded in 1990. The company was started as a co-operative to allow the owners and a few of their friends to buy top name equipment and accessories for their hang gliding and paragliding hobbies at a reduced price. As more enthusiasts became involved in free-flight sports, the owners saw an opportunity to leverage their hobby into a full time business

Figure 2. Paraglider Action Shots

while still doing what they loved. The market for free-flight sporting equipment in the central Idaho area is booming. Annual sales increased from $20,000 in 1990 to more than $1,200,000 in 2004. Consumer demand drove the company to its present location with a showroom, a warehouse, and a service and repair area. The showroom is a four thousand square foot expanse, allowing sufficient room to examine the various models that are available. The state-of-the-art warehouse features catalogued and indexed parts ready for installation. The service and repair area includes both an indoor and outdoor area, allowing for several repairs to be performed simultaneously. The firm is nestled in a pristine setting with a nearby escarpment that can be used for hang gliding and paragliding takeoffs for those who want to "test drive" the equipment. The company now employs approximately ten people in various capacities including sales, repair and service, management, and general support.

Because free-flight sports are seasonal, Lost River Wind Riders expanded their sales line in 1999. In keeping with the theme of air-reliant vehicles they decided to add snowkiting equipment to their line of offerings to ensure year-round business. Snowkiting is an outdoor winter boardsport that combines the airfoil and techniques used in kitesurfing with the footgear and gliding surface used in snowboarding. Large, highly controllable foils or inflatable kites propel boarders across the snow with just the power of the wind, allowing the snowkiter to travel uphill with ease if the wind is blowing in the right direction. The snowkiting line proved to be a successful complement to the free-flight equipment. Figure 3 shows a series of snowkiting photos.

The company is also considering adding ultralight aircraft to their product line. This move would increase the company's operational complexity because government regulations require specific record keeping for all aeronautical equipment that is sold or serviced. Further, repairs on aeronautical equipment must be performed by technicians with the proper certifications, and replacement parts must be traceable to specific manufacturers. All aircraft are governed by very strict standards to ensure the safety of consumers and passengers. These regulations require parts tracking, service operations tracking, maintenance schedule tracking, etc. Figure 4 shows a series of images of ultralight aircraft.
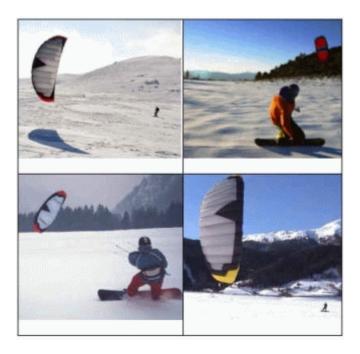
Figure 3: SnowKiting Action Shots

Figure 4: Ultralight Aircraft Images

LRWR's customer base increased, as did customer demand. Many customers now make several purchases and own multiple pieces of free-flight equipment. The company must be able to easily find and identify which parts are needed for repairs by identifying the piece of equipment for which parts are needed. Information such as this must be readily accessible.

Customers want the convenience of a company that keeps customer information on file such as credit cards and address, and can access the information to process new sales orders quickly or provide quick service. The inability to provide this level of customer satisfaction may result in reduced sales as consumers look elsewhere for better service.

Inventory control is problematic without an automated system. Reorder points are being missed and inventory stock-outs occur, resulting in lost sales. Manual systems require substantial record keeping and regular physical inventories to maintain sufficient stock on hand. The owners want to be able to generate a report that indicates not only the items that are below the reorder points, but will also include sales history and trends. This information will allow better control of capital as needed items are purchased and unnecessary or duplicated items are not.

Because they set high goals and standards for their company, the owners are concerned about improving their customer service and equipment sales system. They requested a database that supports the core business requirements of the enterprise. LRWR provides standard retail services for customers through the following business processes:

- Customer purchases equipment

- Customer returns defective/unwanted equipment

- Customer requests equipment service or maintenance

LRWR needs additional "back office" services to support business requirements:

Print purchase agreement	Print service agreement
Generate service detail report	Generate sales report
Generate service summary report	Print current inventory list
Order new equipment and parts	Process new inventory
Generate salesperson sales/ commission report	Generate technician service report

PROCESSING DESCRIPTIONS
The LRWR computer system makes use of barcodes to record information. Each piece of equipment is assigned a unique ID for inventory control.

Customer Purchases Equipment
A customer may purchase one or more items. A purchase generally follows a script:

1. The customer provides a picture ID and credit card for an imprint. Alternatively, the customer may pay with cash or check, although LRWR discourages the use of personal checks for the big ticket items that they sell.

2. The employee selects "Equipment Sale" from the main menu.

3. The employee requests the customer phone number to determine if the customer is in the customer list.

    If the phone number is not found, then the Customer Entry Form is displayed and their personal information is entered and added to the customer file, including:

    - Name
    - Address (include city, state, zip)

    - Telephone
    - E-mail address

    If the phone number is found then the customer may be in the list and the

    Equipment Sale Form is displayed.

4.   The Equipment Sale Form allows the following items to be entered:

- Salesperson number
- Customer number
- Payment type

- Credit Card type*
- Credit Card number*
- Expiration date *

- Verification code*

*If appropriate

5. For each item purchased, the following information is entered into a form and stored:

- Equipment type (selected from a drop-down box listing each product category in alphabetical order followed by model numbers)

- Model number
- Serial number

- Description
- Price

6. The employee saves the purchase agreement and prints a copy, which the customer signs. One copy is retained and one copy given to the customer as a receipt.

Customer Returns Defective/Unwanted Equipment

When a customer returns defective or unwanted (and unused) equipment the following events take place:

1. The customer provides a receipt and the defective/unwanted equipment.

2. For non-defective items, the employee checks the date of the receipt to determine if the product is being returned within the 30 day period.

3. The employee selects "Equipment Return" from the main menu.

4. The customer indicates a reason for the return, and the employee checks the corresponding reason on the form.

5. The employee checks the item for extraneous damage. If there is none and the product was not defective, then it is returned to inventory. If it is defective, then the item will be returned to the supplier.

6. The Equipment Return Form contains the following items:

- Date returned
- Reason for return
- Serial number

- Employee Number
- Model number
- Price

- Customer number
- Description

Customer Requests Equipment Service or Maintenance

The customer brings equipment in for service if it has been damaged or fails to work properly. The customer may also bring equipment in for regular maintenance. The equipment is not required to have been purchased at LRWR. The following sequence of steps is performed:

1. The employee selects "Equipment Service" from the main menu.

2. The employee requests the customer phone number to determine if the customer is in the customer list.

- If the phone number is not found, then the Customer Entry Form is displayed and their personal information is entered and added to the customer file. The details are discussed under Customer Purchases Equipment.

- If the phone number is found then the customer may be in the list and the Equipment Service Form is displayed.

3. The employee records the problem as described by the customer.

4. The list of repair services is consulted, and the customer is given a rough estimate (non-binding) of the price and time required.

5. The following information is entered via a service entry form:

- Repair number
- Model number
- Serial number

- Customer number
- Description (list box)
- Problem description

6. A service agreement with the above information is printed[1] and signed by the customer to authorize the repairs. One copy is retained and another provided to the customer.

7. When service personnel work on the item their employee number is recorded as the technician of record. Generally only one technician works on a single piece of equipment, and even in those situations that require multiple technicians, only the primary technician is recorded.[2]

8. The technician records the repair service applied.

9. The technician records both the total time required to complete the repair and the parts used to complete the repair. Multiple parts may be required to complete a repair. The technician records the remaining information on the service entry form:

- Technician number
- Parts needed
- Hours labor

- Repair service applied
- Parts Cost
- Labor cost

10. When the customer returns to pick up the item, payment information is entered:

- Payment type
- Credit card number *
- Verification code*

- Credit card type *
- Expiration date*

*If appropriate

11. A repair service detail report is generated and signed by the customer. One copy is retained and one copy given to the customer as a receipt.

Print Purchase Agreement

A purchase agreement must be printed for every equipment sale. The purchase agreement contains the following information:

---

[1] The service agreement is discussed in detail later in this section.
[2] Each technician must be properly certified before being hired. Technicians can be full time, part time, or contractors.

- *Header Section:* Current date/time, salesperson number, customer name, customer address, customer city/state/zip, customer phone, customer e-mail

- *Detail Section (for each item):* Model number, description, serial number, sales price

- *Footer Section:* Sales subtotal, sales tax, grand total, payment method, masked credit card number

Print Service Agreement

A service agreement must be printed prior to every repair. The service agreement contains the following information:

- *Header Section:* Current date/time, customer name, customer address, customer city/state/zip, customer phone, customer e-mail

- *Detail Section (for each item):* Repair number, model number, serial number, problem description, estimated parts, estimated labor, estimated cost

- *Footer Section*: Estimated total cost

Print Service Detail Report

A repair service detail report is generated and provided to the customer. It includes the nature of the problem, the parts required and their associated cost, the total labor charge, and total charge. The Repair Service Detail Report contains the following information:

- *Header Section*: Current date/time, technician number, customer name, customer address, customer city/state/zip, customer phone, customer e-mail

- *Detail Section* (for each item): Model number, description, serial number, problem description, repair service applied, parts needed/cost, hours labor/cost

- *Footer Section:* Parts and labor subtotal, sales tax, grand total, payment method, masked credit card number

Generate Sales Report

The sales report can be generated on a daily basis or as needed. It includes a listing of all sales for a specified period, including:

- Header Section: Begin date, end date

- Detail Section: Model number, description, quantity sold, unit price, total sales

- Footer Section: Grand total

Generate Service Summary Report

The service summary report can be generated on a daily basis or as needed. It includes a listing of all service jobs performed for a specified period, including:

- *Header Section:* Begin date, end date

- *Detail Section*: Service performed, quantity performed, hours labor, labor cost, parts cost, total cost

- *Footer Section*: Total performed, total hours, total labor, total cost, grand total

Print Current Inventory List

Periodically an employee may find it necessary to print an inventory report. Such reports are used when it is necessary to take inventory of current stock, and also when restocking inventory. The report includes the following:

- *Header Section:* Current date/time

- *Detail Section* (for each item): Model number, description, count, reorder quantity, serial number, retail cost, purchase date

Order New Equipment and Parts

An order for new equipment is generated under the following circumstances:

1. Periodically an employee runs an inventory report (as indicated above) that indicates the total number of items in stock. If the number falls below a preset limit, a reorder request is generated for a number of items equal to the limit minus the current number. The preset limit is based on projected demand for a particular equipment type and is outside the scope of this system.

2. Before an order is actually placed, this reorder request is compared with projected demand for this particular equipment type, with the remaining sales season taken into account, and order quantities can be adjusted. Price is obtained from the supplier (outside the bounds of this system) for each item and entered into the purchase order. Shipping charges are also provided by the supplier. The tax rate is obtained from local governmental tax regulations, and the subtotal, total tax, and total are all calculated.

3. Orders for the same supplier are combined together into a single purchase order.

4. These purchase orders are sent via email to suppliers who provided an email address for their contact (the sales representative). Otherwise they are faxed or mailed to the appropriate supplier.

Process New Inventory

Assume that all orders placed to a given supplier are received in full, and there is no need to make an allowance for partial shipments and backorders.

1. When a shipment is received, an employee enters the following information into the system for each item:

- Serial number
- Equipment description*
- Purchase date

- Model number
- Retail cost

*Equipment description is selected from a product category list.

2. The system creates a new record in the inventory table for each item. The system also generates the equipment ID in sequential order, and uses it as an inventory tag.

Generate Salesperson Sales/Commission Report

The salesperson sales/commission report can be generated for one or all salespersons as needed. It includes a listing of all sales and commission data, including:

- *Header Section:* Begin date, end date

- *Detail Section*: Salesperson number, commission percent, sales count, sales amount, commission amount

- *Footer Section*: Total count, total sales, total commission

Generate Technician Service Report

The technician service report can be generated for one or all technicians as needed. It includes a listing of all service jobs performed, including:

- *Header Section:* Begin date, end date

- *Detail Section:* Service performed, quantity performed, hours labor, labor cost, parts cost, total cost

- *Footer Section:* Total performed, total hours, total labor, total cost, grand total

Business Rules

A business rule is a statement of a policy, procedure, or principle that indicates how a specific organization operates in specific instances. In some cases these rules may change over time, and a system must be designed to accommodate such changes. A partial list of business rules associated with LRWR includes the following:

- An employee is assigned an employee number, which may be referred to as a technician number for technicians or a salesperson number for salespersons.

- Lost River does not sell parts directly.

- Purchases may be returned within a thirty day period only if the product is still in "new" condition. If there is an obvious defect in the equipment then the thirty day restriction may be waived.

- Each transaction will be charged a 7.75% sales tax.

- Labor on repairs will be billed at a set rate of $45 per hour.

- Each product category can have multiple pieces of equipment in stock.

- A partial list of product categories includes:
- hang glider   • paraglider   • snowkite

III. STUDENT RESPONSIBILITIES

Students are responsible for turning in intermediate deliverables throughout the project, generally one per week. Note the approach used, in which a large project is divided into a series of milestones or deliverables. This is a form of project management that forces the developer to meet deadlines or run the risk of falling farther and farther behind. The completed project, presented in a technical report, is due near the end of the semester. A suggested time table for project management purposes is shown in Table 1.

Deliverable I – E-R Diagram

The E-R Diagram should be developed through a step-by-step process. The deliverable should provide the following:

- A listing of objects (potential entities) on a process-by-process and/or report-by-report basis.

- A listing of attributes for the entities and composite entities (sometimes referred to as associative entities or gerunds).

- E-R diagram showing such quantities as connectivity, cardinality, optional/mandatory participation, and weak entities.

Table 1: Suggested Timetable

Deliverable	Time Frame
Entity-Relationship Model	10 days
Normalized Relational Schema	7 days
Design Validation Table Implementation	10 days
Input Forms	7 days
Query Design	10 days
Advanced Forms	7 days
Reports	7 days
Stored Procedures/Triggers	10 days
Final Project	7 days

Deliverable II – Relational Model

The relational model should be developed through a step-by-step process. The steps that will be followed are:

- Review the identification of attributes and the E-R diagram from Deliverable I. If modifications are needed (as indicated in grading of Deliverable I) please include those.

- Using the modified E-R diagram along with the entities, relationships, and their attributes, determine and specify the relations. Provide the relational schema for each relation.

- Normalize each relation, explaining the introduction of any new attributes, and why each relation does or does not need to be normalized. Show the original relation, then show first normal form, then second normal form, and then third normal form.

- Indicate the primary key in each relation by underlining, and double-underline or italicize foreign keys.

- Turn in a relational schema for each relation in the form TABLE_NAME (PRIMARY_KEY, $ATTRIBUTE_2$, ...$ATTRIBUTE_N$)

- Turn in the latest E-R Diagram.

Deliverable III – Design Validation

Provide a validation of the forms and/or reports in terms of the latest E-R diagram. When performing the validation, select the primary entity on which the form or report is based, and then show how the attributes, including those from other entities, are obtained through, for example, foreign keys and composite keys. The form and report validations should appear in the deliverable in the same order in which they appear in the case description.

Deliverable IV – Table Creation/Data Entry

Using the latest relational model, create a database and the appropriate tables. Be sure to create tables to represent both the entities and the composite entities. Enter some sample data for each table. Make certain that the composite tables that provide the linkage between the two tables being bridged contain appropriate data. The steps that will be followed are listed below:

- Using your relational model, create each table.

- Specify table linkages. Access Note[3]: Use the Relationships button in Access to determine the linkages.

- Using the problem description, enter some sample data into each table. If you have to, make up some reasonable data. Enter at least five tuples into each table, and be sure that data that allows the tables to be linked is provided. Access Note: Do not accept the fifty character default length for text fields. Assign input masks, default values, and validation rules wherever they make sense. Use the Lookup Wizard in the Datatype field to display a description rather than a key value whenever you have a foreign key in one table.

- Print each table and include it in the deliverable. A screen capture program such as SnagIt may be used to capture a copy of each table.

- Print the structure for each table and include it in the report. Access Note: To print the database structure, use the Tools-Analyze-Documenter. Select the Options in the lower right corner and then click the middle radio button for Files. No other options should be selected.

- Print the table relationships. Access Note: Click on the Relationships button on the Access toolbar to obtain the relationships. The relationships can be printed using the File - Print Relationships command.

- Submit both a disk (or CD) and your printouts.

Deliverable V – Data Entry Forms

Using tables developed in Deliverable IV, design and create the data entry forms specified below. The forms will be graded on appearance and content. The steps that will be followed are:

- Using the Access tables, design and create the Customer Entry Form (Figure 5) and Technician Entry Form (Figure 6). Set the forms up for data entry. Use applicable formats and masks if available. Test the forms to be sure data is entered properly. Save the forms to disk. Note that technician data is stored in both the Employee table and the Technician table.

- When designing forms, consider which data values can be supplied through a selection in a drop-down box, such as equipment type. Some may involve a logical default.

Submit the forms on disk (or CD), with the form names clearly indicated, and provide a printout of the forms, using SnagIt or the Print command.

Deliverable VI – Query Design

Using the tables developed in Deliverable IV, develop a set of queries as specified in the query list. Include data in the tables to test each query. Be sure to save the queries and submit the database. Provide printouts of both the SQL view and the query result. Be sure that there is data in your tables so that the instructor or grader can duplicate your results.

- Submit the queries on disk (or CD) with the query names clearly indicated.

- For each query, provide a printout of the SQL view and the query result.

  - *Access Note:* To display the SQL view: from the query menu select View, and then select SQL View from the drop-down menu.

  - *Access Note:* To display the query result: from the query menu select Query, and then select Run from the drop-down menu.

---

[3] The term Access Note throughout what follows helps students who use Microsoft Access as their database.

Figure 5. Customer Entry Form

Figure 6. Technician Entry Form

- *Access Note:* Don't forget that if your query includes an attribute name that has a #
  sign, like Technician#, the attribute name has to be enclosed in square brackets.

Query List
1. List the technician number, hours worked, salary per hour, and total salary for each
   technician who worked more than 40 hours. (You may need to add appropriate data to your
   technician table to obtain results.)

2. List the model description and manufacturer for all products whose manufacturer name begins with an "A" and has a third letter "r". (Your answer should include Aeros, Airwave, and Airush.)

3. List all salesperson information, including employee number, name, sales count, and sales total (SalesAmount) and commission earned in descending order by commission earned.

4. List the customer name, serial number, model number, model description, and purchase agreement date for all items for which the purchase agreement date is May 10, 2005.

5. List all repair details (customer number, customer name, serial number, service date, problem description) for all repairs associated with a specified customer. The query should display a prompt requesting the customer number or name. This type of query is sometimes referred to as a parameter query.

6. Part 1: For each product category list the model number, description, and the total number of sales from that category. Part 2: As a continuation from Part 1, list the model number, description, and the total number of sales for the product category that has the highest number of sales.

7. List the model number, description, and number of suppliers for those product categories that were supplied by multiple suppliers.

8. Given a customer name, list all credit cards associated with that customer. Include card number, card type (Visa, Mastercard, etc.), and expiration month and year, in the format xx/xxxx. The query should display a prompt requesting the customer number or name.

9. List the model number, description, total number of repairs in 2005, and the repair year for all product categories on a category-by-category basis.

10. List supplier number and supplier name for all suppliers for which there are no current orders. Sort the list in ascending order by supplier name.

Deliverable VII – Advanced Forms

Create and submit the following forms, which are based on multiple tables.

Purchase Confirmation Form - Create a form with subforms to replicate the purchase confirmation form. It will differ slightly from the case description to make it easier. It should display the various purchases, but is not intended for input. Therefore, you should disable all of the fields (set the Enable property to No). Figure 7 shows an example. Access Note: As discussed in class, select the "primary entity" (the one that has connections to most other participating entities) and base the main form on it. In this case it should probably be Purchase Agreement. Then embed subforms to supply data from the other participating entities. The example in Figure 7 contains two subforms, because a subform can actually be based on more than one table. Be sure that the primary key/foreign key linkage is present in the main form and each subform, even if the fields are hidden, because they are required to link the forms.

Equipment Entry Form - Create an Equipment Entry Form that permits data entry when new equipment is received. An example is shown in Figure 8. This form should be done without using subforms. The Model is selected through a list box. Note that the Sale Price, Date, Manufacturer, and Inventory Count are all disabled.

• In the case of the Manufacturer, the correct value is supplied when a Model is selected

• The date field is disabled because the default value of the field is set to the current date.

Figure 7. Purchase Confirmation Form

Figure 8. Equipment Entry Form

- The sale price value is calculated as soon as the Purchase Price is entered.

- The Inventory Count is also incremented by one automatically as soon as the Model is selected.

In the samples the subform cannot be distinguished from the form. Several properties must be set to accomplish this goal. Submit both a diskette (or CD) with the form names clearly indicated and a printed copy.

Deliverable VIII – Reports

Create and submit the reports specified as they appear in the problem description. Submit both a diskette (or CD) with the report names clearly indicated and printed copy.

- *Inventory Report* - List all items in inventory grouped by product category. Test your report with multiple items in stock for at least one model. Figure 9 presents an example.

Figure 9. Inventory Report

- *Purchase Agreement* – Create a purchase agreement that lists all item charges, calculates a sum of those charges to get the subtotal, calculates the sales tax, and then adds the tax to the subtotal to obtain the total. Be sure to include purchase agreement information, customer details, details about each item purchased on this contract, and the credit card number (partially masked, like XXXX-XXXX-XXXX-1234) and card type. Your report format should resemble Figure 10 as closely as possible. You may generate a listing of all agreements, although you can easily modify the report so that it is based on a parameter query that requests an agreement number. Test your report with multiple purchases on at least one purchase agreement. Contact the instructor for tips on masking the credit card number.

Deliverable IX – Stored Procedures and Triggers

Before beginning this deliverable, modify the Product_Category table to include a new Boolean (Yes/No) attribute called ReorderNecessary that will be set to true when an item needs to be reordered. The attribute should default to false.

- Since the default value may not be valid for all the data in your table, write a stored procedure to set the value of the new ReorderNecessary attribute to its correct value. If the ModelInventoryCount is less than or equal to the ModelReorderQuantity, then set the

Figure 10. Purchase Agreement

ReorderNecessary value to true. Otherwise set the ReorderNecessary value to false. Execute the procedure to reset the value.

- Since the default value may not be valid for all the data in your table, write a stored procedure to set the value of the new ReorderNecessary attribute to its correct value. If the ModelInventoryCount is less than or equal to the ModelReorderQuantity, then set the ReorderNecessary value to true. Otherwise set the ReorderNecessary value to false. Execute the procedure to reset the value.

- The next stored procedure is more complex. When an item is purchased by credit card, the card number must be validated. The algorithm to accomplish this task is fairly straightforward, and consists of three steps. These steps are performed by working from the rightmost digit of the credit card number.

   Step 1: Double the value of alternate digits of the primary account number beginning with the second digit from the right (the right-most digit is the check digit.)

Step 2: Still working from the right, add the individual digits comprising the products obtained in Step 1 to each of the unaffected digits in the original number. For example, if the product is 12 then add 1 + 2 to the unaffected digit to the right.

= 2+(1+0) + 8+(1+2) + 8+(0) + 0+(0) + 3+(8) + 7+(6) + 8+(1+2) + 4+(1+8)

= 3   + 11   +8   +0   + 11   + 13   + 11   + 13

= 70

Step 3: The total obtained in Step 2 must be a number ending in zero (or mod 10 = 0) for the account number to be validated.

70 mod 10 = 0 ∴ Card number is valid

- Write a stored procedure to validate a credit card number. Test it with a valid credit card number like 5268 0800 4337 6894.

- The first trigger represents a typical inventory management task. Whenever an item is sold, the associated inventory count is decremented. The system should automatically check to see if the inventory count fell below the reorder quantity. Write a trigger to compare the Product_Category attribute ModelInventoryCount to the ModelReorderQuantity. If the value is less than or equal to the reorder quantity then the ReorderNecessary attribute should be set to true. The trigger should be invoked whenever the ModelInventoryCount or ModelReorderQuantity attributes are updated.

- The next trigger calls a stored procedure. When an item is purchased by credit card, the card number must be validated. Write a trigger to execute the stored procedure that you developed to validate the card number when the value of the PurchaseAgreementCardNumberUsed field is inserted or updated.

Final Project

Students are required to follow a specific technical report format that includes the following:

1. Executive Summary
 	
  a. Goals
  b. Problems (encountered during   the study that impact the company)
  c. Results
  d. Recommendations
2. Introduction
 	
  a. Company background
  b. Problem (that made a new system necessary)
3. Entity-Relationship Diagram
	4. Normalized Relational Schema
	
	5. Design Validation
	
	6. Implementation
	
	  a. Database Table Creation
	  b. Input Forms (single table)
	  c. Query Design
	  d. Advanced Forms (multiple tables)
	  e. Reports
	  f. Stored Procedures and Triggers
	7. Summary

The overall organization of the report as well as its content influence the grading, and the presentation must be "professional quality" because in a real setting the presentation will be management's first exposure to a project, and a bad first impression is difficult to overcome.

Editor's Note: This article was received on June 30, 2005 and was published on September 25, 2005

ABOUT THE AUTHOR

Kevin R. Parker is Professor of Computer Information Systems at Idaho State University. He previously held an academic appointment at Saint Louis University. He has taught both computer

science and information systems courses over his fourteen years in higher education. Dr. Parker's research interests include e-commerce marketing, competitive intelligence, knowledge management, the Semantic Web, and extreme programming. His work appears in such journals as *Journal of Information Technology Education, Journal of Information Systems Education, the International Journal of Internet and Enterprise Management, and Journal of Issues in Informing Science* and *Information Technology*. Dr. Parker's teaching interests include web development technologies, programming languages, data structures, and database management systems.