Himalaya°com

Himalaya°com is a startup company which wants to pursue the exploding opportunities of on-line business. Hilbert Dude, the founder of this startup, has monitored development of this e-business market for a while and identified *Amazon.com* as the primary market leader (to beat). He believes that, to grab market shares from Amazon.com, it's necessary to inject some new ideas into their business. While not being very innovative himself, he looked at another success story, *eBay*, and decided to bring a 'bidding' flavor into his business model. Combining the strength of Amazon.com and eBay, plus a cool brand name, Himalaya°com, he managed to convince some rich dudes (in the Dude Family) to sponsor an initial round of funding and is ready to fly.

Mr. Dude is not a technical person, so he decides to find a technical team to prototype and validate his business ideas. The approach is to propose a design and explore the feasibility of the design through prototyping. The goal is not to produce a complete implementation of the system, as this would require too much time and money than the initial funding can support. Instead, Mr. Dude likes the team to focus on the parts of the design that pose a significant risk, or that involve a lot of uncertainty. Based on evaluation and testing on the prototype, the design can be improved later to better meet the requirements. This design-prototype approach is often adopted when the requirements are not well understood or the method of achieving them is not clear. On the other hand, a successful prototype can serve as the foundation for future production system in operation and will help to secure the next round of funding.

Being attracted by the large amount of stock options and the potential of getting rich and retired in a couple of years, you and your gang decide to give the project a shot. Since Mr. Dude is not very technically savvy, he tries to communicate his visions with the technical team and expects the team to figure out all the missing details. Basically, the technical team (i.e., you and your team members) will design a database application to manage the on-line business of Himalaya°com. You will write several transactions to access the database in order to support the functions required for the system. The project consists of three phases:

1. Requirement Analysis and Conceptual Database Design;
2. Logical Database Design and Normalization
3. System Prototype (Implementation, Testing, and Demonstration)

The first phase is to analyze the data (and business) requirements of Himalaya°com and to come up with a conceptual database design by using entity-relationship model. The second phase is to decide which database management system to use, create a logical database design and to refinement and normalize the initial design. Finally, you will populate the database, write a set of representative transactions to access the database, and implement the application.

Phase 1 – Conceptual Database Design

Due Monday 02/09/15. Hardcopy before class. E-copy via ANGEL.

Project Description

As mentioned earlier, Himalaya°com will pattern features of (but not identical to) the Amazon.com on-line bookstore (www.amazon.com) and the eBay on-line auction website (www.ebay.com). Thus, it may help to explore these websites to better understand their functions and the requirements for Himalaya°com. The following is a description of some of the basic requirements, including the types of information that must be stored and how it will be accessed.

Sale Items- The focus here is the items for sale. These items can be pretty much anything. An item is sold either by listed price or by auction. The sources of the items may be a company (i.e., a *supplier*) or an individual (i.e., an on-line *seller*). A unique identifier is assigned to an item when it is in stock or put up for auction. This is used to identify the item. A short description (no more then 500 characters) is associated with an item (provided by a supplier or a seller). In addition, a URL may be provided to link to a more detailed description at supplier's or seller's websites. The on-line seller may specify a *reserve price* (which is hidden from the buyers) for an item he posted for auction. A reserve price is the minimum price a seller is willing to accept for the item. At the end of the auction, if no bid is higher than the reserve price, the seller is not required to sell the item. The seller must also specify the location of the item (i.e., the State it would be shipped from). Himalaya°com may set the listed price of items based on statistics collected from the auction of the same items.

Categories- The items available at Himalaya°com are categorized using a predefined *classification tree*. Each node represents a set of items. The root of the tree is labeled 'All' and represents all items. Each node has on average fifteen children (subcategories). Each, with a descriptive name, represents some subset of the items represented by the parent. An item can be specified by a path through this classification tree. For example, we may categorize an item as:

1. Books > Audio Books > Business > Sales; or
2. Electronics > Camera & Photo > Camcorders > Digital8; or
3. Baby > Strollers > Lightweight.

The depth of the tree varies but is no more than sixteen levels deep.

Suppliers- All the suppliers of items sold at Himalaya°com are maintained in the database. Supplier information includes company name, address, point of contact (person), phone number, company category, revenue, etc.

Registered Users- To sell or bid on an item, a user must be registered. A registered user is identified by a user name and authenticated with a password. In addition, the

maintained information includes, e-mail address, name, address (which consists of street, city, state, and zip), phone number, credit card info (including type of credit card, credit card number, expiration date), age, gender, annual income, and etc. Of course the last three items are collected solely for telemarketers (but we won't tell the users that). Finally, there could be more than one address, phone number and credit card for each user.

Rating- We attempt to control fraud by allowing users to comment on the past behavior of other users. A user that took part in an auction can register a Positive, Neutral, or Negative evaluation of the seller. These ratings and a short explanation (less than 300 characters) are then made available to other users. In this way, a user's reputation is forced to precede him.

Browsing- Users are able to browse the items by traversing the category tree. At each point, they are given a summary of all the items that appear in that category.

Searching- Users are able to search the items by entering some keywords or conditions. As a search result, a list of items that satisfy the search criteria is returned to the user.

Sale- A customer can purchase an item based on listed price (instead of by the auction approach). Himalaya°com places a charge on the credit card the customer supplied. If the charge is successful, the item is sent to the customer. The sale transaction will be maintained in the system for at least six months.

Bidding- A user can place one or more bids on an item as long as they are not the seller of the item. (You can assume *simple bidding* rather than the *proxy bidding* used on eBay.) Each bid that is placed must be at least $2 higher than all previous bids and must be placed before the auction ends. At the end of the auction the seller and all bidders are notified of the highest bid and the user that placed it. Contact information is sent to the seller and the highest bidder so that they can complete the transaction. An auction starts when the seller registers the item for auction and ends exactly two weeks later. Information about an auction in which the item is not sold can be discarded immediately.

Order and sale reports- Orders for items which are low in stock or out of stock need to be placed. Periodically (every week), a report summarizing the ordering and sale information based on categories of items are generated.

Delivery- The delivery of an auction item is complicated. After a winner is determined, the seller does not want to deliver the item until he has been paid, and the buyer does not want to pay until the item has been delivered. Himalaya°com will serve as a trusted third party to resolve this standoff. After a winner in the auction has been announced, the seller will ship the item to us. When and if the item is received, Himalaya°com places a charge on the credit card the user supplied. If the charge is successful, the item is forwarded to the buyer and a check is mailed to the seller. If the item does not arrive in two weeks, or the charge does not go through, Himalaya°com declares the auction void and, if necessary, returns the item. Information about auctions that are successful will be

maintained in the system for at least six months. Information about successful and voided delivery cannot be discarded until six months after e-mails are sent to all parties notifying them of the outcome. To support the removal of this information, information regarding to when notifications were sent needs to be maintained.

Reports to Telemarketers- Periodically, a report including the name, address, e-mail, phone, age, gender and annual income is sent to a telemarketing firm.

Questions- Mr. Dude has tried to specify as much details as he could to get the project start. However, if your team needs more details please contact the chief operation officer of Himalaya°com, i.e., the TA for the class, who will be able to help clarify on questions about the requirements of Himalaya°com. A Frequently Asked Questions (FAQ) list will be maintained on the class web page to disseminate her answers.

Project Report

The deliverable for Phase 1 of the project is a project report covering the ***requirement analysis*** and ***conceptual design*** of the database application. Your document, not including appendices, should be no more than ***fifteen*** double-spaced pages in length. It must have page numbers, section numbers and a table of contents. The document should include (in an appendix) a clearly formatted summary of individual and group progress reports from the beginning of the semester until the due date.

Requirement Analysis- Your team should present a concise (itemized) summary of the application and its operations. There is some vagueness in the project description. You should clarify them and define exactly how Himalaya°com should operate and what functions your systems will provide to support those operations. Clearly describe all the ***extensions*** (i.e., those not specified in the project description) for your design and prototype. You may include in the document (or as an appendix) some figures (e.g., projected screen shots or web designs) to illustrate the functions and operations.

Conceptual Design- Your team should present an entity-relationship diagram describing your design. Also, your project document should include a narrative description of the diagram. Please do not assume the underlying database system and do not map your design into relations – which is the task for Phase 2 of the project.

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Phase 2 – Logical Database Design and Normalization

Due Friday 03/06/15. Hardcopy before class. E-copy via ANGEL.

Project Description

Based on the Requirement Analysis and ER design you developed in the first phase of the project, you will finalize the schema for the Himalaya°com database. You should produce a refined schema that reduces redundancy to an acceptable level (at least in the 3rd Normal Form) while not unduly affecting performance. Your schema should also support the enforcement of most, if not all, of the integrity constraints that you identify in this phase (for example, the functional dependencies) and the previous one. I will leave the specific details of how this refinement is done, up to you. However, I would expect you to apply some combination of translating the ER components to relations and normalization.

Project Report- You should submit a report that describes your ER design from the first phase with corrections based on your own and our evaluation. In addition, you should provide SQL statements to create (specify) all of the relations in your database. As mentioned above, I expect your design to be based on 1) transforming ER components (i.e., entity set, relationship set, constraints, etc) to relation schema; 2) specify new integrity constraints such as functional dependency; and 3) refining the schema through normalization. In the report, I also expect you to describe how the created tables are related to your ER design and how they meet the requirements you specified in Phase 1.

In addition, I would like you to describe your design approach and the relations it produced (i.e., document what you have done on schema refinement). For coherence of the report, you may choose to leave this part in the Appendix (i.e., it's up to you to decide how to organize your report.)

Formatting- Your document, not including appendices should be no more than ***twenty five*** double-space pages in length. Please note that this document extends your previous document and for that reason will include it (with the proper corrections). Your document must have page numbers, section numbers and a table of contents. Your document should include (in an appendix) a clearly formatted summary of individual and group progress reports from the beginning of the semester until the due date.

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Phase 3 – System Prototype

Due Thursday 04/30/15. Hardcopy before class. E-copy via ANGEL.

Demonstrations to begin 04/30/15 (Please schedule with the TA)

Project Description

During this phase of the project you will implement the database system you have previously designed for Himalaya°com. You will create a database in MySQL based on your design and populate it with testing data you generate. In addition, you will implement several transactions for the internal and/or external user operations of Himalaya°com.

Populating the Database

The first task is to create and populate the database you designed for Himalaya°com. You should create all of the necessary tables defining primary keys, foreign keys, and any integrity constraints you feel are helpful. In addition, define any views of the schema you will need. Because the designs proposed by the various groups are not uniform, I will not provide a set of data for you to load. Instead, you should develop a method of loading your database that satisfies the following requirements. Some sample data for the Himalaya°com database include:

1. Fifteen users. At least five of the users have commented on another. The comments are associated with some auction items.
2. Twenty items to be auctioned. For item I_1, the auction is complete. We are still waiting for the item to be delivered. For the other two items, I_2 and I_3, one has received at least one bid and the other has not.
3. Five direct sale items to be sold directly from the stock.
4. Twenty categories that form a browsing (category) tree, at least three levels deep. Do not count the root as one of the categories or a one of the three levels.

Note that the above are just some sample data. Please include more data to adequately demonstrate the transactions you write for the operation of Himalaya°com. You should produce one or more SQL scripts so that you can easily restore the database states.

Transactions

The next task is to implement each of the following transactions.

AddUser: This is for registering a new user. Acquire necessary information from user and enter into database. Remember, the information we supply to the Telemarketer's is REQUIRED (How do you expect us to make money?). Please be sure that the user's password is not displayed while it is being entered.

BrowsingItems: This really constitutes an extended interaction with the user that consists of several transactions. The session begins by displaying the root category name together with its subcategories. Following each category name is the number of items in the category. An example is given below:

All (0) : *Books (212)* *Electronics (53)* *Collectables (19)*

By clicking on the category left of the colon, the items in that category are displayed. Clicking on a category on the right, replaces the display with one in which the selected category is on the left of the colon and its subcategories are on the right.

Note that the above is just an example. You can have your own design different from the example.

SearchingItems: Users are able to search the items by entering some keywords or conditions (e.g., price range). As a search result, a list of items that satisfy the search criteria is returned to the user.

BuyItem: A customer can purchase an item based on listed price (instead of by the auction approach). This interaction can only be carried out by a registered user, so authentication is called for. Himalaya°com places a charge on the credit card the customer supplied. If the charge is successful, the sale is finalized. The sale transaction will be maintained in the system for at least six months.

AuctionItem: This is used to place an item up for auction. Enter all necessary items into the database, acquiring whatever information you require from the user. Only a registered user can execute this transaction. You need to verify that the user knows the appropriate password.

BidItem: A registered user (must authenticate user by checking password) specifies a bid on an item. The item is specified using its item identifier. A bid is rejected and the bidder is notified if the amount does not exceed the previous high bid by at least $2, or if the bid does not exceed the reserve amount for the item.

TerminateAuction: This is executed at the end of each day to terminate all auctions that finished during the day. It does not use a web interface so a normal Java application or a C with embedded SQL application can be used. It must locate all auctions that finished. For each item, it must determine if the item was sold or not. If it was not sold, all information about the item and auction will be removed from the database immediately.

TeleMarketingReport: Periodically, a report including the name, address, e-mail, phone, age, gender, and annual income of users, and the total number of their bidding activities is sent to a telemarketing firm.

General Constraints

Because the interaction with a user can be quite time consuming, you may divide database interactions into short transactions.

Project Report- You should submit a cumulative report that describes your ER design, schema refinement and implementation. Discuss any important implementation issues you considered and discuss any details of the design you feel are noteworthy. Include listing of all your source code in a appendix. You will be asked to demonstrate your project to the TA or myself.

Formatting- Your document, not including appendices should be no more than ***thirty-five*** pages. Please note that this document extends your previous documents and for that reason will include it (with the proper corrections). Your document must have page numbers, section numbers and a table of contents. Your document should include (in an appendix) a clearly formatted summary of individual and group progress reports from the beginning of the semester until the due date.