HelloWorld

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HelloWorld is a startup company that wants to pursue the exploding opportunities of online business. XXX, the founder of this startup, has monitored the development of this e-business market for a while and has identified Amazon.com as the primary market leader (to beat). He believes that in order to grab market shares from Amazon, it is 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 add a "bidding" feature into his business model. Combining the strength of Amazon and eBay, plus a cool brand name, HelloWorld, he managed to invite enough investors to gain the initial round of funding and is ready to take the next step.

XXX is not a technical person, so he decided 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. 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 a 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 retiring in a few years, you and your mates decide to give the project a shot. Since XXX 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 HelloWorld. 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 consists of analyzing the data (and business) requirements of HelloWorld and developing a conceptual database design by using the entity-relationship model that you learned in class. The second phase is to decide which database management system to use, create a logical database design, refine and normalize the initial design, and populate the database. Finally, you will write a set of representative transactions to access the database before implementing the application.

OVERALL REQUIREMENTS

Before we jump into the description for each phase, let's talk about what you're expected to fulfill when working on the project.

Document formatting

We provide a project document template (a .docx file) that you are more than welcome to directly follow. However, you are also encouraged to create a template of your own, as long as it maintains a professional image and includes all the components from our provided template. You can also write your documents in Latex or MarkDown languages. Your project reports for each phase will be turned in both electronically and in hard copies. When submitting electronic copies, make sure you convert them into PDF files; when submitting hard copies, make sure you bind the documents neatly (a lot of times, the volume will be too thick for stapling, so you can come up with other ways to bind your documents.)

For each phase, check below for the minimum number of pages (excluding cover page, table of contents, and appendices):

Phase	Minimum number of pages
1	15
2	25
3	35

Please note that each phase's document extends the previous document with proper corrections and modification.

Source control

It is required that every team member owns a GitHub account, and the team manages the codes for the project (including all your write-up files) in one shared repository. When assessing your project, the status shown on your repositories will become an important indicator (e.g., how frequent the repository is committed, how each team member is doing compared to the others). Also, ensure that you maintain good documentation for your codes.

Project management

All the teams should manage their project's progress with an online task management tool, Asana. It is important to leverage Asana well, as your progress reports will be exported from this tool. Therefore, make sure you use Asana to carefully plan each task in the project and keep the conversation/discussion between teammates going on the platform.

PHASE 1 – CONCEPTUAL DATABASE DESIGN

Due: September 18th, 2015

Checklist

✔	Task
	Requirement analysis
	Conceptual design

Task 1: Requirement Analysis

As mentioned earlier, HelloWorld will pattern features of Amazon.com and eBay, but will not be identical. Therefore, it may help to explore these websites to better understand their functions and the requirements for HelloWorld. Below are the eleven basic functions that you must include in your design:

1. 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 source of the items may be a company (i.e. a supplier) or an individual (i.e. an online seller). A unique identifier is assigned to an item when it is in stock or put up for auction. A short description is associated with an item (provided by a supplier or a seller). The online 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 item will not be sold. The seller must also specify the location of the item.

2. Categories: The items available at HelloWorld are categorized using a predefined classification tree. Each node represents a set of items. The root of the tree is labeled "All" to represent all items. Each node has an average of fifteen children (subcategories). Each has a descriptive name and represents certain subsets 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 > Wearable Technologies > Smart Watches; or
3. Beauty > Hair Care > Shampoo > Dry Shampoo.

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

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

4. 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, email address, name, address (which consists of street, city, state, and zip), phone number, credit card info (including type of credit card, credit card number, and expiration date), age, gender, annual income, etc. Also, there can be more than one address, phone number, and credit card for each user.

5. Rating: We attempt to control fraud by allowing users to comment on the past behavior of other users. You can design a rating system that you think will lead to the best quality control standards. These ratings and a short explanation are then made to other users.

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

7. Searching: Users are able to search for items by entering keywords or conditions. As a search result, a list of items that satisfy the search criteria is returned to the users.

8. Sale: A customer can also purchase an item based on the listed price (instead of through the auction function). HelloWorld places a charge on the credit card that the customer supplied. If the charge is successful, then the item is sent to the customer. The sales transaction will be maintained in the system for at least six months.

9. Bidding: A user can place one or more bids on an item as long as they are not the seller of the item. 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 at the exact time that the seller specified. Information about an auction in which the item is not sold can be discarded immediately.

10. Order and sale reports: Periodically (every week), a report summarizing the ordering and sales information based on categories of items are generated for HelloWorld to learn how the business is doing and more accurately understand consumer behaviors.

11. Delivery: The delivery of an auction item is complicated. You and your team can come up with a mechanism that will not only ensure the success of sellers in receiving payments and buyers receiving products, but also reasonable for HelloWorld to implement.

Your team should present a concise (itemized) summary of the application and its operations. There is some vagueness in the descriptions of the basic requirements. You should clarify them and define exactly how HelloWorld 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., an initial system framework or interface designs) to illustrate the functions and operations.

Task 2: 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, as that is the task for Phase 2 of the project.

PHASE 2 – LOGICAL DATABASE DESIGN AND NORMALIZATION

Due: October 15th, 2015

Checklist

✔	Task
	Schema refinement and normalization
	SQL statements
	Technology survey
	Populate data for database

Schema Refinement and Normalization

Based on the Requirement Analysis and ER design you developed in Phase 1 of the project, you will finalize the schema for the HelloWorld database and specify the integrity constraints in this phase. You should produce a refined schema that reduces redundancy to at least the 3rd Normal Form without 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 (e.g., functional dependencies) and the previous one. I will leave the specific details of how this refinement is done up to you.

SQL statements

You should provide SQL statements to create (specify) all of the relations in your database. I expect your design to be based on:

1) Transforming ER components (i.e. entity set, relationship set, constraints, etc.) to relation schema
2) Specifying new integrity constraints, such as functional dependency
3) Refining the schema through normalization

Even if you decide to use NoSQL for your project, this part is still required. 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.

Technology Survey

I would like you to describe your design approach and the technologies that you choose to use (i.e. software, programming languages, and packages). Consider as many aspects of your project as possible and discuss the reasons, pros, and cons of your tool choices.

Populating the Database

Finally, you should start populating the data you want to include in your database. Because the designs proposed by the various groups are not uniform, I will not provide a set of data for you to load, but your data should satisfy the following requirements:

1. Fifteen users. At least five of the users have commented on another. The comments are associated with certain auction items.
2. 50 items to be auctioned. These items should cover different statuses (e.g., auction complete, still bidding etc.).
3. 50 direct sale items to be sold directly from the stock.
4. 20 categories that form a browsing (category) tree at least 3 levels deep. Do not count the root as one of the categories or as one of the three levels.

You do not have to have this data in the database by the time you give your phase 2 presentation, but they should be imported in the database before the first demonstration. Also, the interface does not have to be ready at this point. However, you should be able to have a rough interface capable of communicating with backend before the first demonstration.

PHASE 3 – SYSTEM PROTOTYPE

Due: December 10th, 2015

Checklist

✔	Task
	Transactions
	Complete system framework
	Reflection

During this phase of the project, you will implement the database system you have previously designed for HelloWorld. You will also implement several transactions for the internal and/or external user operations of HelloWorld. Finally, you will wrap up this project by presenting your final system framework and discussing what expectations have been met.

Task 1: Transactions

You should implement each of the following transactions:

AddUser: This is for registering a new user. Acquire the necessary information from the user and enter it into the database. Please be sure that the user's password is not displayed while it is being entered.

BrowsingItems: This actually 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.

SearchingItems: Users are able to search the items by entering certain 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 the listed price (instead of through the auction approach). This interaction can only be carried out by a registered user, so authentication is required. HelloWorld places a charge on the credit card that the customer supplied in the authentication process. If the charge is successful, then the sale is finalized. The sales 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 the 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 (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 their 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.

Task 2: Complete System Framework

Include an illustration of the final system framework of your project, describing how the front-end communicates with the back-end, what tools are used for each components etc. There are no strict rules on how you should present your framework. Use your creativity to put all you have done into one big figure!

Task 3: Reflection

Since this is the final phase of the project, it's time to reflect back on whether you have hit the goals you set for your team at the beginning of the semester. Make a comparison between what was proposed, and what has been achieved. Discuss why some tasks were not done or why you added some tasks, if either of those situations occurred.