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Honors Database Reflection Essay
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The primary goal of the research project that I was asked to complete over the course of the summer of 2015 for Honors course credit was to design and create a database-centered application to digitize records used by the Honors Concentration's administration to maintain data about its students. More specifically, it was necessary to design an efficient database to store information about students in the Honors Concentration, and a software application was necessary to allow administrators of the Honors Concentration to have an interface with this database. The information stored in the database would include students' grades in Honors courses, SAT scores, and other personal information submitted as a part of the Honors Concentration's application. To complete this project, I needed to use my database design skills, software design skills, and programming skills, all of which are essential skills in the modern software industry. This project furthered my education and allowed me to contribute my talents to improving the Honors Concentration.

In addition to developing a piece of software that would be useful to the Honors Concentration, I wanted to create a system that could be maintained by the Honors Concentration without much intervention from a programmer. It was important to enable people with standard computer skills to view information in the database, edit that information, and remove erroneous or unwanted information. This functionality was the main purpose of the software application that was written as part of this research project. It was also desirable to allow people to add tables to the database and set up relations between tables in the database without having to modify the code for the application directly. I created a set of commands served by scripts within the system that provide this functionality without requiring users to directly change the code in the system. This was an important goal because useful software must be maintained as requirements change. It is possible that the Honors Concentration would have to add new tables

and columns to the database to track new types of data regarding Honors students. This second interface with the system itself allows people maintaining the system to easily make necessary changes. Despite the robustness of this system, it will not be used by the Honors Concentration due to restrictions placed on sensitive information by IERP. However, this research project was still a valuable learning experience from a computer science perspective as well as an interdisciplinary perspective.

The main challenge of this project from a computer science perspective was creating a system that was almost entirely self-sufficient. It is very difficult to design a system that will allow people who do not know how to program to maintain the system as requirements change. This is because changing requirements almost always require the code to change, and it is difficult for people who cannot program to rewrite code. If the system was not designed to be flexible with regard to changing requirements, there could be serious consequences. If the Honors Concentration tried to maintain a less flexible system, it would be necessary to hire a programmer to make changes when needed. If the system was designed without flexibility in mind, the programmer working with the Honors Concentration would have a very difficult time trying to extend its functionality. If the system was entirely rigid, the worst case scenario would be to discontinue use of the system in favor of a different, newly-made system. This would render the system useless, and the time spent developing it would be more or less wasted.

In hopes of preventing negative consequences, I designed an application that provided the basis of a content management system without making any assumptions about the structure of its database. In general, I developed a pattern from which all of the necessary web pages, database tables, and data manipulation code were generated. As a result, the system that I designed requires no maintenance of the code itself. This process honed my skills for generalizing a

problem and designing flexible software solutions, which are critical skills in the software industry. This design for the application makes it unnecessary for someone to change the code that manipulates the data as long as the data is properly organized in the database.

Although my design for the system itself prevented users from having to change the way that the Honors database application handled data, it is still necessary to modify the code to store new types of data in the database. For this reason, I designed utility scripts that make changes to the code for the user when provided with minimal information. This information usually includes the name of the table to be changed and the names of any columns that are to be changed or added. For example, let us assume that the user wanted to add a new table to store people in the system where people had a first name, a last name, and an address. Let us also assume that the user wanted the menus that listed people in the database to identify them by their first name and last name. To add this table, the user would run the utility script:

```
rake add_table person {first_name} {last_name} address
```

That simple command would make the table that the user had in mind, and it would also generate all of the code necessary for the application to manipulate and display the data in this new table. Note that `first_name` and `last_name` are surrounded by braces. This signals the script to generate code that will use those attributes for identifying people rather than other attributes like `address`. Clearly, this solution is much simpler than requiring the user to modify the code without help.

From an interdisciplinary perspective, this research project helped me to hone my communication skills and improve my ability to solve problems that do not involve programming. Over the duration of this project, I spent a lot of time explaining the design of my application with diagrams and without relying on my audience to have a computer science

background. This is very important in the software industry because software developers often have to explain the design and functionality of their applications to their project manager, the design team, clients, and other people that will not necessarily have a background in computer science. I also helped the Honors Concentration to work with IERP to help provide the best solution possible. It was necessary to meet with the Honors Concentration and Web Service as well as people at Network and Systems Services to discuss the best way to provide the Honors Concentration with a viable software solution. In the real world, ensuring that the job is done as well as possible is always a priority. Sometimes the best solution is to pass work off to another person or group that is better equipped to handle it. In the case of my project, I solidified the goals, but IERP was better equipped to create an application that served the Honors Concentration's needs while protecting sensitive information. In short, this project was an example of one that required the help of another group, which is a very common scenario in the software industry as well as nearly every other professional setting.

Although my project will not be directly used by the Honors Concentration, it was a valuable project because it extended my education and provided the Honors Concentration with the best solution to their problem. The solution currently being developed by IERP is a result of the discussions that my research project produced. My research project also improved the quality of the final solution by solidifying the requirements for the overall project through many reviews of the application design and prototype. By playing an active role in this project, I was able to help the Honors Concentration to get closer to digitizing their application process. I also gained experience in establishing the requirements for real-world software applications and revising the design to accommodate new requirements. This experience will be very valuable, because it is very rare to start a project with clearly defined requirements that do not change.

Overall, this research project is worth of Honors course credit because it benefitted my education, will help the Honors Concentration to digitize their application process, and will serve as valuable experience in my desired career field.