

MEDICAL CODING BANK



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Tokimo Vyas | Mercer University Informatics | Capstone

This project was completed for the Mercer University B.S. of Informatics Capstone program under the guidance of Dr. Feng Liu.

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TOKIMO VYAS | MERCER UNIVERSITY INFORMATICS | CAPSTONE

1 | PROJECT OVERVIEW

The goal of this project was to explore a research area relevant to the Health Information Technology concentration of the Informatics program here at Mercer University that also had the potential to be a marketable product.

1.1 EXECUTIVE SUMMARY

The field of Health informatics is vast. Topics range from the organization and management of data to the management and development of systems used to manipulate health related data. This project focused on developing a system to provide learners with an option to practice and learn how to code medical records using real-world scenarios.

1.2 ACKNOWLEDGEMENTS

I would like to take the opportunity to thank Dr. Feng Liu for her guidance in navigating me through the Informatics Capstone course. Additionally, I would like to extend gratitude to Danielle Thrower and Stephanie Chapagain for assisting me in validating the system development by providing their feedback regarding topics of usability.

1.3 BACKGROUND

Medical coding in its simplest terms is the translation of medical procedures and diagnoses which have been documented in a medical record into a standardized set of medical codes which are then submitted to a payer for reimbursement. These codes are generally in the form of procedure codes, diagnosis codes, and other classes of codes such as those classified as Healthcare Common Procedure codes.

As a profession, medical coders typically must be certified in order to get a job in the field. The two major certifying bodies are the AAPC (American Academy of Professional Coders) and AHIMA (American Health Information Management Association). While this profession may seem new due to its recent explosive growth, it has been around in some form or another since the 17th century. In recent times, the profession has continued to see steady growth each year since 1995. According to the Bureau of Labor Statistics, this profession, which is included in the Medical Record and Health Information Technicians category, is expected to grow at a rate of 13% from 2016 to 2026, faster than the average for all occupations. Part of the reason that the profession is expected to grow is due to an aging population which will require more health services, an influx of data with the addition of different types of health records requiring management as a result of the introduction of electronic health records (EHRs), and the surge of illnesses such as cancer, requiring registrars with specialized skill sets to categorize illness related data.

Neither the AAPC nor AHIMA freely publishes exam certification details, but they do provide self-study material and there are a host of organizations that offer class room and online exam preparedness courses. It is possible to get an associate's degree in Medical Coding at some institutions as well as learn on the job. More often than not though, people are desiring to enter the world of medical coding as a result of working in another sector of the health information industry, or through being exposed to it by someone that already does the job. In this case, these individuals likely won't have enough experience to pass the certification exams without a great deal of practice and exposure, no matter how well versed they become with the resource manuals they will need in order to get through the 5 hour certification exam.

The questions on the exam provided by AAPC are multiple choice which makes it possible for someone to conclude a correct answer through the process of elimination although they do make the questions quite tricky through nuanced minutiae. AHIMA's exam is a combination of multiple choice and fill in the blanks.

The problem for this group of individuals is that without real world experience, it will still be difficult for them to understand what is included in a medical case, medical record, or operative note. Many testers want to be prepared as possible before and after the exam by being exposed to as much realistic information as possible.

There are few resources online to support this endeavor. A fairly intense search yielded sites with merely a handful of medical cases with answers, while some organizations will put forth challenges on a weekly basis which doesn't really help a person that is planning to take the exam in a specific time frame.

The more operative notes and medical records that a tester can code, the more likely they will begin to understand how they are typically formatted, all of the complexities involved in a procedure, what some of the lesser known medical abbreviations are, as well as be exposed to many common procedures and medical terminology. This is important because medical codes are not quite straightforward and contain quite a bit of detail that differentiate them from one another. If the wrong code is picked it could be the difference between the physician getting paid or the physician being audited.

The gap that exists could be filled by the medical coding bank, a website dedicated to providing hundreds if not thousands of medical coding practice cases across all surgical specialties, including answers as well as rationale for those answers. Users would then get a simulated feel for what it is like to work in a medical coding setting as well as improve their medical coding skills.

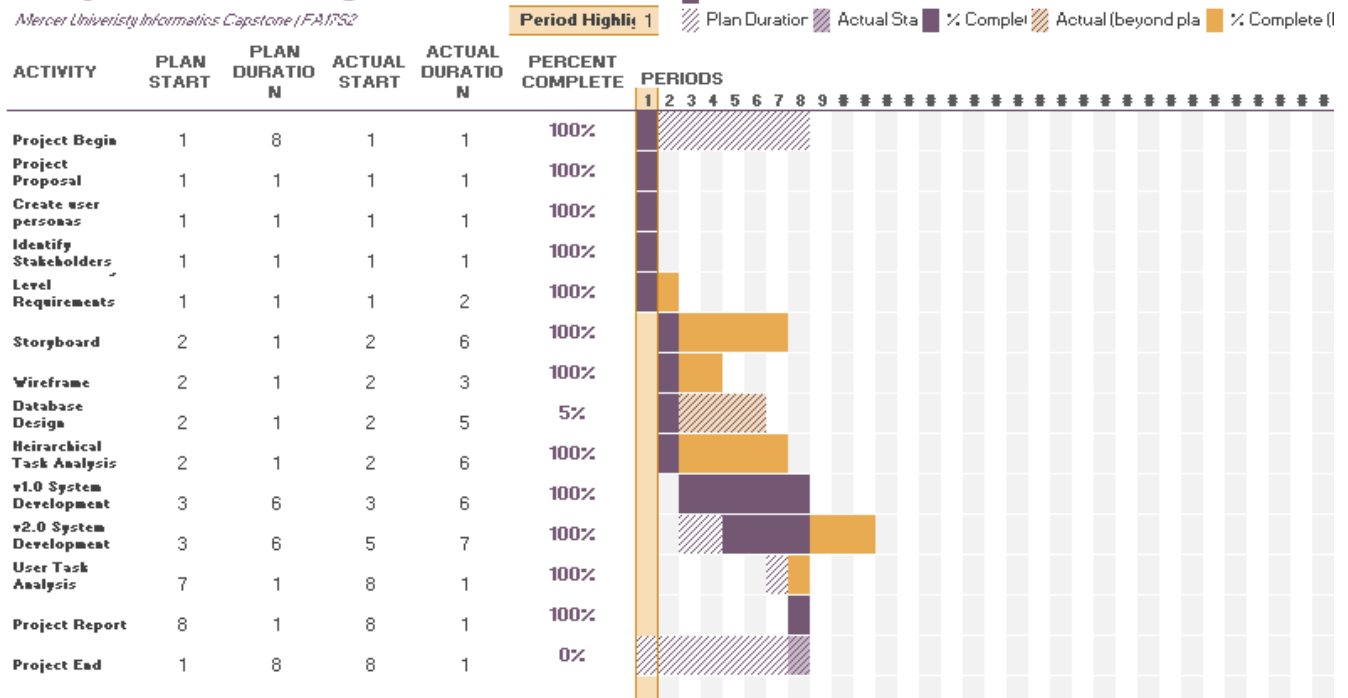
2 | PROJECT PLANNING

This project took place over an 8-week period from October 19th through December 16th 2017.

2.1 PROJECT OUTLINE

Capstone Project Plan

Mercer University Informatics Capstone / FAITS2



2.2 STAKEHOLDER IDENTITY

In this case, three main stakeholders have been identified:

- **Users**

Goal: To register for access to the medical case training module, complete coursework, and discuss cases with other users. They want the system to be easy to use and have access to the information they need in order to prepare for their certification exam.

- **Instructor**

Goal: To create and manage product content, suggest updates to the medical cases in the system, and respond to student inquiries. Would like an easy way to communicate with the students.

- **System Administrator**

Goal: To manage user accounts, update the medical cases in the system, keep track of student registration, manage subscriptions, and manage disputes. Would like an easy way to manage the cases in the system.

3 | SYSTEM DEVELOPMENT

Though the site is small in terms of how many functions it performs, the information that learners will have access to will be extremely comprehensive. The highest level requirements of the system include:

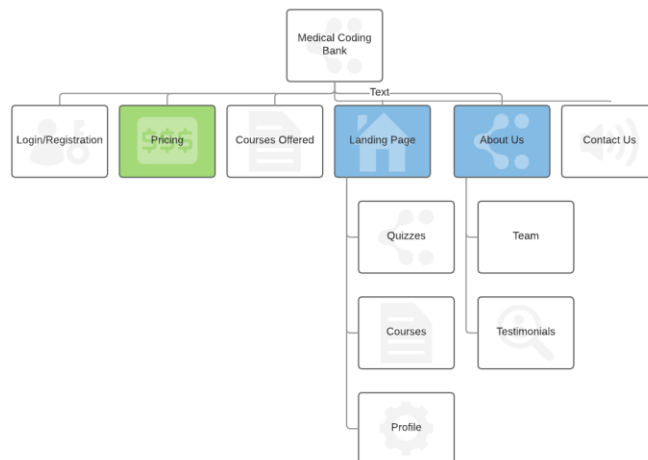
1. The ability for learners to create an account secured with credentials
2. The ability for learners to select study material independently
3. The ability for learners to communicate directly with staff and other site members
4. The ability for instructors to create and manage courses and quizzes
5. The ability for instructors to respond to learner inquiries
6. The ability for system administrators to make mass updates to course material
7. The ability for system administrators to manage learner access and profiles

The following sections outline the system development requirements implemented based on user analysis.

3.1 SITE STRUCTURE

MEDICAL CODING BANK

tokimo | December 9, 2017



3.2 USER PERSONAS



JACKIE BERGER

Jackie is a 38-year-old, recently divorced, mother of two children. Prior to her divorce, she was planning to obtain a Master's degree in Public Health. She currently works as a QA Analyst for a fortune 500 company. She commutes for a total of 3 hours to and from work. Her job does not offer much flexibility in terms of work-life-balance, so she is having difficulty managing the demands of her children's schedule.

She is currently looking for a work situation that will allow her to work from home so that she can facilitate getting her children involved in extracurricular and enrichment activities.

She has no training in medical coding, but is familiar with the concept. As a software QA Analyst, she is very technologically savvy.



CONNIE PELIKAN

Connie is 27 years old. She is single with no children. She has worked as an office assistant in a doctor's office for the past 5 years. She has a certificate in medical anatomy and terminology. She is familiar with the basics of medical coding but she has no practical experience. She would like to transition to medical coding within her doctor's office and has decided to take a self-study course to brush up on her skills. She is very familiar with using a computer.



MELISSA AVENUE

Melissa is an instructor at the Medical Coding Bank. She has been a certified medical coder for 10 years, but is new to the role of instructor. She is very competent with technology and feels comfortable using a computer to carry out her tasks as an instructor.

3.3 SCOPE

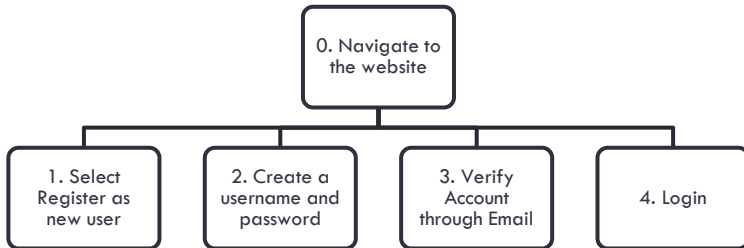
The following items are what's in scope for this project.

- Account creation and maintenance – the ability for users to create an account from the landing page of the site as well as reset passwords
- User self-enrollment – the ability for users to access medical cases and quizzes independently
- Data storage and retrieval – the ability to create and publish quizzes and courses
- Data retention and maintenance – the ability to update and retire quizzes and courses
- User Profile management – the ability for users to access and update information on their own profile
- Communication – the ability for learners, instructors, and staff to communicate with one another

3.4 USER REQUIREMENTS

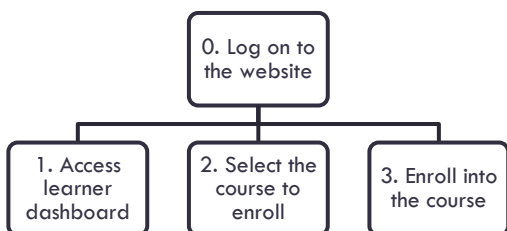
The following requirements outline things that the system needs to be able to do as a result of user input, along with a brief scenario outlining an example of how the user might conduct the described activity.

3.4.1 REGISTER AS A NEW USER



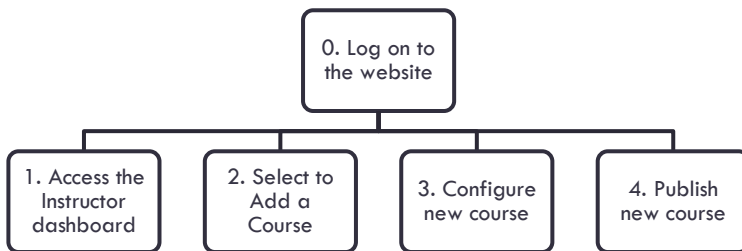
Requirement ID:	1
Purpose:	This function allows the user to log in and gain access to the system.
Inputs:	The user creates credentials consisting of an email address and password combination or logs in via a social application API such as Twitter, Facebook, Google+, or LinkedIn.
Process:	User credentials are stored and a profile is created for the user.
Outputs:	User gains access to the system by entering their credentials.
<p>Example Scenario: Jackie wants to become a member of the medical coding bank. She accesses the website and registers as a new user. She opts to create an account using her email address and a password.</p>	

3.4.2 ENROLL IN A COURSE



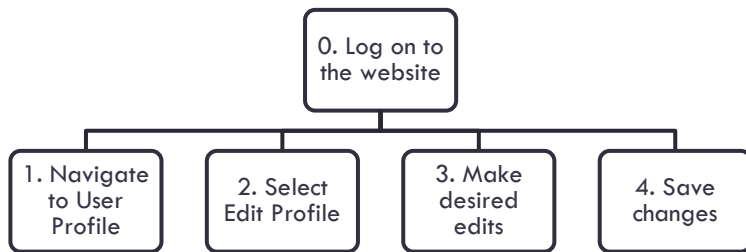
Requirement ID:	2
Purpose:	This function allows the user to pick which areas they want to study without having to request access to it.
Inputs:	The user selects what they want to study.
Process:	The system applies the selection to the student profile.
Outputs:	The user is presented with the study selection so that they may begin their study.
<p>Example Scenario: Connie wants to test her knowledge on Cardiology Coding. From the available course list she selects the course she wants and is directed to her dashboard which now displays her course selection.</p>	

3.4.3 CREATE A COURSE



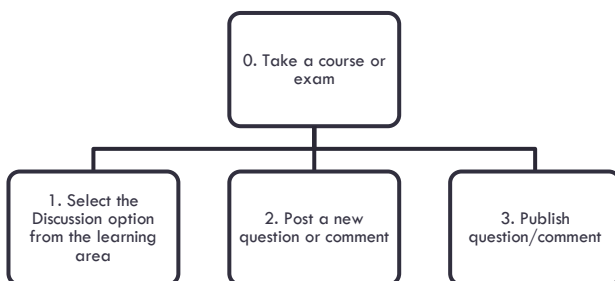
Requirement ID:	3
Purpose:	This function allows instructors to author courses and quizzes.
Inputs:	The instructor accesses the Add Course section on their instructor account dashboard
Process:	The system provides a course form with steps to guide the instructor to authoring and publish the learning material.
Outputs:	The newly published learning material is added to the existing list of available courses.
<p>Example Scenario: Melissa Avenue is an instructor. She has created a new set of questions that she would like to add to the testing bank. She accesses the system and is able to create a new group of test questions that are automatically added to the test bank at large.</p>	

3.4.4 UPDATE USER PROFILE



Requirement ID:	4
Purpose:	This function allows user to update their profile information such as name, contact information, and password resets.
Inputs:	The user accesses their profile from the navigation menu and edits the existing content.
Process:	The system stores the new information provided by the user to the user throughout the system.
Outputs:	The changes are visible to the student immediately.
<p>Example Scenario: Jackie Berger was married when she started her training. As she has since divorced, she changes her old name from Jackie Sandwich to her maiden name, Jackie Berger. As a result, the system now displays her updated name and any materials she receives will reflect her name change accordingly.</p>	

3.4.5 DISCUSS EXAM QUESTIONS WITH PEERS



Requirement ID:	5
Purpose:	This function allows user to ask questions or begin a discussion on the specific learning area.
Inputs:	The user selects the discussion option and posts a question/comment to the group.

Process:	The system creates a new post on the discussion form
Outputs:	The new post is displayed on the discussion form and is visible to all learners accessing the same learning area.
Example Scenario: Jackie has encountered a question that she thought she had answered correctly based on what she knew so far, however, the system indicated that her answer was incorrect. Because she still found the rationale to be a bit confusing, she posts a question in the discussion area to see if others were having a similar experience.	

3.5 DEVELOPMENT LIMITATIONS

Version 1.0 of the system included a requirement for a mechanism which allowed learners to log on to the system and enroll themselves into courses. Due to the time constraints of the course which did not allow for PHP/MySQL integration, the login and registration functionality is simulated through a workaround identified by a Demo Login button. Similarly, the medical cases and quizzes are predefined and users do not have the option to Enroll into a specific course. These limitations were addressed in version 2.0.

4 | USABILITY METHODOLOGY & USER EXPERIENCE

To determine the usability of the system as designed, user input was gathered through a process of usability testing with observation and a survey. The users were provided with a list of tasks and asked to speak out loud during the process so that their output could be recording without intervention.

4.1 USABILITY GOALS

When the system was designed the biggest goal was for the system to provide an easy method of access for learners. The registration and self-enrollment process should be intuitive so that it is obvious to the user what the function is of each section available. The navigation and sub-navigation menus should be constrained so that users do not lose their way between sections. The user interface should have plenty of white space so that all sections are apparent.

4.2 USER EXPERIENCE GOALS

Users should walk away feeling as though their interaction with the site was pleasant and minimal. The pages should interact with each other seamlessly and it should be very easy to move from one section to another. All information on the site should be clear and concise so that users can easily determine what they should do or where they should go in order to execute their desired tasks.

4.3 USABILITY TASKS

High level usability tasks include:

- Registering on site as a new user
- Logging into site

- Taking a quiz and review answers
- See Medical cases and answers
- Create a discussion post
- Log out of account

4.4 USABILITY ANALYSIS & OUTCOME

The same task list was used for both v1.0 and v2.0 of the medical coding bank website. There were some tasks the user would not have been able to perform in version 1.0 that should have been resolved by the 2.0 version.

The reason that usability testing and a survey was chosen is because this project is website based. Most people use websites on a daily basis and are very expressive when attempting to do tasks when they don't work. Good website design generally functions without issues, so this method would help to uncover any potential gaps users might encounter based on the way that they approach using the site. As a developer, you can assume what you think a user might do, when in reality, they may attempt to perform some very unexpected actions.

In this case, both versions were presented to the users for testing and it was very clear that version 1.0 was missing some functionality that would have made it much easier for a user to navigate. This was expected. Version 2.0 was met with much more success and yielded much more positive remarks regarding its usability.

5 | CONCLUSION

Though the test on version 2.0 was mostly successful, particularly as it pertains to the student profile and the overall layout of the product. However, there is still room for enhancements. The testing capability is currently very basic and could use a revision so that the test engine is much more dynamic. In order to achieve this, additional development is necessary. There will need to be custom PHP development in order to strengthen the test engine which will make this product stand out from similar applications.

5.1 SYSTEM REVISION

Version 1.0 was hand coded and allowed the user to choose between taking a test and practice coding medical cases. There was no PHP in the backend, so all of the testing data was hard coded which would not support the requirement for a true test bank, nor would it support the requirement for maintaining logins, student progress, or allowing students to manage their profiles.

Version 2.0 was configured using existing technology which allowed for a smoother user experience compared to version 1.0. There is a fully functioning test bank and the system has all the tools built in to manage membership accounts. However, as mentioned, the testing engine still does not meet the requirement although it does a much better job aesthetically than version 1.0. Additional details about enhancements to be included in a version 3.0 release are in section 5.2 below.

5.2 FUTURE ENHANCEMENTS

Version 3.0 enhancements should drastically improve this product. Some changes that will be implemented are:

- A method for users to be able to measure their competency by capturing the % of correct answers based on goals created by the student. Example scenario: Cardiology coding is a difficult surgical specialty to code. A learner will have the ability to create a practice set of cardiology coding and the system will capture how many of those are correct and provide a visual representation to the student so that they can see how competent they are based on that practice set.
- Users will be able to mark cases as difficult to return to them for additional practice. In this case, users will be able to mark a case that they want to return to and they will be kept in a queue (similar to the notion of adding something to 'Favorites') so that the user can easily access them for additional practice. The system will also have the capability of capturing cases that all students have marked as difficult based on the difficulty voting system and will automatically categorize them as difficult based on an algorithm to be defined by number of votes and number of correct/incorrect answers.
- Currently, the system only allows users to take courses/quizzes based on individual modules posted by Instructors. In the future version, students will be able to create their own quizzes and practice sets based on criteria available such as medical specialty, type of question, and difficulty.
- Users will be able to create timed quizzes to include the number of questions as well as the specific time they'd like to allocate to that number of questions in order to simulate a certification testing environment.