# MMI 498 Reflection: The Final Piece

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As I approach the conclusion of my Master’s of Medical Informatics (MMI) program at Northwestern University, it is time to reflect back on the program and assess the learnings I will take away with me. This reflection paper will provide a review of each piece of the puzzle from entering the MMI program, the courses completed to reach this point focusing on key learnings from each course as well as correlating this experience to my current and future career plans. I found my path through this program to be much like a puzzle, each course acting as a piece of the puzzle, providing answers and requiring proficiency, and often linking back to prior or upcoming courses. The commonality was each course lead a step closer to the big picture of obtaining an MMI degree and leading to enhanced professional growth.

I began my pursuit of the MMI degree in an attempt to address career questions. Where am I today? Where am I going? Where did I want it to end? My career started as a Registered Nurse after completion of a diploma program with my areas of specialization in pediatrics, pediatric critical care, and neonatal intensive care. It was my return to school to complete a bachelor’s degree when I had my first experience with computers. That one computer class sparked an interest that lead to my pursuit of gaining experience in the arena of information technology (IT). After completion of my bachelor’s degree, I took a position with a national vendor offering my first opportunity to participate in the design and implementation of hospital systems. After what one might view as career confusion, going back and forth between clinical and IT positions, I concluded my path was in the world of IT. This revelation hit while working in the area of quality management requiring manual abstraction of data from records and I knew there was a better way. I pursued acceptance into the MMI program at Northwestern University. Having strength in the clinical arena, I was admitted and placed on the technical course path.

Recognizing that my experiences left me technically weak, my plan of attack was to tackle the technical courses, CIS 313 and 317. Dr. Faisal Awwaki instructed the first course I took in the program, CIS 317 Introduction to Databases. Although I had past experience as an analyst collecting and documenting specifications as well building systems using software specific tools, database management was beyond the scope of my experience. Objectives of the course were to gain an understanding of database management including how data is organized and abstracted as well as how databases are designed. In the beginning of the course, we were walked through basic concepts about databases including theory and structure with the key learning to understand relationships of attributes making up the database structure and master the business rules that apply to the relationships. These concepts and skills were critical to completion of the final project of this course, building an access database. The learnings were reinforced by completing exercises requiring application of Armstrong’s Axioms principles to determine dependencies in relational databases. The exercises grew in complexity throughout the course. This lead to our final project requiring use of the knowledge acquired, applying it in a three-phased approach to building a database. In phase one, the objective was to identify the tables required in the database, which lead to phase two, building the schema. The final phase involved interpreting the schema into an access database that offered standard reports and queries. The learnings of this course are a key component to the responsibilities of my current position, which I will discuss later in this paper.

I began CI7 in great fear of how lacking I was in technical knowledge and was pleasantly surprised how much I enjoyed the course. I found the analytical reasoning and practical experience with the database to be challenging while providing me a feeling of great accomplishment. Having overcome my technical fears, I proceeded to CIS 313 Networking and Telecommunications. The objectives of this course were to understand the Open Systems Interconnection model (OSI model). Simply put, it is a means of dividing communication systems in layers. Each week was dedicated to specific levels of the network and components in that level required to build a network. The knowledge gained was put into action as we built a network for a given scenario addressing each level and component taking into account all aspects of the network from cabling/wiring to hardware such as servers and routers to security. The outcome was a complete schematic and paper explaining each component and rationale for the decision made in building the network. Although I found the course to be informative, I learned that this takes an expertise beyond my passion not meeting my desired path. I did however gain a new respect and appreciation for the impact a network has on an organization and how critical planning not only for the immediate needs of an organization but future objectives as well.

After completion of the technical courses, I changed focus moving into the core classes of the MMI program. Although I did not take these courses in numerical sequence, for the purposes of this paper I will present them in order. Introduction to Medical Informatics (MMI 403) was the first in the series with the primary objective to introduce the discipline of medical informatics. The course met the objectives by providing a high-level overview of many aspects in informatics that I would be obtaining more in depth knowledge of in future courses. Some specific areas included how medical data is utilized in the clinical, administrative and financial areas as well being introduced to software applications including decision support, EMR’s, PHR’s, web based applications to name a few. In addition, it was my first introduction to the concept of regional health information organizations (RHIO) and health information exchanges (HIE). The theories and concepts gained through this high-level overview provided an understanding of the focus on outcomes management and data analytics specific to research. This course allowed me to demonstrate my knowledge both in the “classroom” and in the work environment.

Competency in 403 was demonstrated through completion of homework assignments requiring application of theories discussed as well as readings and research. Another competency involved writing a business case for addition of a new service in a hospital, in my case, virtual colonoscopies. In addition to being provided scenarios to apply the learnings, I was offered the opportunity to evaluate software applications within my work environment. At the time I took this course, I was in process of providing recommendations based on analysis of the OB system utilized in the hospital I was employed. The learning affected the outcome by providing information and recommendations on areas such as decision support I may otherwise have over looked. In addition, although privacy and ethics are not new or unique to healthcare, it provided a reminder to me affecting what data would be discussed or shared regarding my findings.

MMI 404 Health Care Operations provided reinforcement and theory that applied to knowledge I had acquired through employment in healthcare nearing thirty years. The objective of the course was to develop knowledge on hospital operations, which included review and development of staffing models, dashboards, and the role and function of the Board of Directors. Working knowledge was obtained through practical application. Practical application was evaluated through development of a staffing model for the surgical area. Having worked in quality, I had the opportunity to provide data for report cards obtained through data abstraction and calculations of percentages representing compliance with best practice guidelines. In this course, I had the opportunity to develop my own dashboard representing nursing operation measures accounting for clinical and financial factors. The final project for this course required applying our knowledge of management teams and Board of Directors. Given a specific scenario, a small team determined the most appropriate approach to influence the board of directors on the advantages of adding a new service to their existing organization. I had the opportunity to work with a team of my peers convincing the board of directors to consider acquisition of an eICU. This experience was similar to a real life situation I had requiring me to convince the Board of Directors to add an additional service for the purpose of recovering denied outpatient claims by insurances. It was through in-depth analysis the problem was defined including the extent of its existence that the team could offer data supporting a return on investment to sponsor the project.

Healthcare Information Technology Integration, Interoperability, and Standards or MMI 405 paved the way for the future direction of health information systems.In the prior courses discussed, we were introduced to healthcare reform and more specifically meaningful use. I bring this to light because the idea behind integration, interoperability and standards will be key to success as more people gain health coverage and more healthcare organizations build their IT infrastructure. As most are aware from personal experience, more care is moving to outpatient settings. The outpatient setting may be a surgical center, physician’s office, or clinic. Regardless of the setting, a visit to these locations may lead to indirect interaction with other healthcare providers such as radiology centers and laboratories. I use this example to demonstrate the criticality of integration and interoperability. The services provided require communication back to the ordering provider and more importantly must be linked to the patient record. Taking these learnings a step further, I was able to tie it to principles learned in MMI 403, specifically RHIO and HIE and the importance of other providers obtaining access to testing and results for the purpose of efficient and timely patient care, cost reduction and coordinated care. In addition to the communication amongst providers, standardization is the means of ensuring communications are possible especially in the case of RHIO’s and HIE’s that send and receive information from disparate systems at multiple facilities.

Mastery of knowledge in this course was demonstrated by providing a team presentation and paper requiring us to design the information architecture for an integration specialty. Included considerations were stakeholders, business needs and standards, type of information systems including diagrams of the proposed architecture, data elements, and integration among disparate systems. My group developed a RHIO incorporating physician offices, hospitals, surgical centers, and outpatient laboratories for a rural area. In addition to the group project, I was able to incorporate the learnings from my workplace analysis of the OB system identifying gaps or potential risks along with recommendations for resolution.

MMI 406, Decision Support Systems and Healthcare refers to a class of knowledge-based information systems used in healthcare to assist in making clinical decisions for patients taking into account such factors as co-morbid conditions. We were afforded the opportunity to familiarize ourselves with benefits and limitations of the systems through use of the application TreeAge. Realistic scenarios were provided and utilizing our clinical knowledge, we mapped the scenarios and ran analysis to determine best outcomes for the given scenario. The objective of the exercise was to demonstrate how to apply the science of decision analysis and provide the foundation to application of the knowledge to real-world patients. As I progressed through the course, I learned the difference between rule-based learning and machine-based learning and the correlation to decision support systems. Bayesian probabilities were reinforced from biostatistics, which was prerequisite to this course. I found the learnings later in the course applicable to my work experience. Focus was placed on evidence-based medicine and the role it plays in decision support systems. The readings and discussion included policies to be considered as well as implantation, and supply and demand. I was in a position working with physicians developing and implementing evidenced-based orders and documentation templates. When developing evidenced based components of a system, edits or rules, which guide the physician making decisions, are critical. Prior to the course, I did not correlate the work I was doing with decision support. I learned that many of the decisions clinicians make on a daily basis are based on the concepts of decision support but the documentation and implementation of all the knowledge is the challenge.

To date, I have not completed course work for Legal, Ethical and Social Issues in Medical Informatics (MMI 407), however, having an extensive background in healthcare, there are legal issues that are all to familiar such as HIPAA. Taking into consideration learnings from the prior courses, I realize that there is more than HIPAA when considering legal aspects in medical informatics. Reflecting on the idea of RHIO’s, HIE’s and the integration that involves multiple health systems competing for business brings to mind many legal concerns. In addition, many legal concerns come to mind as we transition to the world of web based personal health records. I anticipate obtaining insight into these issues as well as possible discussion around the HITECH act and more.

**MMI- DL Course Syllabus**

As I mentioned earlier, I did not take the courses in sequential order. MMI 408 Medical Technology Acquisition and Assessment was one of the last courses I took prior to Capstone which, although was unintentional, found to be beneficial. The objectives of this course were to gain further understanding of hospital operations and more specifically as they relate to making decisions in acquiring technology to improve operations. Measurement of my success in the course was through a group project with a phased approach reflective of acquiring systems in “real life.” We began by defining the requirements or Statement of Work, followed by the Request for Proposal (RFP), Vendor Selection and finally contract negotiations. Contract negotiations involved a simulation of actual concerns presented by students representing each side, vendor and client. This approach to the course allowed to us to apply not only learnings from lecture and discussion but from reading “Getting Past No: Negotiating in Difficult Situations” and “Software Agreements Line by Line: A Detailed at Software Contracts and Licenses & How to Change Them to Fit Your Needs.”

I found the project in MMI 408 not only beneficial in reinforcing the learnings from this course but utilizing acquired knowledge from prior course work specifically relating to healthcare operations (MMI 404) and the integration and interoperability courses (MMI 405). Although I had not completed the leadership course, I can now reflect back and tie in aspects of that course as well such as knowing your audience, a beneficial skill when attempting to gain their trust and buy in when investing in technology.

Prior to taking Biostatistics and Medical Informatics (MMI 409), I questioned the correlation between statistics and medical informatics. Through my years of schooling, I enjoyed math but like many people feared statistics. The objectives of this course were as follows:

 Gain a conceptual and theoretical understanding of statistical methods utilized in

 research methods including hypothesis testing, estimation, t-tests, chi-squared

 tests, variances, linear regression, and nonparametric tests. Analyzing data with

 SPSS statistical software and drawing meaningful inferences from data.

 Determining appropriate use of statistical methods for given research situations.

Evaluation of our learnings was through weekly Readiness Assessment Tests, fondly known at RATS, a comprehensive final examination and participation in discussions. Although I agree the RATS and final exam were a measurement of our understanding and application of knowledge, I found discussions related to readings in the book “More Damned Lies and Statistics: How Numbers Confuse Public Issues” most enlightening and can be applied to everyday life. As I watch and listen to news, concepts of this course leave me evaluating the accuracy of what is being reported as well as evaluating the desired direction the audience is being persuaded to believe.

After completion of the course, I could not imagine how I personally would utilize this information in my career in medical informatics. To my surprise, I find myself working in a position in data analytics that requires understanding and utilization of statistics daily. In my current role as Project Manager/Research Lead, I am required to understand these concepts in order to provide accurate reports on hospital outcomes in national studies but also the ability to document methodology and specifications requiring statistical calculations to support study results. The most frequently used statistics is z-scores and probabilities.

Leadership and Organizational Change (MMI 481) was my final core class prior to Capstone. This course was divided into four areas of focus: organizational culture, managing change, organizational alignment, and influence. The objective was proving the ability to apply theories behind each area to our readings as well as our own personal and practical application. This was accomplished through reflection papers for each area of focus as well as a project identifying a real life situation. The project allowed for analysis and application of the material to areas of our choosing. I selected evaluating the impact of publically reported data on health care organizations and the impact on culture.

I will summarize some key learnings from each module of the course because I believe this course is applicable to any organization I may work now or in the future. I also believe it can be tied back to any course in this program and had I taken it earlier may have altered the outcome of other projects. The first module was organizational culture. I learned the components that define culture: assumptions, beliefs, values, language, and behavioral patterns. Taking it a step further I gained a deeper understanding of artifacts, espoused beliefs, and assumptions. In addition, I learned about group evolution and the impact leaders have on culture.

The module on managing change gave insight on the concept of vital behaviors. The means to ensure vital behaviors are defined in the model known as the six sources of influence. This model demonstrates strategies to drive change through motivation or ability. The three sources that further define the strategies include personal, social and structural. Organizational change, how and why people react to change was another important aspect of this module. Having this knowledge prior to presenting to a board of directors as we did in MMI 404 or negotiating in MMI 408 may have altered my approach addressing issues such as resistant behaviors ultimately affecting the desired outcome.

Influence was the final module, which applies to our everyday lives. Put in simple terms, this entails having an understanding of what the customer or decision-maker knows and using the areas of weakness to influence a purchase or decision. Taking this concept one-step further, leaders fall into decision-making categories and the category they most resemble drives their preference for how information is presented and an expected timeline for decision-making. These learnings provided an understanding and critical skill beneficial in courses like Health Care Operations (MMI 404) and Medical Technology Acquisition and Assessment (MMI 408). Both course projects required the ability to influence leaders in a direction favoring your proposed solution for the given scenario each requiring investment for the organization.

Now I give you the final piece, Capstone (MMI 498), which is the course that pulls all the pieces together. The objective of Capstone is to demonstrate knowledge and skill in medical informatics. These objectives are demonstrated through completion of two assignments, development of a web based portfolio and a team project. The web-based portfolio offered the opportunity to demonstrate learnings through this reflection and posting artifacts. This allowed me to share what I learned, how mastery of skills were measured and applied academically and professionally, and where I may focus my career in the future. The team project for Capstone offers opportunity to apply the learnings to client-based situations seeking professional recommendation. My team project offered the opportunity to participate in the development and recommendations for implementation of a patient centered medical home in Chicago affiliated with Feinberg School of Medicine. Patient Centered Medical Homes are the focus of where health care is headed and success of these practices are based on technology implemented to support complete communication. Although the course has not reached completion, a post of artifact to this web portfolio will occur shortly after completion of course work (after Dec 1, 2010).

As I progressed through the program, I viewed this process much like a puzzle. Each course offered new learnings frequently tying back to knowledge obtained in prior courses resulting in a deeper understanding. In addition to tying the courses together, I had the opportunity to apply relevant information to my work environment representing growth academically and professionally. As I mentioned earlier in this paper, evaluating an OB system in addition to review of documentation for quality and data collection was one example that offered opportunity for application of learning in the “real world.” As I moved into a role working with physicians on CPOE, physician documentation, and pharmacy applications, decision support began to become an obvious piece of the puzzle to understanding how evidenced based practice guidelines should be implemented. Successful installation as well as issues to avoid, such as alert fatigue, was a take away from Decision Support that could be applied. Decision support was not the only course that was beneficial but similar to my prior experience with the OB system, integrating with other components of the system as we learned in Integration, Interoperability, and Standards was critical in preventing duplicate documentation and physician dissatisfaction. In addition, making recommendations to physicians that may affect workflow or any change perceived as affecting their workload requires understanding of hospital operations. It was through courses such as Networking and Communication, Introduction to Medical Informatics, and Integration and interoperability that provided insight, knowledge, and skill that I could apply to system evaluation. As I have learned, each course is a piece of the puzzle and each puzzle piece completes the picture and success of any IT project.

I mentioned earlier my doubt utilizing biostatics in my career endeavors. Much to my surprise, I find myself working in data analytics. This path has provided opportunity to use clinical knowledge, primarily related to hospital quality, my understanding of databases including data abstraction and system documentation, and biostatistics. Once again, I find the interrelationships between courses in the MMI program and real life experience.

*Why am I doing this program?* The answer to this question that I have been asking myself throughout the nearly three years that it took me to complete this program has now become clear. Along with applying my newly acquired knowledge from this curriculum to work experiences as discussed earlier, I have also taken away skills that go beyond the “classroom.” Many other skills that I believe some students may over look are necessary for success in today’s work environment that we learned to manage. For example, how am I going to do a project with another student three hours away and working midnights? How I am going to write a paper with a group of people I do not know, all with different backgrounds and experiences and styles? With the advancement of technology, employees’ working remotely is on the rise. In addition, if you work for a large national or international company, you may not all be in the same room, time zone or even the same country and therefore meetings are adjusted to accommodate the situation. Much like real life, this program teaches compromise, acceptance, and adaptability. In closing, although I enjoy my current role in data analytics with a focus on patient safety and quality in healthcare, IT is a rapidly growing and dynamic area, so I will keep the path clear and be open to opportunities that lead to support of quality and safety for all patients in the world of healthcare.