

2008

Hospital for Special Surgery



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Introduction

This thesis is the final report on our case. The case study was performed during Module 8 – Information & Process Modeling and was about the Hospital for Special Surgery (HSS).

Hospital for Special Surgery

The HSS is one of the major players in the area of musculoskeletal healthcare, and its *mission* is to impart their knowledge to other hospitals not only to meet the institution's mission of improving the quality of care for patients around the globe, but (also) to further HSS's status as the worldwide leader in musculoskeletal treatment and ensure that HSS made the best use of its limited resources. The patient is situated in the center of the healthcare process and the *vision* of HSS is to lead the world as the most innovative source of medical care, the premier research institution, and the most trusted educator in the field of orthopedics, rheumatology, and their related disciplines (1).

The HSS is founded by Dr. James Knight in 1862. The Hospital for the Ruptured and the Crippled flourished under doctor Knight's leadership. He embraced the Expectant Treatment concept; a concept that emphasized on sunshine, fresh air, diet, exercise, electrical stimulation and gentle rehabilitation. Ironically Dr. James Knight was not an advocate of surgery (only in extreme cases). His successor – Dr. Virgil P. Gibney – will open the first operating room and would like to change the local center into a international renowned center for the treatment of musculoskeletal diseases.

In 1940 the international intentions will become more recognizable when the hospital changes its name to HSS, entered an agreement of affiliation with New York Hospital and Cornell University Medical College (1). Because of the growth of the HSS, the hospital moved to its present site on the Eastern River (between 70th and 71th streets) in 1955; see front page for image of the HSS. In 1956 the Caspary Research Building was delivered and the HSS positioned to become a world leader in the field. During the sixties and seventies the HSS recognized the importance of technology and bioengineering on orthopedics, one of the developments lead to the evolution of the HSS Total Condylar Knee Replacement used worldwide. In the later years of the century the HSS expanded and strengthened its position as worldwide leader in musculoskeletal treatment. The table below will show some facts of the HSS of the present day.

Facts at a Glance (1)			
Number of beds	162	Number of operating rooms	26
Active medical staff	271	Number of patient visits	249,878
Number of scientists	82	Number of surgeries	18,494
Number of FTE employees	2,559	2007 Operating budget	\$ 462 million

Table 1 – Facts at a Glance

Assignment

In order to support the HSS in reaching their mission and goals it is required to create a good Foundation for Execution. Without a *Foundation for Execution* it might occur that healthcare professionals, supporting staff and management all have different opinions about the same important questions in the HSS. Furthermore, without a Foundation for Execution it is impossible to deliver good care, because the information to make decisions is not available and different departments do the same thing throughout the hospital and each with a different system. This is why it is impossible to get a complete picture of the patient in general. Omitting this information will make it unable to improve quality of care and the pathway to recovery – elaborated upon in a later



section – will be interrupted or delayed (that is something we do not want). Ultimately the HSS cannot reach their mission, vision and goals without a Foundation for Execution.

Now we know that a good Foundation for Execution is required we have to create a good one. In order to be able to do so, we need the information presented in the case study and the information presented on the HSS website. Besides that kind of information we also used the books of Ross & Weill (2), (3) and the book of Berg (4). A good Foundation for Execution consists of an *Operating Model*, *Enterprise Architecture* and *IT Engagement Model* (2).

In this report we will create an operating model, enterprise architecture and finally the IT engagement model. We will create the Foundation for Execution for the HSS in order to support the – long-term – mission and strategies. The operating model is the necessary level of business process integration and standardization for delivering care and services to patients. First will be decided which type – out of four – operating models we will choose, accompanied by the argumentation why this type has been chosen and why others have been rejected as potential model. The reasons why the operating model will be created are: it describes how the hospital wants to thrive and grow, how the hospital will enable and execute strategies, and it drives the design of the Foundation for Execution.

Secondly the enterprise architecture is developed. Enterprise architectures can be developed on multiple levels, but we choose to create an enterprise architecture at the hospital level. The enterprise architecture is the organizing logic for business processes and IT infrastructure, reflecting the integration and standardization requirements of the hospital's operating model. It is important to create the enterprise architecture because it provides a long term view of the hospital's processes, systems and technologies so that future projects (new treatments and research for example) can build capabilities and even more important: "it takes the operating model from vision to reality".

Thirdly the IT engagement model will be created, this model is a system of governance mechanisms assuring that business and IT projects achieve both local and hospital-wide objectives. The latter one is an important one, because most IT projects in hospitals are local and do not take the hospital into account. A good engagement model can assure that everyone knows what to do and how to do it.

Finally these three parts of the Foundation for Execution come together and the HSS is able to reach their – long-term – mission and goals. Throughout this report all the decisions we made will be supported by our argumentation. We end this report with the conclusion and discussion whether or not we reached the aim of the assignment.

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Operating model

The operating model is the necessary level of business process integration and standardization for delivering goods and services to customers. In the following section, we describe the intended level of integration and standardization and the suited operating model.

In the definition of the intended operational model, we take the mission of the HSS into account to expand in the future. Especially when the expansion will occur to other countries, this greatly influences the working processes. In conformance with the earlier stated mission, the HSS strives to deliver top-quality care with the focus on delivering good service and care to the patient.

Integration

For every treatment, the patient consults several specialists, nurses, physicians etc. within the HSS. To facilitate the necessary communication between these people, their data has to be shared optimally. The HSS has to build its IT infrastructure in a way where all data is stored centrally. In this way, all care providers have access to the same information. If new applications are needed, the required interfaces with the existing infrastructure have to be created first if the implementation is to be approved.

This data integration enables the HSS to present a single face to the customers and process transactions between processes. By achieving these results, better quality of care can be delivered to the patient for the available information for decision making will be of better quality. The shared data will also make the organization more transparent and agile. Using these properties, the managers can improve efficiency and coordination more easily.

For every 'pathway to recovery' (PTR), a wide range of different healthcare professionals are involved. The data integration facilitates a platform in which they can communicate in a structured way. It allows professionals to alert or consult colleagues and to transfer patients to one another. A good communication (supported by IT infrastructure) will speed up the overall flow of information and patients through the hospital. This will reduce costs and improve patient satisfaction.

Standardization

Standardization of business processes and related systems involves defining how a process will be executed regardless of who is performing the process or where it is completed. The level of standardization within the HSS is very high for each individual PTR. The HSS is constantly improving the processes and formalizes them in such a way that all involved professionals execute them according to protocol.

The standardization between different PTR is not very high because the different patient groups have different needs. Furthermore, the mission to go global makes a high organization-wide standardization impossible. Different countries require other medical practices because of cultural, technical, jurisdictional and financial differences.

Sub-processes which are common for all patients (admission, appointment making etc.), have higher degree of standardization throughout a hospital, but also differ per country. The medical processes, differ for each PTR and each country.

Operating model

As Figure 1 illustrates, there are four different operating models. On the x- and y-axis of the diagram, the level of standardization and integration is situated.

The Unification model would result in a very high possible efficiency, but is not very realistic considering the situation the HSS would like to be in. The large number of processes and the diverse product group (patients) makes a high level of standardization impossible.

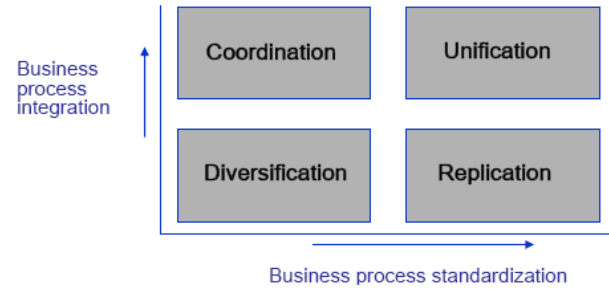


Figure 1 : Different operating models

The integration of the HSS has to be as high as possible, the bottom two (diversification and replication) are also not applicable. Diversification is not applicable because it results in small autonomous sub-organizations which do not take into account what other units are doing in the hospital – while the care process in the HSS will require a close relationship between the units in order to deliver the best care for the patient, in order to get an overall picture of the patient and the healthcare process, data has to be shared – or at least – be integrated; something that is not doable with the diversification model. Unfortunately the healthcare processes will never be the same and it is – almost – impossible to standardize all processes. Furthermore, the PTR is and will be a multidisciplinary different business unit which has to corporate and share data in order to deliver the highest quality of care to patients. The need for centralized and integrated data in an environment with different processes makes coordination the suited model for the HSS.

The coordination operating model has the following characteristics (3):

- Shared customers, products, or suppliers
- Impact on other business unit transactions
- Operationally unique business units or functions
- Autonomous business management
- Business unit control over business process design
- Shared customer/supplier/product data
- Consensus processes for designing IT infrastructure services; IT application decisions made in business units

These characteristics reflect to a large extent the desired architectural state the HSS would like to be in. The culture within the organization is very cooperative, which comes forward at the shared customer characteristic. Patients are treated by a large number of different healthcare professionals who all contribute to the care process.

The coordination model makes cooperation between several departments (business units) possible, without harming their autonomy. The decision making (even about IT applications) stays within the department, as long as the new applications meet specific requirements from the central IT service (interface etc.). The processes (PTR) are managed and optimized by the local departments as well, which makes them very agile and flexible. This will also improve the staff involvement in improving the PTR and make them more motivated.

Because the data is shared throughout the hospital, all care providers have access to all information needed to take well-informed decisions. Not only will this improve the medical decision process, it will also improve patient satisfaction for the systems which will present as a single face.



Enterprise Architecture

One of the most important features of the HSS is the PTR System. It is an easy-to-read grid system for tracking the patients' functional progress for the entire care team. In order to access this information the entire care team must have access to the system. The care team consists of multidisciplinary healthcare professionals. One way to support these professionals is to have some sort of shared system available; this can be seen in the core-diagram.

The choice that has to be made is what type of operating model – and consecutively what type of – enterprise architecture applies to the HSS, in order to take the operating model from vision to reality. Although the case is mainly focused on the total hip replacement (THR), the HSS is much more than the THR alone. Its mission stated that they would like to improve quality for care for patients around the globe and further the status to be the worldwide leader in musculoskeletal treatment (1).

Musculoskeletal treatment is a broad definition and has a broad spectrum of treatments, diagnoses and that would not be easy to standardize them. This because no treatment is the same as one other, it would be impossible to standardize them. It would be better to focus on integration in the operating model and enterprise architecture in order to meet the mission and strategy of the HSS. According to the aforementioned the enterprise architecture will be focused on coordination – this is in concordance with the operating model, the next paragraph will shortly recap why the other models are not usable for the HSS it has been more thoroughly mentioned in the operating model section.

It is impossible (and not realistic) to strive for the unified enterprise architecture, because the HSS would like to go global and in other countries different laws and rules apply (and sometimes there are treatments that cannot be done). As a consequence, the replication model will not fit in. Therefore it is better to focus on integration, the HSS is specialized but it is not a large factory yet where every process is exactly the same over time and there is not much variability. The care process is never the same and there is a lot of variability, this is mainly caused by the most important key player of the HSS; the patient. Patients are humans and humans are unique and standardizing humans is impossible. According to the aforementioned the coordination model will be applied instead of the unification model. In the next section the core-diagram will be explained. The core-diagram is attached in Appendix A – Core Diagram.

The core-diagram

In order to create the enterprise architecture the key players (are equivalent to customers in a business for profit) are defined. These key players do not differ that much from hospitals in general. The most important group of key players is the patient group. This is noticeable in the mission statement of the hospital; the HSS would not only improve the quality of care for patients in their hospital, but over the entire globe. The other key players are the healthcare professionals and supporting personnel (like administrative staff, ground maintenance staff, etc.).

The key players can login in the integration portal. The integration portal has the function to integrate (one of the major pillars of the coordination core diagram) all the distinct services, technologies and processes of the HSS. Noticeable in this part is that patients do not have the rights to enter information in any system, other key players do have – to a certain degree – the possibility to enter data in the technologies available in the HSS.

Hospital Pillars are processes that the HSS would like to perform (treatment, research, education, evidence based medicine) or has to perform (billing/payment, order-entry) to be able to deliver care.



Additionally the HSS tries to beat its competitors by – trying – to deliver the best care and give insights in the care process in order to persuade patients to come to the HSS (like providing process tracking and ask patients how they have experienced their stay in the HSS). HSS is and will be an advocate of creating/designing quality indicators and use these to show that they are the best of the best. Furthermore, employees have to undergo a special training to be able to fit in the HSS Culture.

Before any key players can access data, they have to be authorized. This is done by the hospital process¹ entitlement. In every process it is noticeable that the patient is the central player, it is all about the patient. This can be seen very clearly in the PTR, a patient receives the care required to recover. The PTR has been reviewed several times in order to meet the specific patient needs (and not the other way around which is happening quite often in other hospitals). Hospital processes like case management, the performing of audits among the patients, recording the pathway, feedback on the process and the one patient agenda reflect on these requirements and the requirements of the future. In order to be the best in the world and improve healthcare it is necessary to receive feedback on the care process and cases have to be managed and recorded. All these should be clearly structured and available to the patient and the pathway to recovery should be as convenient as possible for a patient, all the appointments and treatments have to be in line with the wishes and the agenda of the patient (one patient agenda).

In order to be the best and the number one in the world it is necessary to perform research and pilot new features in the healthcare world. With piloting new features is meant that when there are new treatments tested and become available the HSS should be the first to use them. Furthermore, the HSS is the hospital that makes it possible to test new treatments and make sure that these new treatments become available.

Because of the patient centered mission and (IT-) strategies, two hospital processes are added to the enterprise architecture; these two processes are the Internet Communication and the provided Patient Information Guide. Internet Communication can be extended with instant messaging. Nowadays it is possible to mail a healthcare professional or call him, but with instant messaging the patient could get instant answers to asked questions; internet communication therefore could significantly contribute to the HSS mission to improve the quality of care of patients.

As any other hospital the HSS has some hospital processes which are quite common, like allocation of resources is necessary to be able to deliver care. Scheduling and workflow management are also required to strive the HSS's mission.

Within the eclipse the technologies are visualized. The data is stored centrally, the Electronic Patient Record is the bible towards recovery it will be supported by the PTR where cases of patients are stored. The Employee Management System holds information about all the employees (general information, contractual data, job information etc.) in order to make appropriate schedules.

Without the specific technologies it is impossible to execute the hospital processes and systems will no longer be usable. For example: when a healthcare professional (key player) needs to order (hospital pillar) medication for the treatment (hospital process) the CPOE has to be available (technology). All the key players, hospital pillars, processes and technologies are closely connected.

¹ The term hospital processes is used in this document, this has exactly the same meaning as the term business processes, except for the fact that these processes take place in a hospital.



IT Governance

It is important to be able to understand, design, communicate and maintain the effective governance and the IT Governance Design Framework will help with these processes.

There are many definitions for IT governance, one narrower or broader than the other. According to Weill and Ross, IT governance is *Specifying the decision rights and accountability framework to encourage desirable behavior in the use of IT* (3). However, the IT Governance Institute expands this definition: *Specifying the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives* (5).

IT Governance Matrix

The discipline of information technology governance is derived from the corporate governance and deals primarily with the connection between business focus and IT management of an organization. Table 2 illustrates the governance arrangement matrix for the 'Special Surgery Hospital'. The desired state of IT governance is indicated with crosses.

Domain	IT principles		IT architecture		IT infrastructure strategies		Business application needs		IT investment	
	Input	decision	Input	decision	Input	decision	Input	decision	Input	decision
Business monarchy										X
IT monarchy			X			X				
Federal	X				X					
IT duopoly		X		X				X		
Feudal							X		X	
Anarchy										

Table 2 – IT Governance arrangement matrix

First of all, the IT principles should be determined in a federal way. Each department of the hospital is specialized and has its own needs. They should thus be able to express their own needs for IT and provide input for the decision-making of the IT principles. The decision-making for the IT principles should be made centrally in an IT duopoly. This duopoly should contain an IT committee to control the implementation of the IT principles in the hospital, and an executive committee to preserve the right direction of the hospital according to the overall business goals.

The input for the IT architecture should be provided by an IT monarchy. The IT monarchy consists of the IT department. The IT department can define the requirements which have to be covered by the IT architecture. Sometimes a department requests for a specific functionality which is not supported yet by the current infrastructure. With their technical know-how the IT can define whether it's possible or not to adapt the infrastructure to support these new functionalities. Furthermore, it is necessary to determine common functionalities which can be shared among different departments of one hospital, or among different co-operating hospitals. The decision-making for the IT architecture should again be made centrally in an IT duopoly. The IT department can give advise and propose new ideas, but the decision-making will be made together with an executive committee to preserve the right direction of the hospital according to the overall business goals. This executive committee is primarily responsible for the standardization of processes and the efficiency and effectiveness of these processes.



The input for the IT infrastructure strategies should be given in a federal way. As explained for the IT principles, each department is specialized and has its own needs. Each department should thus be able to express their own needs for IT. However, an IT monarchy will make the final decisions about the IT infrastructure strategies. The IT department has the most technical knowledge and experiences in order to determine which functionalities can be shared and which cannot.

As described earlier, every department should be able to express their own needs for functionalities. Input for the business application needs should thus be provided in a feudal way, so every department can express its own needs for business applications. Final decisions, about requests done by a department, should be made in a duopoly way. Central management could combine the needs of different departments for functionalities and decide what can be shared and what cannot. These decisions can be made together with the specific department(s) to obtain a solution.

Finally, the input for IT investment should also be given in a feudal way. Each department has its own needs for functionality and thus its own requests for investments. However, the decision-making about these investments will be done centrally. A budget is assignment to every department by a business monarchy. Each department can thus use their own budget to make proposals for new functionalities or for sharing functionalities with other departments in the hospital. The final decisions will be made by the business monarchy, which controls the overall investments in the hospital and for each department in the hospital.

IT Governance Design Framework

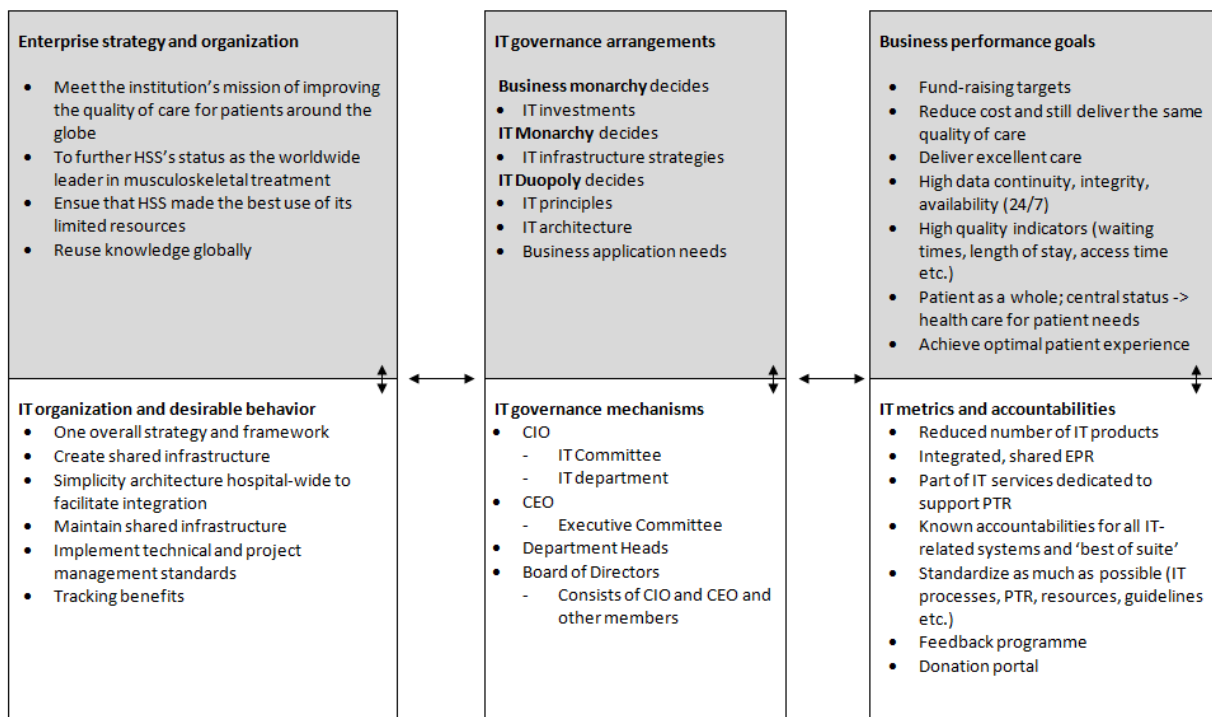


Figure 2 – IT Governance Design Framework

Enterprise strategy & IT organization

John Reynolds (CEO) has overseen the creation of teams at HSS; he has created extensive programs for the education of middle management and through its organization learning department. He also worked on a project next to HSS and this was replicating HSS' operating system into the United Kingdom's National Health Service. Because of this project's success and the amount of interest from



other hospitals in the country for this project, Reynolds started to think of sharing their knowledge to other hospitals. The tasks that he wants to maintain, if this idea will be realized, is to meet the institution's mission of improving the quality of care for patients around the globe, to further HSS' status in musculoskeletal treatment as the worldwide leader and that HSS should ensure the best use of its limited resources.

The first task, the NHS project and the interest of Cyprus Medical Center led Reynolds's to ask himself to expand in the US and if so where? If we look at the governance patterns it will show us that there will be an industrial and regional difference between the hospitals. By looking at hospitals as individuals there is likely also a difference between organizational structure (centralized, decentralized etc.), size of the hospital and diversity of specialisms and so on. The question that followed was, are there financial benefits? To determine this it is necessary to look at the IT expenses and how they are spent. Also the IT value should be governed to determine the quality of the output as well as the input, to be able to ensure the best use of their limited resources. The knowledge that the both hospitals will share might not be enough, so reusing knowledge from other hospital experiences over the world is also a strategy. If they monitor these aspects and other aspects defined in IT governance they will be close to realizing their last task to further their status as a worldwide leader.

To share HSS's operating system with another hospital, they need to setup a strategy that they both agree on. It is likely that the other hospital will have another mission and strategy than HSS. By collaborating and cooperating with the other hospital HSS will still follow their values (1). They will be working with each other (teamwork) and there is a possibility of innovation. All three will be focusing on improving the quality of healthcare for the other hospital and to plan this it is desirable to find out how to translate the HSS's operating system to the other hospital. That is why they need to create and maintain a shared infrastructure so that communication between the two hospitals will be safer and possible. The infrastructure will as well support their architecture as track their benefits, which is important for realizing their strategy. To maintain efficiency between the two hospitals there should be standards for the technical and project management.

IT governance

The IT governance arrangements have been discussed with the governance arrangement matrix. The HSS has a CIO who is head of the IT-department and chair of the IT committee. The CEO is the chair of the Executive committee (taking into account the interests of the HSS). The department heads are responsible for the all-day progress of the department. The Board of Directors consists also of the CIO and the CEO. So that the different organizational structures are interleaved and stay in contact with each other in order to reach the HSS mission.

Business performance goals & IT metrics

The HSS is a not-for-profit organization and is partly dependent fund-raising. These funds can be raised among other organizations or people who would like to donate to the HSS. One of the goals is to acquire as much funding as possible to be able to perform even better in healthcare and doing more research. Everyone who would like to donate can do that – easily – only by means of the donation portal.

In order to reduce the costs it is necessary to reduce the number of IT products (use only one system to register appointments for example) and when data is available (an integrated and shared EPR) it is easier to deliver streamlined care, because all data is available. Patients can be treated faster and therefore their length of stay will be shorter, therefore their cost of care will be reduced. The money



that will become available can be used to improve the quality of care even further and do even more research. An addition to this is that some IT services are dedicated to PTR, to support the pathway to recovery as good as possible. Furthermore when processes, resources and PTR are as much as possible standardized it can reduce costs (standardization is to a certain extent possible, as mentioned before).

When care is delivered information is needed. This information is stored in systems, these systems have to be up-and-running for 24/7; the data has to be available and integer. In order to have the data available at all time, the responsibilities of the IT-related systems have to be known. It has to be defined who is responsible for maintaining what system. The IT is also accountable for selecting the 'best of suite' (systems that fits the most in the overall strategy and which are easily integrated). Healthcare professionals are responsible for the correctness of data. Again a little bit of standardization can reduce errors and data will become more reliable.

To be the best it is needed to deliver excellent care and score high on quality indicators. It is necessary to record the healthcare processes in order to get information about length of stay, waiting times and etc. Excellent care can be delivered by means of the aforementioned, but also by treating the patient as a whole and see the patient as the center of the entire healthcare process. The healthcare process will be adjusted to the patient needs and not the other way around, the healthcare process has to be convenient for the patient. This can be measured by using a feedback programme in order to improve the quality of care and achieving the optimal patient satisfaction.

Final Remarks

Conclusion

We have read the case about the HSS. The HSS is the world leader in musculoskeletal treatment. In order to stay the number one and improve the quality of care of patients around the globe we have created a Foundation for Execution.

First we have created an operating model. In order to support the HSS mission and vision we have chosen the coordination model. We focused on integration instead of standardization. It is important to support the continuity of care delivered to patients, therefore the data must be shared. PTR's can be standardized to a certain extent, but it is not possible to standardize the whole hospital or other hospitals worldwide. It was necessary to create the operating model first, because the enterprise architecture and the IT governance are influenced by the operating model.

The Enterprise Architecture has been developed in concordance with the operating model, in other words, the enterprise architecture was also based on coordination. Our enterprise architecture has some shared data and applications, but it is possible that several departments have some dedicated data and applications. All the dedicated or unique processes and systems are not mentioned in the enterprise architecture and the core diagram. The enterprise architecture and its core diagram gave us a better insight in the HSS and its future state.

It was not that easy to create the IT governance. However we have created the IT governance by creating the IT governance framework and the IT governance design framework. These two methods were very useful to get insights and a good overview of the IT structure and governance, the two methods replenish each other and gave a good overview in how the Foundation for Execution can be supported by the IT.

Discussion

The Foundation for Execution has been created for the HSS. Our Foundation for Execution is one of the solutions; because we do not have a complete insight in the HSS, only from a case and the HSS website. It may be that we came to another Foundation for Execution when we had performed site visits and spoke with some key players and stakeholders.

Furthermore we have modeled the Foundation for Execution at a high level, in other words, at the hospital level. We envisioned the coordination model within the Foundation for Execution, but it is possible that on departmental levels a unification model is used (for example: the PTR process for THR can be standardized, because most of the patients undergo the same procedures. In this case an unification model may be applicable). These lower levels are not discussed in this report.

We fulfilled the assignment by creating the Foundation for Execution. It will be interesting to discuss our results with other groups and these discussions can lead to better understanding and even more insight into the matter of the course.

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Appendix A - Core Diagram

