Teaching Case Notes

Enterprise Architecture Specification Case Study

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ABSTRACT

These Teaching Case Notes are intended to accompany the Teaching Case paper with the same title. It contains models developed by the project team. A selection of models developed by team members for the respective viewpoints, namely Enterprise, Information Business Systems, Data, Application and Enterprise Security Viewpoints.

1. INTRODUCTION

The Teaching Case Notes provided here are in support of the Teaching Case Study on Enterprise Architecture Specification paper by the authors and the team project sponsor. A selection of the models developed by team members for the respective viewpoints are presented in the sections below.

2. ARCHITECTURE MODELS

Architecture models were developed for the enterprise, information, business systems, data, application and enterprise security viewpoints. The models are summarized per viewpoint in the sub-sections below. The populated Architecture Framework is given in Table 1 to facilitate referencing in the Teaching Case paper (TC paper) and these Teaching Case Notes (TC Notes). The partial architecture framework (first three columns) are given in the TC paper, Table 5. The model portfolio was developed during the Information/ Business Systems Architecture stages for the viewpoints (Enterprise, Information, Business Systems, Data, Application and Enterprise Security) that were addressed by the project team. Models included are stated in bold type.

Table 2 lists the XYZ ACO Concerns and Principles addressed by the team, arranged per architecture viewpoint. Cross-referencing among viewpoints is given where relevant. The core principles and concerns of the Business Systems Architecture viewpoint will be implemented over several stages of the architecture development cycle, with selected concerns of Business Performance Management, being targeted for Release 1 (see Teaching Case, Section 1.1 Scope of Architecture).

2.1 Enterprise Viewpoint Models

A selection of supplementary models to those given in the Teaching Case Paper, developed by the team, is included in this section for the Enterprise Viewpoint. The Enterprise Viewpoint focuses on the and overarching concerns and principles of the business, and includes the business strategy, the XYZ ACO value chains, and the XYZ ACO EA as interpreted by the team in the form of a conceptual model at the start of the project.

Business Strategy. Table 3 presents a synopsis of the XYZ ACO Business Strategy and some corporate concerns.

The Value Chain Model. Figure 1 shows the primary and support activities for XYZ ACO to achieve patient value. Transparency and share-ability of data and information according to authorizations of use are concerns.

Enterprise Architecture Model. The As-Is EA diagram in Figure 2 shows a conceptualization of the XYZ ACO assets in a layered model. The current EA cannot deliver XYZ ACO services, due in part to the disparate systems utilized by separate contracts, management, and accounting involved in the XYZ ACO enterprise systems.

Model Portfolio for Enterprise Viewpoint											
Model	**View/ Model type**	**Stage/ Phase**	**Purpose**	**Concern/ Principle**	**Stakeholder**	**Content**	**Layer**	**Aspect**	**Standard**	**Modeling language**	**Tool**
Organization Diagram	System Diagram	Enterprise Strategy Planning	Strategic Planning	Existing status in XYZ ACO	Senior Man/ Employees/ Collaborators	Overview	Business	Structure	XYZ ACO	Graphic	Visio
XYZ ACO Value Chains **TC Notes Figure 1**	Process model/ Conceptual	Enterprise Strategy Planning	Strategy Planning	Quality, Affordability Accountability, Security Transparency, Ease-of-use	Senior Man. Archit. Team	Overview	Business	Structure	BPMN	Graphic	Visio
ACO Current State EA	EA Model	Architecture Stage	Planning	Existing status/ Concerns & principles	Project Team	Overview	Business Technical	Structure Behavior	TOG	Graphic	Visio
XYZ ACO Performance Matrix **TC Paper Table 2**	Strategic-Tactical-Operational / Planning	Enterprise Strategy Planning/ IT Strategy	Analysis/ Alignment / Project Planning	Quality, Affordability Accountability, Security Transparency, Ease-of-use	All collaborators	Coherence	Strategic / Tactical/ Operational	Static	Rummler-Brache	Tabular	MS Word
Populated Arch. Framework **TC Paper Table 6 TC Notes Table 1**	Framework / Conceptual	IT Strategy Stage/ Analysis	Operational Planning	All viewpoints for EA initiative	Project Team	Coherence	Business Technology	Structure	DMIT	Matrix	Ms Word
Business Strategy Table **TC Notes Table 3**	Strategy statement	Enterprise Strategy Planning	Strategy Planning	Quality, Affordability Accountability, Security Transparency, Ease-of-use	XYZ ACO Senior Man Project team	Overview	Business	Static	XYZ ACO	Tabular	MS Word
Principles/ Concerns	Statement of Princ. & Concerns	EA Project Planning	Adoption in Arch. Specs.	Quality, Affordability Accountability	Project Team	Coherence	All Layers	Static	XYZ ACO	Tabular	MS Word

TC Paper Table 4 **TC Notes Table 2**				Transparency Ease-of-Use, Security							
Model Portfolio for Information Viewpoint											
Hierarchy of Information Needs **TC Notes Fig. 3**	Inf. Req. Diagram/ Strategic-Tactical-Operational	Information Architecture.	Information Analysis	Accessibility, Sharability Security	Project Team	Overview	All Layers	Structure	XYZ ACO	Graphic	PVW
Core Information Entities.	Conceptual	Information Architecture	Information Analysis	Accessibility, Sharability Security	Archit. Team	Overview	Strategic	Static	XYZ ACO	Tabular	MS Word
Summary of Information Flows **TC Notes Fig. 5**	Inf. Flow diagram/ Logical	Information Architecture	Information Analysis	Accessibility, Sharability Security	Project Team	Overview	Strategic	Dynamic	XYZ ACO	Graphic	PVW
Core Information Requirements **TC Notes Fig. 4**	Inf. Req. diagram/ Logical	Information Architecture	Information Analysis	Accessibility, Sharability Security	Project Team	Overview	Strategic	Structure	XYZ ACO	Graphic	PVW
Model Portfolio for Business Systems Viewpoint											
Business Capability Map **TC Fig. 1**	Bus. Taxonomy diagram/ Conceptual	Business Systems Architecture	Informing, deciding	Business capability, business processes	Business Analyst, Project Team	Coherence	Business	Structure	TOGAF 9.1	Graphic Map	Visio
Business Context Diagram **TC Fig. 2**	Business Context	Business Systems Architecture	Informing, deciding, designing	Initiative Business scope, Key internal/ external interfaces & interactions	All collaborators Providers, Payers, Patients	Overview	Business	Business Behavior	Business Std	Graphic System diagram	Visio
Patient Appointment Scheduling **TC Notes Fig. 6**	Process model/ Logical	Business Systems Architecture	Inform, deciding, designing	Accessibility, Sharability Security, Ease-of-use	All collaborators Providers, Payers, Patients	Coherence	Business	System behavior	BPMN	BPMN Process diagram	Visio

Service Performance Management **TC Notes Fig. 7**	Process model/ Logical	Business Systems Architecture	Inform, deciding, designing	Accessibility, Sharability Security, Ease-of-use	All collaborators Providers, Payers, Patients	Coherence	Business	System behavior	BPMN	BPMN Process diagram	Visio
Model Portfolio for Data Viewpoint											
Partial CRUD Matrix **TC Notes Table 5**	Functional / Logical	Architecture - IT Analysis	Analysis, Deciding, Designing	Accessibility, Sharability Security	Architects Designers Users	Coherence	Data	Static	Data Std	Tabular	MS Word
High-Level Entity Relationship Data Model	ER Model/ Conceptual	Architecture - IT Analysis	Data Analysis	Accessibility, Sharability Security, Data an asset	Architects Designers	Coherence	Data	Static	Federal Std - Data modeling	UML ER Diagram	Visio
Relationship Between Arch. Schemas	Arch. Schemas/ Conceptual	Architecture - IT Analysis	Data Analysis	All viewpoints	Architects and Developers	Overview	Data	Structure	Arch. Std	System Diagram	MS Power Point
Conceptual Data Model **TC Notes Fig. 8**	Data Model/ Conceptual	Architecture - IT Analysis	Data Analysis	Accessibility, Sharability Security	Architects, Designers, Developers	Coherence	Data	Static	Data Model Std	UML Class diagram	Visio
Model Portfolio for Application Viewpoint											
Application Model	Functional / Conceptual	Architecture - IT Analysis	Planning	Consistency, Technology independence	Archit. Team	Overview	Application	Structure	Application. Model Std	System Diagram	MS Word
Patient Appointment Manager System **TC Notes Fig. 9**	Use case/ Conceptual	Architecture - Build	Designing	Ease-of-use, Structured, Consistency, Technology independence	Architects Designers Users	Coherence	Application	Behavior	TOGAF	UML Use case	Visio
Physician Perf. Rep. System **TC Notes Fig. 10**	Use case/ Conceptual	Architecture - Build	Designing	Ease-of-use, Structured, Consistency, Technology independence	Architects Designers Users	Coherence	Application	Behavior	TOGAF	UML Use case	Visio
Model Portfolio for Enterprise Security Viewpoint											

Composite Enterprise Security Diagram **TC Notes Fig. 11**	Enterprise Security/ Conceptual	Architecture – IT Analysis	Informing	Security for all viewpoints Physical Security of assets	Management Project Team	Overview	All layers	Structure	IFIP Std	Graphic/ System diagram	Visio
High Level Security Model **TC Notes Fig. 12**	Security model/ Conceptual	Architecture – IT Analysis	Informing/ Designing	Security at all levels	Project Team	Overview	All layers	Structure	TOGAF 9.1	Graphic	Visio
Information Security Management **TC Notes Fig. 13**	Strategic-Tactical-Operational/ Security	Architecture – IT Analysis	Informing	Security at all levels	Project Team	Overview	All organization levels	Structure	NIST Std	Graphic	Visio
Group Roles identification	Roles/ Security	Architecture – IT Analysis	Informing/ Deciding/ Designing	Secure accessibility Groups & permissions	Management Project Team	Overview	Business	Static	XYZ ACO	Matrix/ System Diagram	MS Word
User Mapping	User Taxonomy/ Security	Architecture - IT Analysis	Informing/ Deciding/ Designing	Secure accessibility	Management Project Team	Overview	Business	Static	XYZ ACO	Matrix/ System diagram	MS Excel, MS Word
Permission Identification	Permissions/ Security	Architecture – IT Analysis	Informing/ Deciding/ Designing	Secure permissions	Management Project Team	Coherence	Data	Dynamic	XYZ ACO	Matrix/ System diagram	Ms Excel, MS Word
User Authentication	User Authent./ Security	Architecture - IT Analysis	Informing/ Deciding	Secure authentication	Management Project Team	Overview	Data	Dynamic	DBMS	Matrix/ System diagram	Visio MS Word
Data Encryption/ Decryption Requirements	Encryption/ Security	Architecture – IT Analysis	Informing/ Deciding	Rules for encryption/ decryption	Management Project Team	Coherence	Data	Static	XYZ ACO	Tabular	MS Word
Access Control Process Model	Access/ Security	Architecture – IT Analysis	Informing/ Deciding	Access control	Management Project Team	Coherence	Data Application	Dynamic	Technology	Graphic / Process diagram	Visio

Table 1. Populated Architecture Framework

OVERARCHING ENTERPRISE VIEWPOINT	
PRINCIPLE/ CONCERN	**DEFINITION**
Quality	**XYZ ACO Group Quality Care**
Statement	Enterprise should provide excellence in care through its coordinated care services.
Rationale	Strategic Business Vision is to have an accountable health care organization providing coordinated excellence in health care services.
Implications	Health care services provided by all stakeholders must be of consistent quality throughout the enterprise; Requires that a systematic enterprise architecture be developed adhering to all the stated principles
Affordability	**Affordable Health Care Services**
Statement	Health Care Services should be affordable for the membership
Rationale	Strategic Business Vision
Implications	Costs should be contained by all stakeholders throughout the Group; sustainable health care spending; comply with Affordable Healthcare Act of the Centers for Medicare & Medicaid Services (CMS)
Accountability	**Accountable Health Care Services**
Statement	XYZ ACO aims to manage healthcare costs through accountability by all stakeholders
Rationale	Strategic Business Vision
Implications	All stakeholders must be accountable for their services and behavior and healthcare must be managed; confidentiality if patients must be maintained
Ease of Use	**Applications easy to use (also Application Viewpoint)**
Statement	Software Systems and User Interfaces must be easy to use
Rationale	Complexity must be reduced to avoid mistakes
Implications	Flexibility and ease of use must be balanced in terms of complexity, manageability and performance for applications.
Transparency	**Information Transparency and Visibility (also security views and enterprise security viewpoint)**
Statement	Data and information must be transparent to stakeholders
Rationale	Data and information must be transparent (visible) to the users based on need to know and responsibility
Implications	Authorizations must be given and authentication performed on all classes of users of the systems
INFORMATION ARCHITECTURE VIEWPOINT	
Accessibility	**Maximize accessibility of information (also Data Viewpoint)**
Statement	Purpose of information management is to make information maximally accessible, visible and transparent to the Enterprise as a whole.
Rationale	Principle represents “Information as a Service”, and stakeholders of XYZ ACO businesses must have access to pertinent information.
Implications	A common set of policies, procedures, and standards governing information management and access for both the short and the long term must be established and developed. For maximum enterprise-wide benefit information accessibility must be implemented and managed in all systems
Information Security	**Information is secure within XYZ ACO (also Data and Enterprise Security Viewpoints)**
Statement	Information is protected from unauthorized use, access, disruption, modification, perusal, inspection, recording and disclosure. In addition to the traditional aspects of information systems, this includes, but is not limited to, information protection of confidentiality, integrity, authenticity and availability.
Rationale	Open sharing of information and release of information throughout the enterprise, compliant with relevant legislations must be balanced with the need to restrict the availability of classified, proprietary, permitted, professional, and sensitive information. Current laws and regulations require the safeguarding of information security and privacy of data. Pre-decisional (work-in-process, not yet authorized for release) information must be well protected to avoid unwarranted speculation, misinterpretation, and inappropriate use.
Implications	Access to information must be based on a need-to-know policy, and permissions granted on a need to know basis. All viewpoints must consider implications of information security. Information security safeguard must be implemented to restrict access to level of granted authorizations, such as “view only”, or “never see”. XYZ ACO requires a policy on managing during of protection for pre-decisional information and other works-in-progress.

Shareability	**Information is shared in XYZ ACO business environment (also Data and Security viewpoints**).
Statement	Stakeholders have access to the information necessary to assist medical personnel and patients. Therefore, information must be shared across the entire enterprise functions and organizations.
Rationale	It is cost-effective to maintain accurate information in a single location instead of maintaining duplicative information in multiple locations. The efficiency of information collection, creation, transfer, assimilation, accession, and confirmation is driven by the capability of the XYZ ACO to efficiently share information across the enterprise. Shared information will result in improved services, reduce cost and enhance efficiency.
Implications	All participants within the enterprise must understand the relationship between value of information, sharing of information, and accessibility of information. Information sharing is considered in relation to information security so that confidential information is not compromised. A standardized model must be developed for information sharing to ensure all required information is available for various demands. Sharing information must meet the requirements of stakeholders.
BUSINESS SYSTEMS ARCHITECTURE VIEWPOINT	
Performance	**Business Performance Management**
Statement	Ability to track business performance, e.g. service performance reporting, cash payout to partner per day, average payout per Member per provider, etc.
Rationale	Determine cash position of business at any time, identify payout trends, quality of service trends, setting informed targets for LOBs, etc.
Implications	Implement automated reporting scorecard for performance monitoring and target setting for lines of business
Centralization	**Centralize Payment Management**
Statement	Maintain a single payment system for provider partners in the network
Rationale	Improve operational efficiency thereby reducing operating cost, which in turn improves profitability
Implications	Implement single payment system to manage payments to provider partners (PCP groups, Specialists, Service Providers)
Uniqueness	**Single version of Member (Patient)**
Statement	Maintain single version of member information across all lines of business
Rationale	Enables cross-sell / opportunity management (e.g. solicitation) to Members (Patient), driving additional revenue and profit.
Implications	Implement a governable, centralized data repository for Member information/data sharing across the enterprise
Integration	**Enterprise Information Integration**
Statement	Maintain information integration capability that facilitate information/data exchange across lines of business
Rationale	Improve timeliness of reported information for decision making, operational visibility, data/information sharing
Implications	Enable automated enterprise data/information exchange across lines of business
DATA ARCHITECTURE VIEWPOINT	
Data Security	**Data is Secure within the XYZ ACO environment (also Security Views and Enterprise Security Viewpoint)**
Statement	Data is protected from unauthorized use, access, disruption, modification, perusal, inspection, recording and disclosure. Data protection of confidentiality, integrity, authenticity and availability.
Rationale	Open sharing of data and release of data throughout relevant legislations must be balanced against the need to restrict the availability of classified, proprietary, permitted, professional, and sensitive information. Current laws and regulations require the safeguarding of data security and privacy. Pre-decisional (work-in-process, not yet authorized for release) data must be well protected to avoid unwarranted speculation, misinterpretation, and inappropriate purpose use.
Implications	Collection of classified and de-classified data represents a large task requiring review and de-classification procedures to maintain appropriate and suitable control. Information owners and users must determine whether aggregation results at a higher classification level. XYZ ACO needs a qualification policy and procedures to govern this review and de-classification. Access to information based on a need-to-know policy can ensure regular reviews of information. Adequate and secure access to information requires that security requirements are implemented at the data level (not the application level), and must be designed into data elements from the beginning; it should not and cannot be added

	later. Data security safeguards may be for “view only”, or “never see”. Sensitivity labeling for access to pre-decisional, decisional, classified, sensitive, private, confidential, or proprietary information must be determined. (also Information and Security Viewpoints)
Accessibility	**Data is Accessible (also Information Viewpoint)**
Statement	The purpose of data management is to make data maximally accessible, visible and transparent to the Enterprise as a whole (ease of use).
Rationale	Wide access to data leads to efficiency and effectiveness in decision making, and affords timely response to information requests and service delivery. Staff time is saved and consistency of data is improved.
Implications	Access to data does not constitute understanding of the data. Personnel should take caution not to misinterpret information. Access to data does not necessarily grant the user access rights to modify or disclose the data. This will require an education process and a change in the organizational culture, which currently supports a belief in ‘‘ownership’’ of data by functional units.
Shareability	**Data is shared in XYZ ACO (also Information and Security Viewpoints)**
Statement	Stakeholders have access to the data necessary to assist medical personnel and patients. Data is shared across the entire enterprise functions and organizations.
Rationale	Data is easily accessible when it is shared across the enterprise and appropriate access to accurate data is essential to XYZ ACO. It is cost-effective to maintain accurate data in a single location instead of maintaining duplicative information in multiple locations. The efficiency of data collection, creation, transfer, assimilation, accession, and confirmation is driven by the capability of the XYZ ACO to efficiently share data across the enterprise. Shared data will result in improved services, reduce cost and enhance efficiency.
Implications	All participants within the enterprise must understand the relationship between value, sharing and accessibility of data. A common set of policies, procedures, and standards governing data management and access for the short and long term must be established and developed. This principle is in accordance with the principle of data security. Under no circumstances must the sharing of data cause confidential data to be compromised. A standardized model must be developed for data sharing to ensure all required data is available for various demands. Sharing of data must meet the requirements of stakeholders.
Value	**Data is an asset**
Statement	Data has value to the enterprise and is managed accordingly.
Rationale	Data is a valuable corporate resource; it has real, measurable value. The purpose of collecting data is to aid decision-making. Accurate, timely data is critical to accurate, timely decisions. Most corporate assets are carefully managed, and data is no exception.
Implications	All organizations within XYZ ACO must understand the relationship between the value, sharing and accessibility of data. Stewards must have the authority and means to manage the integrity of data for which they are accountable. A cultural transition from ‘‘data ownership’’ thinking to ‘‘data stewardship’’ thinking is needed. The role of data stewardship is critical because obsolete, incorrect, or inconsistent data could be passed to enterprise personnel and adversely affect decisions across the enterprise. Procedures must be developed and used to prevent and correct errors in data and to improve those processes that produce flawed information. Data quality will need to be measured and steps taken to improve data quality.
APPLICATION VIEWPOINT	
Ease of Use	**Applications are easy to use (also Enterprise Viewpoint)**
Statement	Application should be easy to use and require minimal time for training.
Rationale	It saves training time and application misuses by stakeholders. Also this helps proficiency and optimal application operating conditions.
Implications	Applications should have a common “look-and-feel” which requires careful design of the interfaces and application and their usability
Independence	**Applications are technology independent**
Statement	Applications are technology independent and must run on multiple operating systems or platforms. An application may be independently modified or replaced without compromising other applications.
Rationale	Applications remain operable when there are operating system upgrades or replacements; cost is contained.
Implications	Standards must be used in order to guarantee application portability. Application architecture must be designed adopting this principle. Moreover, sometimes a middleware layer should be used to separate the applications from platform.
Structural Quality	**Applications are well-structured**
Statement	Applications must be structured to accommodate the perspectives of all XYZ ACO user communities.
Rationale	Applications take into account different communities’ needs
Implications	Design must be carefully planned and developed and prototyped to verify and validate the functionality.
Consistency	**Application design is consistent**

Statement	Applications should be consistent for all stakeholders as far as naming standards and terminology and usage.
Rationale	This will create a common understanding about the applications throughout XYZ ACO user community, ease of use, flow of information and maintenance.
Implications	This requires careful design of naming standards and acronyms with input from user communities to implement consistent applications.
SECURITY VIEWPOINT	
Transparency	**Information Transparency and Visibility (also Enterprise Viewpoint).**
Statement	Data and information must be transparent to stakeholders
Rationale	Transparency of data and information must be based on need to know and responsibility of users.
Implications	Authorizations must be given and authentication performed on all classes of users of the application systems.
Security	**Information Security (also Information and Data Viewpoints)**
Statement	XYZ ACO should have secure risk free computer environment. For all stakeholders and users.
Rationale	Strategic Security Vision
Implications	Confidentiality, integrity, and availability of patient, personal, and business data must be secured. Systems, data, and technologies must be protected from unauthorized access, operation, and manipulation.
Sharability	**Secure sharing of XYZ ACO data and information (also Information and Data Viewpoints)**
Statement	Stakeholders must have secure access to the information necessary to assist medical personnel and patients.
Rationale	Appropriate access to accurate information is essential to the services of ACO and must be secure.
Implications	DRM (digital rights management) technology can extend access with usage control using cryptography to protect data that may be outsourced or published on the network.

Table 2. Principles and Concerns governing the XYZ ACO

XYZ ACO Business Strategy Statement

XYZ ACO has developed a new approach to providing managed health care for private patients in the USA. XYZ ACO was formed by a partnership between XYZ Hospital, 10 Provider groups consisting of approximately 920 physicians, 630 independent specialists, pharmacies, and laboratories. The intent is to create an accountable care organization with a new care delivery model which would comply with and be governed by the Affordable Care Act of the CMS. The Affordable Care Act includes a number of provisions designed to improve the quality of Medicare services, support innovation and the establishment of new payment models in the program, better align Medicare payments with provider costs, strengthen program integrity within Medicare, and put Medicare on a firmer financial footing. In addition to improving quality, ACO initiatives seek to reduce growth in health care expenditures. It is widely recognized that the current trajectory for the nation's health care spending is unsustainable. Medicare beneficiaries share the burden of rising costs, as they pay higher premiums and larger cost-sharing obligations and out of- pocket expenses.

The XYZ ACO group has now been operating independently for three years, with each entity still separately managed and accounted for on separate balance sheets and healthcare contracts. The strategic business vision is to form an Accountable Healthcare Origination (i.e. ACO) to give coordinated high quality care for their patients. The goal is to manage healthcare costs, provide high quality care services, and be accountable for the care and a profitable organization.

Corporate Concerns

- There is no clear concept of 'Member (Patient)' across the group. As the group's mission is now primarily profitable managed health care this is a major flaw in the data and business architectures, as no ready measures of income per Member are available across the group.
- Recent privacy legislation complicates use of Member information in any case, and an analysis is required of these implications, for preparation of a privacy statement.
- Financial reporting is required, at least on a monthly basis, to be of operational and tactical use. No visibility across all units to manage cost and provide high quality care.
- There is no total business architecture on which to base and manage operation of the group as a whole.
- Hospitals use different application packages.
- Each business within the group uses different application packages. There is no basis for achieving economies of scale in materials and resource purchasing or management, neither for cost management nor for cross-selling services to identified customers.
- None of the infrastructure currently supports operations within an integrated business model.

Table 3. Business Strategy

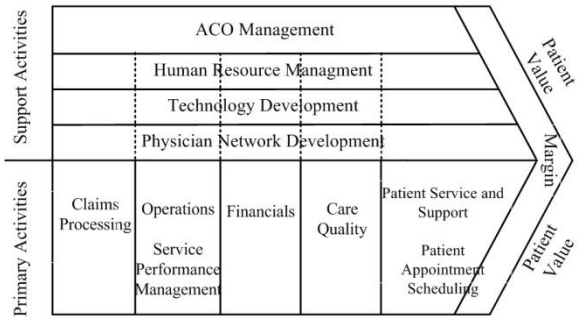

Figure 1. XYZ ACO Value Chains

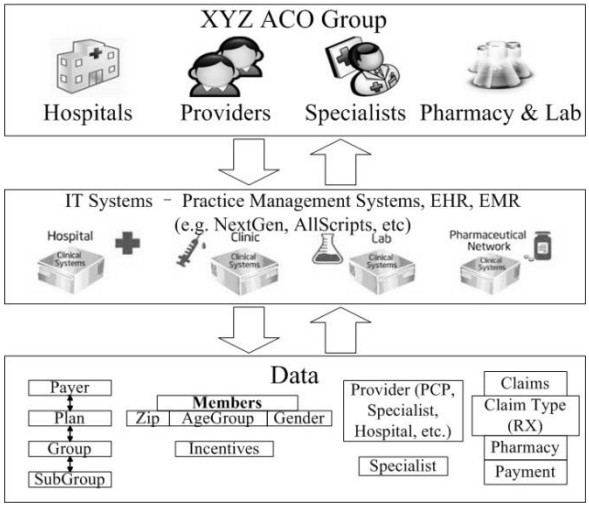

Figure2. Conceptual XYZ ACO As-Is EA

2.2 Information Viewpoint Models

A selection of models developed for this viewpoint are given in this section. The Information Viewpoint models are focused on the information views (of the viewpoint), and included here are the hierarchy of information needs of XYZ ACO, the core information needs of XYZ ACO Stakeholders, and the proposed information flows of main businesses in XYZ ACO.

Hierarchy of Information needs of XYZ ACO. Figure 3 summarizes the hierarchy of information needs into three categories, namely strategic, tactical, and operational information.

Information Requirements of XYZ ACO Stakeholders. Figure 4 displays the core information requirements of XYZ ACO Stakeholders. Physicians need to know all necessary information about patients so that they can make diagnostic decisions efficiently. The Physician Schedule involves information of the daily, weekly, and monthly schedules. Service information relates to the Nurse Schedule, Theater Schedule, Office Information, and any other services' information provided by supporting health care institutions. Patients are able to access detailed information about the physicians' performance, reputation, skills, and schedules to help them to make a choice of physician. In addition the Federal Government can make effective financial decisions about healthcare systems based on the performance of participating organizations.

Information Flow Model. Figure 5 illustrates the information flow for the main businesses in XYZ ACO. The core information that main businesses require include patient information, physician schedules, physician performance records, service information and organization information. Through a Cloud-based service, the main businesses can access systems and obtain the information they need according to their authorizations.

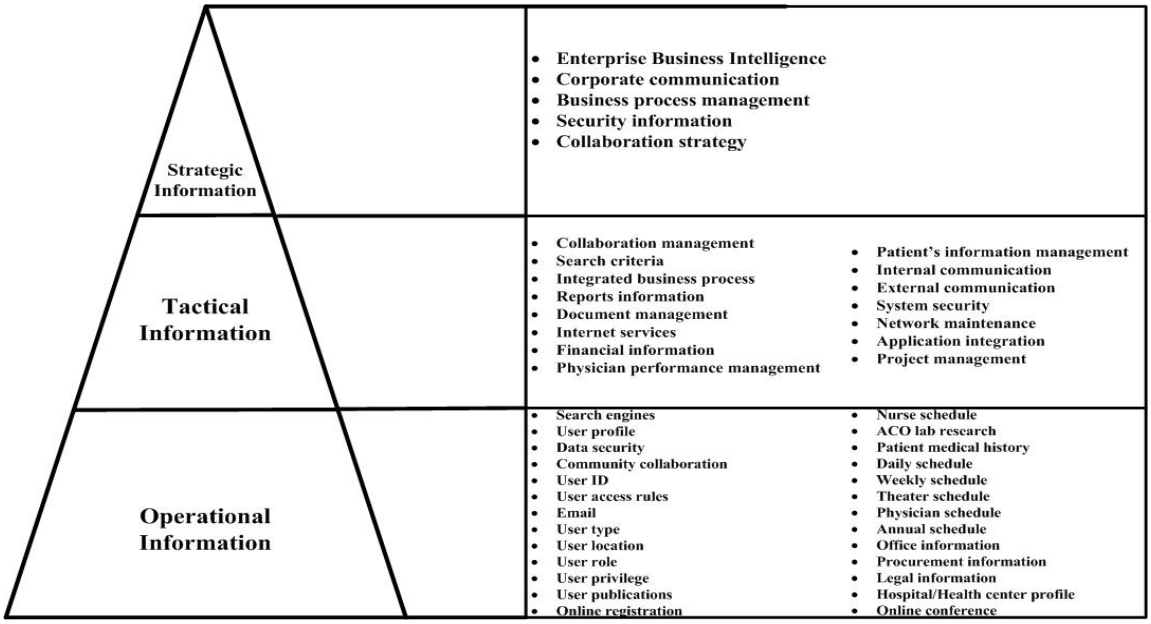

Figure 3. Hierarchy of Information Needs in XYZ ACO

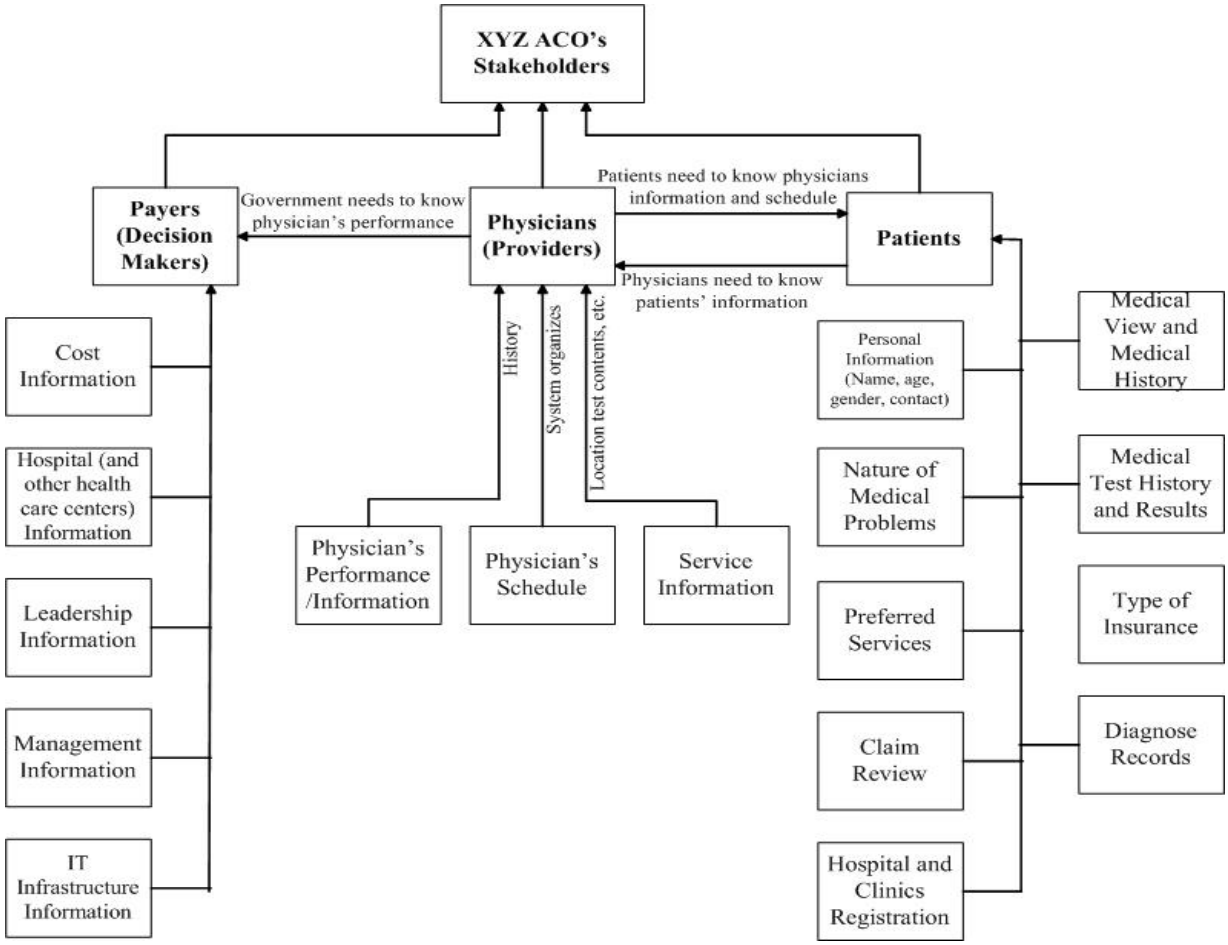

Figure 4. Structure of XYZ ACO Core Information Requirements

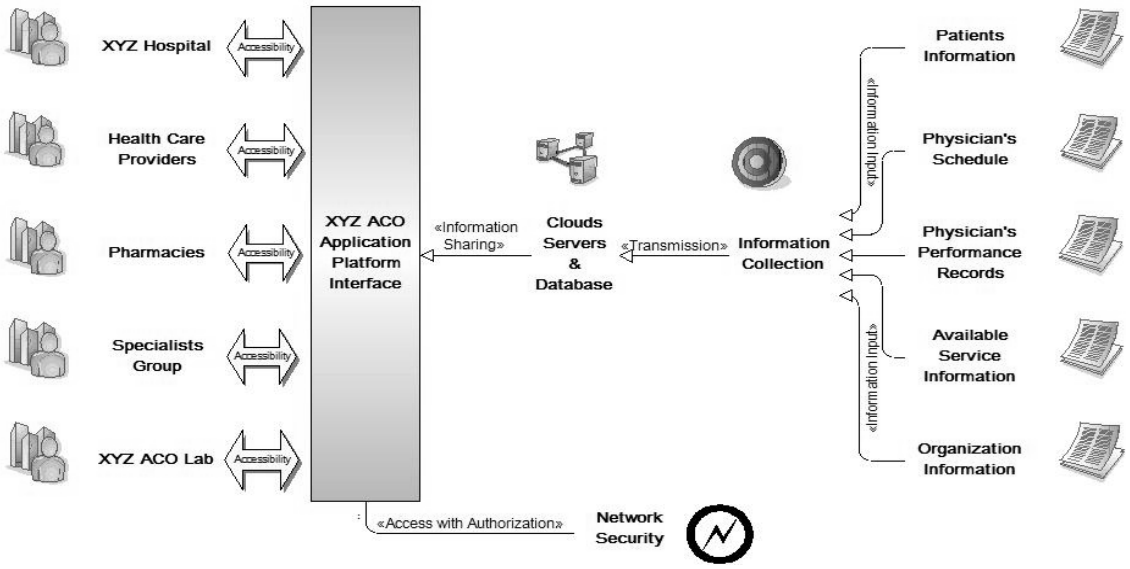

Figure 5. Proposed Information Flow of Main Businesses in XYZ ACO

2.3 Business Systems Viewpoint Models

A selection of additional models for this viewpoint is given in this section. The Business Systems Viewpoint models focus on business related views such as business process views, systems, business information entities and other resources that are used to perform XYZ ACO's operational activities.

Patient Appointment Scheduling. Figure 6 is a high-level process view of the Patient Appointment Scheduling business process. A patient or authorized user (primary care physician (PCP), specialist), Patient Care Representative (PCR)) may use the online, self-service appointment scheduling system to schedule or update appointments with a PCP or specialist. Alternatively, a PCR may log the appointment information on behalf of the patient who has called in. An Enterprise Calendar Manager (ECM) component provides the necessary calendar services for logging appointments.

Service Performance Management. Figure 7 provides a high-level view of the business process to generate the Service Performance Report (SPR), a feature of the Service Performance Management capability. Only authorized users such PCPs, Specialists and XYZ ACO management are allowed to run this report. As part of XYZ's accountable health care strategy, evaluating and monitoring service quality performance information among PCPs and Specialists is critical. Release 1 of the Business Systems Architecture will implement a workload and service quality reporting function to facilitate visibility into care service quality performance and accountable information regarding PCPs and specialists.

Business Information Entities for Release 1. Table 4 shows the business information entities for Release 1 of the EA initiative selected from the complete information analysis done in the team project. The principles of concern are accessibility, information sharing and security.

Business Information Entities
Physician Performance Information
Physician Schedule Information
Patient Information
Patient Medical History Information
Physician Schedule Information
Theater Schedule Information
Weekly Schedule Information
Daily Schedule Information

Table 4. Business Information Entities for Release

2.4 Data Viewpoint Models

A selection of models in this viewpoint of relevance to Release 1 of the EA Initiative, developed by the team, is given in this section. Data viewpoint models focus on the data of the software applications and included here is a CRUD Matrix and the conceptual data model for XYZ ACO Release 1.

CRUD Matrix. Table 5 is a partial CRUD matrix obtained from the data analysis to identify the XYZ ACO organizations that create (C), review (R), update (U), and delete (D). A list of data entities and the business systems that access the data based on the requirement is shown.

Conceptual Data Model. Figure 8 is a class diagram of the conceptual data model of XYZ ACO. The diagram shows the main classes along with their attributes and data types. The relationship among classes is governed by the share-ability, accessibility and security principles.

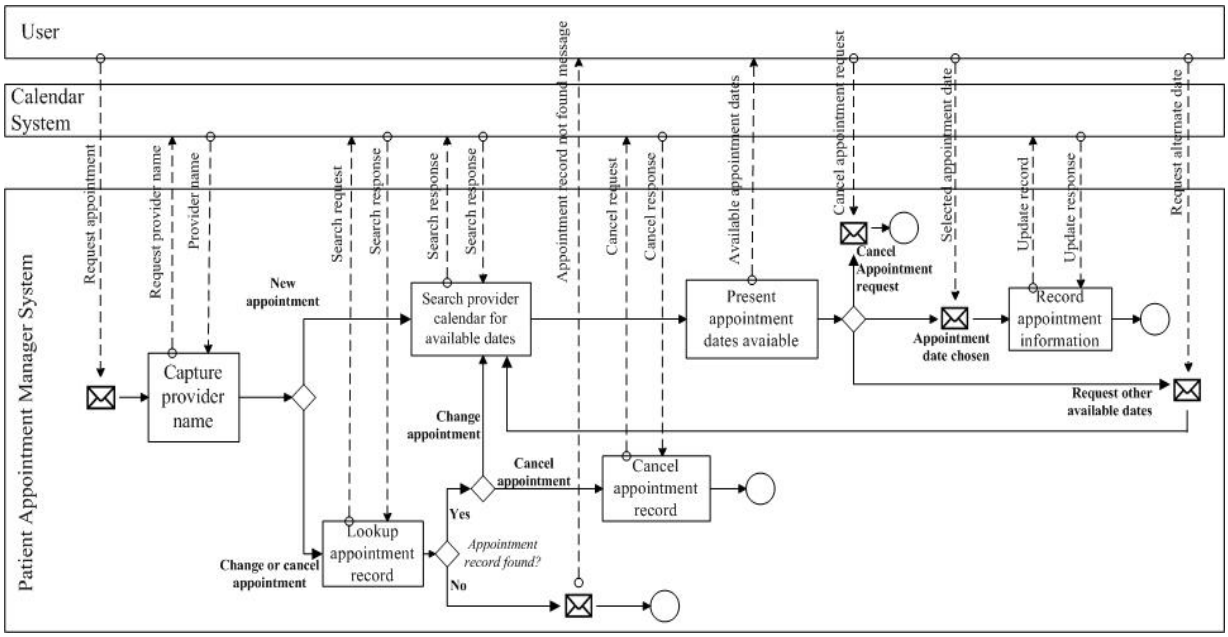

Figure 6. Patient Appointment Scheduling

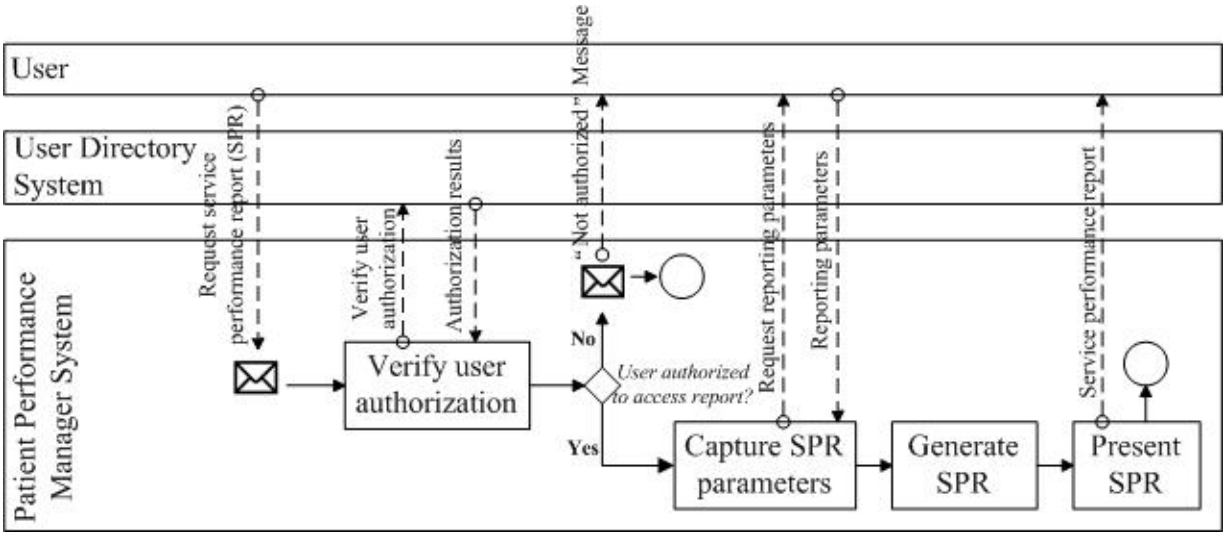

Figure 7. Service Performance Management

Data Entity	PCP Group	Patient	Service Provider	Specialist	XYZ ACO Senior	Nurse	Administrative Staff
Strategy	R	R	R	R	CRUD	R	R
Finance	R		R	R	CRUD	R	R
HR Management	R		R	R	CRUD	R	R
Service Provided	CRUD	R	CRUD	CRUD	CRUD	RUD	RU
Patient Record	CRUD	R	RU	CRUD	CRUD	CRUD	RU
Patient Service	CRUD	R	RU	CRUD	CRUD	CRUD	CRUD
Claims	CR	R			CRUD		
Facility Management	CRUD		RU	CRUD	CRUD	CRUD	CRUD
Payroll	R		R	R	CRUD	R	R
Schedule	CRUD	RU	CRUD	CRUD	CRUD	CRUD	CRUD
Report	R		R	R	CRUD	R	R

Table 5. Partial CRUD Matrix

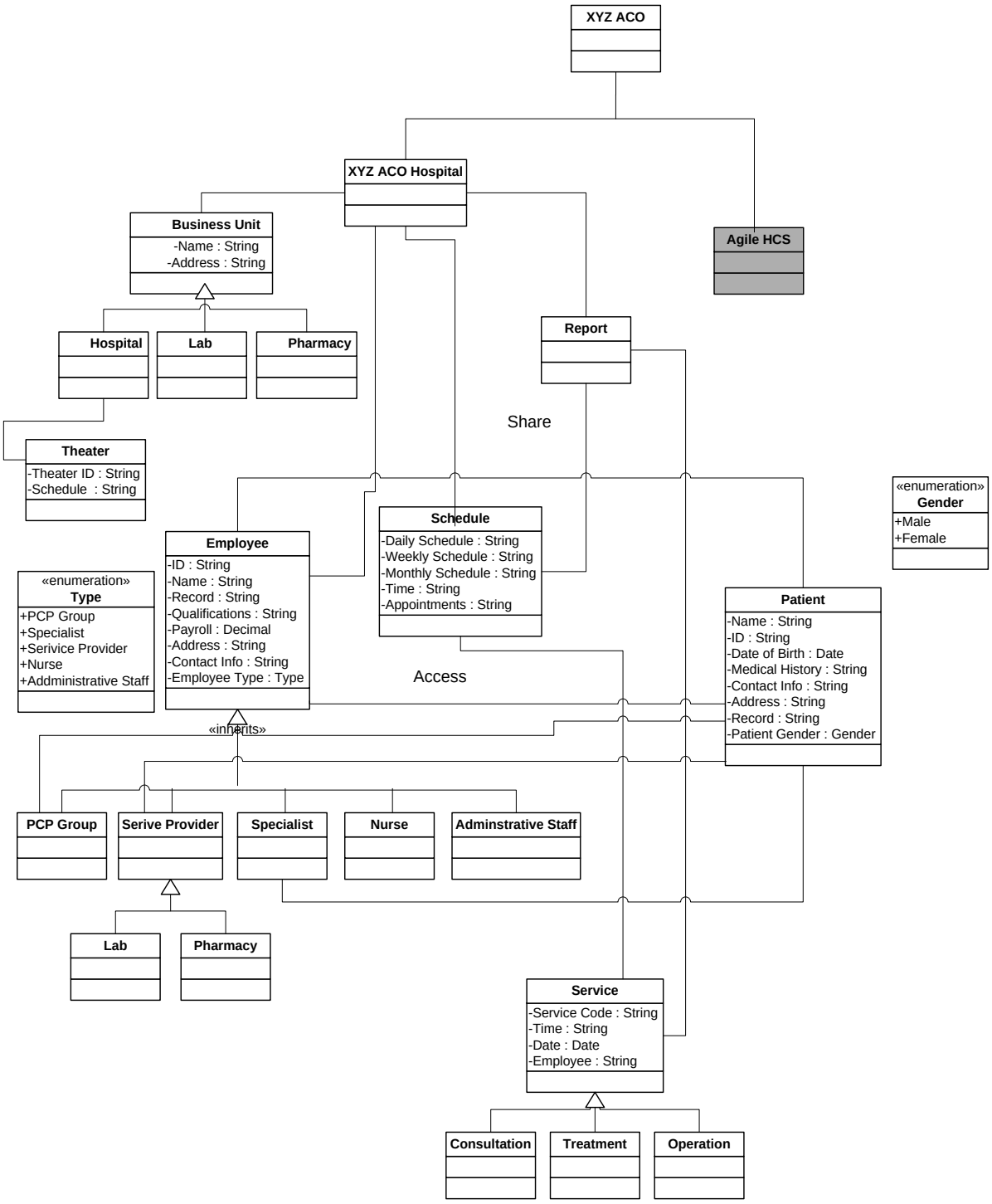

Figure 8. Conceptual Data Model of XYZ ACO

2.5 Application Viewpoint Models

Additional models developed by the team for this viewpoint is given in this section. The Application Viewpoint Models focus on the applications of the EA, and here use cases for the proposed Release 1 are included, namely the Service Performance Management Reporting System and the Physician Performance Reporting System.

Service Performance Management Reporting System. This system includes the Service Performance Reporting System. The application architecture to realize the functionality of Release 1 addresses Service Performance

Management in terms of the concerns pertinent to assessing doctors' performance and quality of service provided to patients treated at XYZ ACO facilities. This essentially includes reporting on the daily, weekly and monthly work schedule, medical procedures performed, as well as patients' review of health care service received during visits.

Physician Performance Reporting. Figure 9 is a high-level use case diagram for the Physician Performance Reporting System. When the patient visits the physician for a consultation or surgery procedure, the name of the doctor (physician or surgeon) is stored in the database along with the date and time of the visit. A XYZ ACO manager can request a report of the service performance of a specific physician (or group of physicians) on the number of patients attended for a specific period (day, week, month, or year). The system accesses the database and prints the requested report.

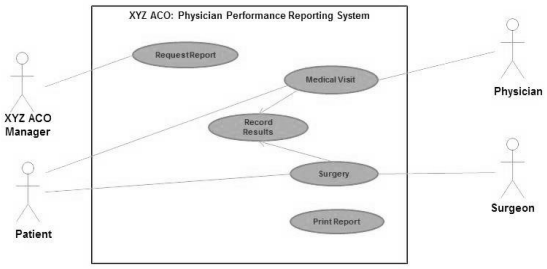

Figure 9. Use Case Diagram for Physician Performance Reporting System

Patient Appointment Manager System. Figure 10 illustrates the Patient Appointment Manager System use case. The patient requests an appointment at a hospital to visit a specialist, or to receive a service at a medical laboratory. Based on availability for an appointment the system accesses the patient record, records the entered appointment information (date, time, and place), and confirms the appointment with the involved parties (e.g. patient, specialist). The patient or physician can cancel an appointment, and the system will record the cancelation in the database. When a patient requests a prescription the system checks for the availability of the requested prescription at the XYZ ACO affiliated pharmacy, and coordinates the delivery of the medicine to a location for pick-up.

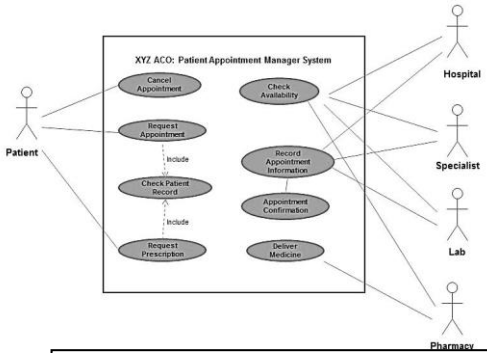

Figure 10. Use Case Diagram for Patient Appointment Manager System

2.6 Enterprise Security Viewpoint models

Due to the scope and complexity of the security requirements of an enterprise the security viewpoint is regarded as a composite viewpoint, and hence called the enterprise security viewpoint comprising all security-related concerns of the EA initiative, including physical, data, information, application, and infrastructure security. A selection of models developed by the team for this viewpoint is given in this section, namely the Composite Enterprise Security Viewpoint, High Level Security Model of XYZ ACO, and the Information Security Management Model.

Composite Enterprise Security Viewpoint. Figure 11 illustrates how security is viewed from a holistic standpoint and its coverage for all enterprise domains.

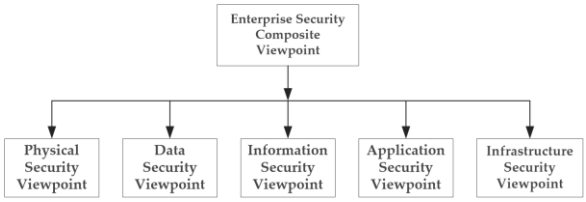

Figure 11. Composite Enterprise Security Diagram

High Level Security Model of XYZ ACO. Figure 12 shows the security level requirements which involves the infrastructure that is rarely visible to the business functions. The fundamental purpose of having security is to protect the value of the systems and information assets of the enterprise. According to The Open Group (TOGAF 9.1, 2011) the generally accepted areas of concern for to security architect are:

- **Authentication:** The substantiation of the identity of a person or entity related to the enterprise or system in some way.
- **Authorization:** The definition and enforcement of permitted capabilities for a person or entity whose identity has been established.
- **Audit:** The ability to provide forensic data attesting that the systems have been used in accordance with stated security policies.
- **Assurance:** The ability to test and prove that the enterprise architecture has the security attributes required to uphold the stated security policies.
- **Availability:** The ability of the enterprise to function without service interruption or depletion despite abnormal or malicious events.
- **Asset Protection:** The protection of information assets from loss or unintended disclosure, and resources from unauthorized and unintended use.
- **Administration:** The ability to add and change security policies, add or change how policies are implemented in the enterprise, and add or change the persons or entities related to the systems.
- **Risk Management:** Is the organization's attitude and tolerance for risk. Note that risk management here is different from the special definition found in financial markets and insurance institutions that have formal risk management departments.

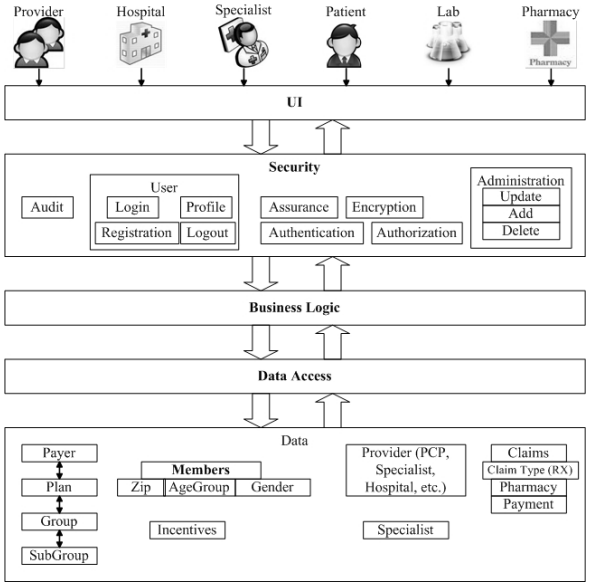

Figure 12. High Level Security Model of XYZ ACO

Information Security Management. Figure 13 presents information security management in the enterprise at three main levels, namely strategic, tactical, and operational. The strategic level impacts the corporate strategy, the tactical level relates to processes and methodologies used to manage security, and the operational level addresses the installation and operation of security tools and measures.

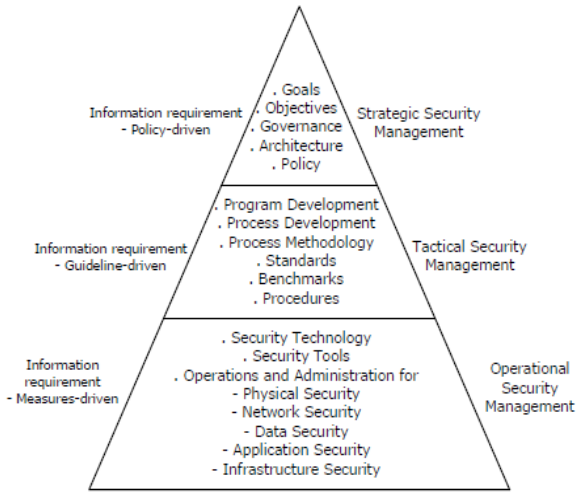

Figure 13. Organization Levels of Information Security Management

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