Competency Area: Business Continuity and Information Assurance

Area Description: Business Continuity and Information Assurance competency area mainly concerns the continuity, auditing and assurance of the information systems. It generally covers areas such as risk avoidance, security management as well as quality auditing. The challenging issues related to business continuity and information assurance span from tactical and strategical to technical and operational levels. They often involve a range of processes from management, such as policy and standard setting, to hands on skills, such as system contingency and recovery planning.

High-level area competencies

The graduates will be able to:

- 1. Create policies and standards for business continuity and information assurance.
- 2. Plan and implement procedures, operations and technologies for managing risk and trust, security and safety, as well as business continuity and disaster recovery.
- 3. Monitor, control and institutionalize the protection and growth of the hardware, software and information assets within information systems.

[Note: the individual competencies within the categories below are not intended to be comprehensive and are potentially more time-dependent than the competency areas and categories. The individual competencies descriptions all start with "Graduates will be able to," which is not included to avoid repetition.]

Competency Categories and Competency Examples — Pre-master's

None explicitly expected.

- 1. Managing and implementing cybersecurity
 - a. Develop, implement and maintain security policy and technical procedures to protect and defend the data and network systems in the organization.
 - b. Monitor and control security related events, such as detecting intrusion, identifying fraud and responding to security incidents.
 - c. Understand essential system and network security related technologies, including cryptology, security protocols and framework, firewall and IDS tools, etc.
- 2. Responding to and managing IS problems
 - a. Respond to problems and incidents raised during the business operations, in order to minimize the interruption to the data and system access.
 - b. Investigate incidents and analyze and report results of these investigations.
 - c. Apply standard digital forensic and cybercrime prevention techniques.
- 3. Evaluating the continuity of system operations through monitoring
 - a. Monitor and track the system operations in order to assure the smoothness and continuity while avoid and reduce interruptions and incidents.
 - b. Track system performance, monitor security and analyze user behavior.
 - c. Assess the running conditions of the IS system within an organization, and take appropriate actions when unexpected events occur.

- 4. Managing system recovery
 - a. Initiate recovery and contingency plans and operations in the events of system failures or security compromises, in order to keep the IT assets resilient to any interruptions of normal business conditions.
 - b. Manage the processes of system isolation and restoration, disaster recovery and crisis management.
 - c. Containing system faults and bringing the system up and back to running from problematic situations.
- 5. Managing Information Systems risks
 - a. Assess and identify potential risks to the information systems and execute necessary actions to avoid and reduce the threats from the risks.
 - b. Identify vulnerabilities and threats.
 - c. Monitor and mitigate risks.
- 6. Protecting IT assets
 - a. Plan and manage the IT assets, including the system, network, databases and established processes and practices within the organization.
 - b. Protect the IT assets from internal and external damages caused by careless or malicious threats.
 - c. Maintain Confidentiality, Integrity and Availability (CIA).
 - d. Enforce regulatory requirements and contracts.
- 7. Developing information assurance strategy
 - a. Develop the leadership and oversight in setting corporate level strategy and policy to assure cost-effective and confident management of the information systems within the organization.
 - b. Integrate protection from risks and security threats.
- 8. Engineering systems for continuity
 - a. Ensuring continuous operation of the IT assets in all phases of the lifecycle of the information systems.
 - b. Apply techniques of continuity-aware planning top IT procurement.
 - c. Execute remedial and contingency planning.
- 9. Implementing and managing quality audit processes
 - a. Assess and audit the integrity and quality of the IT provisions in the organization.
 - b. Monitor and analyze risks and business objectives in order to improve business and IT alignment so that the organization may achieve business continuity.
 - c. Use auditing and monitoring tools and measures.
 - d. Perform impact analysis and assessment.
- 10. Assuring safety throughout systems lifecycle
 - a. Assure safety during all phases of systems development, maintenance and reuse.
 - b. Anticipate safety hazards and perform risk analyses.
 - c. Perform hazard analyses and risk assessments.
 - d. Conducting safety assurance planning and compliance.
 - e. Incorporate safety in systems architectural design.

Competency Area: Data, Information and Content Management

Area Description: Data, Information, and Content Management area covers competencies that enable the graduates to be effective contributors in processes that improve the domain's ability to achieve its goals using structured and unstructured data and information effectively.

High-level area competencies

The graduates will be able to:

- 1. Identify data and information management technology alternatives, select the most appropriate options based on the organizational information needs, and manage the implementation of the selected options.
- 2. Identify, create, and manage organizational policies and processes related to data and information management, balancing multidimensional requirements, such legal and regulatory requirements, ethical considerations and implications of technology decisions, organizational business requirements, data quality issues, and requirements of operating in an international environment.
- 3. Analyze the needs of a domain and determine how those needs can be best addressed with data, information, and content management solutions.

[Note: the individual competencies within the categories below are not intended to be comprehensive and are potentially more time-dependent than the competency areas and categories. The individual competencies descriptions all start with "Graduates will be able to," which is not included to avoid repetition.]

- 1. Understanding key data and information concepts and the data and information management lifecycle
 - a. Explain the differences between data, information, and knowledge.
 - b. Explain the reasons why data, information, knowledge, data management, and content management solutions are essential for human activity.
 - c. Separate the lifecycle stages from each other conceptually.
 - d. Understand the actions required during each of the stages.
 - e. Understand the connection between systems lifecycles and data management lifecycles.
- 2. Capturing and structuring data and information requirements using appropriate conceptual modeling techniques
 - a. Interview and observe users to identify their data needs.
 - b. Evaluate domain activities to understand how they can be improved with effective use of data.
 - c. Structure domain data requirements using Enhanced Entity-Relationship modeling.
- 3. Developing a logical level representation of data based on a conceptual model
 - a. Convert an EER model into a relational data model.

- b. Analyze the normalization status of a relational model and convert it to the third normal form.
- *4. Implementing a database solution to serve systems consisting of multiple applications*
 - a. Write SQL code to implement a relational database based on a relational data model.
 - b. Design and maintain an effective indexing solution for a relational database that supports transaction processing.
- 5. Using a contemporary data manipulation and retrieval language effectively
 - a. Implement a relational database using the DDL features of SQL.
 - b. Retrieve data from a complex relational database using the DML features of SQL.
 - c. Insert, update, and delete data in a relational database using the DML features of SQL.

- 6. Selecting appropriate data management technologies based on the needs of the domain
 - a. Understand differences between technologies for operational databases, structured data warehouses, and repositories for unstructured data.
 - b. Design a technology architecture for organizational data management.
 - c. Select appropriate technology options for each of the architectural categories.
- 7. Securing domain data and protecting user privacy and organizational intellectual property using appropriate technical solutions
 - a. Identify appropriate data encryption technologies.
 - b. Implement data access policies in the context of a database management system.
- 8. Designing and implementing a data warehouse using a contemporary architectural solution
 - a. Understand the differences between an enterprise data warehouse and data mart and select an appropriate solution for an organization.
 - b. Design a schema for a data warehouse using one of the standard design approaches (such as star or snowflake schema).
 - c. Implement a data warehouse using a contemporary technology solution.
- 9. Creating a scalable infrastructure for large amounts of data using parallel and distributed technologies
 - a. Architect solutions for the storage and management of large volumes of heterogeneous data using Hadoop.
 - b. Architect solutions for the storage and management of large volumes of heterogeneous data using NoSQL technologies.
- 10. Developing and implementing organizational information management policies and processes
 - a. Align information use with the goals of the domain.
 - b. Ensure proper access to information.

- c. Manage the policies regarding security, privacy, compliance with laws and regulations, and quality of data.
- 11. Integrating and preparing data captured from various sources for analytical use
 - a. Identify appropriate data sources.
 - b. Design processes for extracting, transforming and loading (ETL) data to the analytical environment.
 - c. Implement ETL processes in an organizational environment.
- 12. Selecting and using appropriate analytics methods
 - a. Identifying appropriate analytics methods for given tasks.
 - b. Using an analytics platform to perform basic analytics tasks.
 - c. Reporting the results of an analytics task.
- 13. Designing and implementing architectures for organizational content management systems

Area: Enterprise Architecture

Area description:

Enterprise architecture has two aims: managing the complexity of information systems and technologies and fit these with the strategy of the organization. The area covers competences that enable graduates to participate in planning, building, using, maintaining and evaluating the architectures.

High-level area competences

The graduates will be able to:

- 1. Design an enterprise architecture (EA). This involves identifying and applying a formal approach to EA development, performing the multistage process of developing an EA, identifying the EA change needs and applying them to the EA. The graduates are able to incorporate information, business processes, technology platforms, applications, software, and hardware in the EA while considering the alignment between business requirements and technology development.
- 2. Deploy and maintain an enterprise architecture. This involves conveying the architecture to business process owners, software development and maintenance projects, and infrastructure planners, taking into account the current status of the projects and infrastructure. This also includes gathering input from the enterprise and from technology developments for maintaining the architecture and performing architecture maintenance.

[Note: the individual competencies within the categories below are not intended to be comprehensive and are potentially more time-dependent than the competency areas and categories. The individual competencies descriptions all start with "Graduates will be able to," which is not included to avoid repetition.]

Competence categories and competence examples — Pre-master's

None explicitly expected.

- 1. Understanding enterprise architecture principles and the value it provides to businesses
 - a. Justify the value of building and maintaining an enterprise architecture.
 - b. Understand and compare various architectural forms (such as SOA, event driven, peer-to-peer).
 - c. Use confidently EA taxonomies and concepts.
 - d. Prepare the organization to have an EA.
- 2. Participating in building and maintaining an EA
 - a. Suggest an appropriate EA framework and methodologies for an organization (such as The Open Group Architecture Framework TOGAF, Federal Enterprise Architecture Framework FEAF, The Zachman framework).

- b. Model the enterprise from various architectural perspectives using a specific architecture framework.
- c. Participate effectively in a process of building an EA conducted using a specific framework model.
- 3. Communicating and deploying an EA
 - a. Select and justify an appropriate deployment strategy (such as replacement or incremental).
 - b. Understand deployment patterns and anti-patterns.
 - c. Manage the necessary organizational changes.
 - d. Establish an EA practice.
 - e. Communicate the enterprise architecture effectively to relevant stakeholders.
- 4. Using an EA to influence IS/IT related organizational improvement projects
 - a. Bring the EA view into organizational improvement projects that are likely to affect (and be affected) by the EA.
 - b. Use the EA effectively to support the interoperability of systems and services.
 - c. Use the EA effectively to support the scalability of systems and services.
 - d. Support high-level system usability using an EA.
 - e. Ensure that the development of IS/IT is aligned with domain changes.
 - f. Ensure alignment between business architecture, information architecture, and IT architecture.

Competency Area: Ethics, Impacts, and Sustainability

Area Description: The ethics and impacts competency area covers the conceptualization and implementation of environmentally and socially sustainable IT solutions that are aligned with the responsibilities of organizations as well as in compliance with legislative and regulatory requirements and industry standards. This competency area addresses key questions such as environmental and social sustainability, safety and health, privacy and integrity. It also covers the impact of IT on the nature of work and workplaces and explores how culture and ethics (internal pertaining to organizations and external pertaining to stakeholders) shape behavior. These areas tend to be aligned with a strategic or a tactical level of organizational decision making.

High-level area competencies

The graduates will be able to:

- 1. Understand and apply sustainable approaches for IT solutions development, IT procurement, IT operations, IT resources management and other IT practices.
- 2. Ensure safety and avoid health hazards for contract arrangements with external parties and internal systems development, maintenance and reuse.
- 3. Ensure that privacy and integrity guide all IT practices.
- 4. Interpret and comply with legislative and regulatory requirements governing IT practices as well as industry standards for IT practices, and understand how culture and ethics shape compliance behavior.

[Note: the individual competencies within the categories below are not intended to be comprehensive and are potentially more time-dependent than the competency areas and categories. The individual competencies descriptions all start with "Graduates will be able to," which is not included to avoid repetition.]

Competency categories and competency examples — Pre-master's

None explicitly expected.

- 1. Designing and managing sustainable IT operations
 - a. Plan for and manage IT assets, systems using processes and practices that reduce consumption of energy and constrain disposal of materials.
 - b. Determine relevant methods and tools for addressing energy efficiency issues in IT operations.
 - c. Establish proper practices for disposal of materials in alignment with regulatory or policy requirements.
- 2. Managing IT facilities sustainably
 - a. Plan and manage IT physical facilities, including conducting environmental monitoring for adverse effects and adhering to health and safety standards at work.

- b. Manage the IT estate in accordance with organizational sustainability targets.
- c. Take responsibility for adherence to health and safety regulations.
- 3. Aligning IT with organizational sustainability policy
 - a. Pursue sustainable IT solutions in accordance with the organizational sustainability policy.
 - b. Monitor and measure IT energy consumption.
 - c. Apply latest approaches for sustainable development in IT projects.
 - d. Mastering regulatory constraints and international standards pertaining to IT sustainability.
- 4. Managing sustainable procurement practice
 - a. Make recommendations to enhance organizational procurement processes to include sustainability, ethical and compliance perspectives.
 - b. Analyze the energy efficiency and environmental aspects of procurement proposals.
 - c. Verify that procurement processes comply with laws such as intellectual property rights.
- 5. Managing contracts ethically
 - a. Negotiate contracts in accordance with organizational guidelines.
 - b. Comply with laws and regulations as well as health and safety standards.
 - c. Negotiate contract terms and conditions to include health and safety provisions.
 - d. Apply judgment in contract negotiations in compliance with laws and internal policies.
- 6. Maintaining compliance with legislation, regulations, and standards
 - a. Understand legislative and regulatory requirements governing IT practices as well as industry standards for IT practices.
 - b. Interpret relevant laws and regulations correctly to ensure that IT practices comply.
 - c. Incorporate industry standards into IT practices.
- 7. Ensuring that protection of privacy and integrity guide all IS/IT practices
 - a. Understand privacy implications of key IS/IT decisions.
 - b. Require technical safeguards to protect individual privacy as part of IS/IT design and implementation.
 - c. Establish a culture in the IS/IT organization that values privacy and integrity.
- 8. Maintaining an ethical culture
 - a. Appreciate the roles of culture and ethics, internal or external to organizations, in shaping IS/IT practices in organizations.
 - b. Understand and interpret how culture and ethics shape behavior towards taking risks.
 - c. Learning from negative outcomes.
- 9. Understanding the ethical implications of IS/IT decisions
 - a. Select appropriate ethical frameworks for analyzing IS/IT decisions.
 - b. Analyze ethical implications of IS related decisions.
 - c. Justify abstaining from harmful decisions.

Competency Area: Innovation, Organizational Change, and Entrepreneurship

Area Description: Innovation, organizational change, and entrepreneurship are concerned with the capability to recognize and exploit the potential afforded by current and upcoming technologies to address existing and new business opportunities. It also includes competencies required to understand and to intervene in different forms of business activities (e.g., work units, work teams, processes, organizations, markets, society setting) in order to make use of information technologies to improve the way those business activities are structured and are performed.

High-level area competencies

The graduates will be able to:

- 1. Monitor the environment in order to identify and evaluate new IS methods and trends in terms of their appropriateness for an organization.
- 2. Develop innovative business models relying on new uses of existing technology or new technologies themselves.
- 3. Develop a plan to exploit new and emerging methods and technologies for new purposes in an organization.
- 4. Devise new ways of structuring and performing business activities at different levels (individual, team, process, and organization), taking into consideration the enabling and enhancing effects of information technology applications.
- 5. Estimate the benefits of the new designs, assessing the consequences of their implementation, and anticipating potential adverse consequences.

[Note: the individual competencies within the categories below are not intended to be comprehensive and are potentially more time-dependent than the competency areas and categories. The individual competencies descriptions all start with "Graduates will be able to," which is not included to avoid repetition.]

Competency categories and competency examples — Pre-master's

None explicitly expected.

- 1. Understanding where and how to monitor the technology environment
 - a. Identify and evaluate sources of information regarding emerging methods and technologies.
 - b. Identify business advantages associated with specific emerging methods or technologies.
 - c. Identify business concerns associated with specific emerging methods or technologies.
- 2. Engaging in entrepreneurial thinking
 - a. Describe the concept of effectual reasoning.
 - b. Leverage effectual reasoning to imagine a set of outputs with a given set of inputs.

- c. Map existing and emerging methods and technologies onto the set of inputs in (b) above.
- 3. Developing a business plan
 - a. List the components of a business plan.
 - b. Articulate a value proposition for a business idea.
 - c. Prepare a SWOT analysis.
 - d. Perform financial assessment (e.g., ROI, IRR, etc.).
 - e. Articulate the risks and rewards of the business plans.
 - f. Propose a set of metrics for evaluating a business plan.
- 4. Innovating by exploiting an emerging method or technology
 - a. Identify opportunities to transform a domain of human activity by applying emerging technologies innovatively.
 - b. Identify the appropriate people to involve in an innovation plan.
 - c. Articulate plan milestones including key decision points.
 - d. Describe key metrics that will be used to inform participants at the decision points.
 - e. Devise novel ways for the provision of business solutions based on IT products or services.
 - f. Build prototypes to develop a proof of concept.
- 5. Understanding the diffusion curve and how to leverage different adopters
 - a. Compare and contrast Rogers' adoption curve with Moore's chasm approach.
 - b. Describe the interests of different adopter categories.
 - c. Develop a plan to engage adopters at various stages along the diffusion curve.
- 6. Understanding how to apply creative problem solving to technology-related issues
 - a. Describe a creative problem solving approach.
 - b. Given a problem, apply creative problem solving techniques to identify possible solutions.
 - c. Evaluate those solutions for a given context and make a recommendation.
- 7. Contributing to organizational development
 - a. Contributes to organizational development initiatives bringing up the perspective of the impact of IT.
 - b. Manage organizational resistance to change effectively
 - c. Modify organizational characteristics to enable business process transformation.
 - d. Enable organizations prepare for change through systematic, planned approaches.
- 8. Identifying opportunities for and designing process improvement
 - a. Identify opportunities for organizational improvements through process modifications.

- b. Create, compare, assess feasibility of, and select from multiple options for organizational process improvements.
- c. Deploy process changes throughout the organization.
- d. Articulate high-level systems requirements to enable organizational process changes.
- e. Apply modern process modeling approaches to identify and document existing and future processes.
- 9. Monitoring emerging technologies to understand their potential to support the domain
 - a. Understand technology fundamentals sufficiently to identify emerging technologies that have the potential to transform the domain.
 - b. Align the use of potential emerging technologies with the needs of the domain.
 - c. Maintain a mechanism to systematically evaluate emerging technologies.

Competency Area: IS Management and Operations

Area Description: IS Management and Operations are concerned with the capability to develop, maintain and consistently improve business performance while providing appropriate information systems, services and infrastructure. The capability focuses externally on creating value for the business and internally on IS staff motivation, performance, and accountability.

High-level area competencies

The graduates will be able to:

- 1. Apply professional management skills to design and manage an effective IS/IT organization.
- 2. Ensure operational efficiency and effectiveness in service delivery.
- 3. Govern IS project management principles and support their use in the organization.
- 4. Manage information systems use.
- 5. Manage information resources together with line management.

[Note: the individual competencies within the categories below are not intended to be comprehensive and are potentially more time-dependent than the competency areas and categories. The individual competencies descriptions all start with "Graduates will be able to," which is not included to avoid repetition.]

Competency categories and competency examples — Pre-master's

- 1. Know and apply broadly applied Project Management tools and techniques
 - a. Understand the fundamental concepts of work organized as projects.
 - b. Understand the principles underlying broadly applied Project Management tools and techniques (such as PERT, GANTT, and their implementations in a popular tool).
 - c. Apply successfully broadly applied Project Management tools and techniques to small and medium size projects.

- 2. Managing the IS/IT function
 - a. Manage the financial performance of the IS function.
 - b. Manage IS service production.
 - c. Manage IS service marketing.
- 3. Managing IS/IT staff
 - a. Establish effective processes for managing IS/IT staff performance.
 - b. Identify needs for education/training.
 - c. Offer an effective education/training program.
 - d. Plan and manage recruiting, hiring and retention processes.
- 4. Managing IS/IT service production

- a. Manage the operational processes that must be performed on a day-to-day basis to maintain acceptable IS performance levels.
- b. Implement service control processes, including production and distribution scheduling, problem control, and service evaluation.
- c. Manage user support so that it serves organizational needs.
- 5. Managing IS/IT sourcing models
 - a. Identify IS/IT sourcing options.
 - b. Select the best IS/IT sourcing option for a specific resource and situation.
 - c. Manage IS/IT service and resource vendors.
- 6. Managing and coordinating information resources
 - a. Identify relevant categories of information resources.
 - b. Determine the relevant focus of control for various information resources (such as centralized, decentralized, mobile).
 - c. Identify and select from various technology options for information resource management.
 - d. Manage processes for information resource management.
 - e. Identify and implement approaches to maximizing the value of information resources.
- 7. Implementing relevant IT governance framework(s) within the organization based on strategic guidance
 - a. Train employees on the use of IT governance framework(s).
 - b. Provide guidance regarding framework use adapted to the organizational environment.
 - c. Monitor organizational alignment with the framework.
- 8. Understanding laws and regulations directly affecting IS/IT management and operations (such as Sarbanes-Oxley, PCI, CANSPAM, HIPAA in the U.S.)
 - a. Identify locally and globally relevant laws and regulations.
 - b. Ensure compliance of organizational IT with laws and regulations via implementation and understanding of established audit practices.
- 9. Managing IS/IT projects and programs
 - a. Select IS/IT projects to execute.
 - b. Determine IS/IT project feasibility
 - c. Identify and manage IS/IT project risks.
 - d. Plan and initiate an IS/IT project, including project scheduling and creation of a work breakdown structure.
 - e. Determine and acquire IS/IT project resources.
 - f. Manage IS/IT project execution, including schedule, scope, and resources.
 - g. Close an IS/IT project.
 - h. Organize similar or related IS/IT projects into programs.
 - i. Manage allocation of resources, schedules, and conflicts between projects within a program.
- 10. Managing IS/IT project portfolios
 - a. Organize IS/IT projects into meaningful portfolios that are aligned with organizational objectives.
 - b. Identify and manage IS/IT project interdependencies.
 - c. Optimize project timelines within and between IS/IT project portfolios.

- d. Integrate IS/IT projects for coordinated delivery of new capabilities.
- e. Allocate resources among projects within a portfolio.
- 11. Managing software and hardware development and maintenance
 - a. Manage software development and upgrade processes.
 - b. Manage software procurement and upgrade processes.
 - c. Manage hardware procurement and upgrade processes.
 - d. Manage systems maintenance.
 - e. Manage systems tuning and balancing.

Competency Area: IS Strategy and Governance

Area Description: IS strategy is concerned with the creation and implementation of long term plans for designing, delivering and using organizational information systems to achieve strategic business goals and objectives. IS governance is concerned with monitoring and controlling organizational IS resources to ensure alignment with and achievement of strategies, goals, and objectives.

High-level area competencies

The graduates should be able to:

- 1. Analyze the effect and impact of IS on industries, firms, and institutions; develop and implementing plans of action for maximizing firm benefits associated with IS design, delivery and use; and manage IS resources financially.
- 2. Create and manage the oversight mechanisms by which an organization evaluates, directs and monitors organizational IT. These mechanisms may leverage one or more governance frameworks; hence, understanding the process of applying and analyzing a framework is a critical competency. Distribution of decision rights and organizational decision making practices are another key component of this competency area.
- 3. Understand methods for measuring environmental impact, establishing practices for minimizing environmental impacts, and planning for long-term firm viability.

[Note: the individual competencies within the categories below are not intended to be comprehensive and are potentially more time-dependent than the competency areas and categories. The individual competencies descriptions all start with "Graduates will be able to," which is not included to avoid repetition.]

Competency categories and competency examples — Pre-master's

None specifically expected.

- 1. Conducting IS strategic analysis
 - a. Understand digital platforms, digital markets, and the process for creating and designing new and innovative digital capabilities.
 - b. Analyze industry conditions using broadly accepted models and understand ways in which IS shapes industry forces.
 - c. Analyze IS resources to identify and create valuable, rare and inimitable IS resource combinations.
 - d. Analyze institutional characteristics (e.g. politics, law, societal norms) having an effect on the firm and understand how IS may be used to influence institutional characteristics.
- 2. Making a financial case for IS

- a. Prepare and develop documents to articulate the business case for investments in IS.
- b. Calculate the economic value of IS taking into consideration tangible and intangible costs and benefits.
- c. Calculate the economic value of IS taking into consideration internal, within firm, costs and benefits as well as external, between firm, costs and benefits.
- d. Calculate the economic value of IS taking into account innovative and disruptive solutions.
- 3. Managing IS/IT sourcing strategies
 - a. Understand factors impacting decisions to purchase and outsource IS/IT.
 - b. Make high-level decisions regarding IS/IT sourcing.
 - c. Guide tactical IS/IT sourcing decisions.
- 4. Engaging in IS strategic planning
 - a. Create strategic plans for IS design, delivery and use that exploit opportunities identified via IS strategic analysis.
 - b. Create IS goals and objectives for strategic plans and define mechanisms by which IS goals and objectives may be measured.
 - c. Create plans for the efficient management of IS platforms and IS markets.
- 5. Planning and implementing IS governance
 - a. Understand and select relevant governance frameworks (e.g. COBIT, TOGAF, ITIL) to guide, manage and govern organizational IT resources.
 - b. Manage the deployment of relevant governance framework within the organization.
 - c. Understand methods for enhancing alignment between IT and business goals.
- 6. Planning for and improving sustainability
 - a. Develop strategic plans of action for minimizing the environmental impact of firm products, operations and personnel in an economically viable manner.
 - b. Measure sustainability impact of IS operations and personnel.

Competency Area: IT Infrastructure

Description: The IT Infrastructure area covers competencies that allow the graduates to contribute to needs analysis for and design and implementation of effective, technically correct IT infrastructure solutions.

High-level area competencies

The graduates will be able to:

- 1. Design integrated communication networks for small and medium size organizations, including local area networks and the use of wide-area network technologies to connect the local networks.
- 2. Specify requirements for large-scale network solutions.
- 3. Design an implementation architecture for organizational data processing and system solutions, using both internal hardware resources and external service solutions.
- 4. Negotiate and enforce contracts with providers of IT infrastructure services.

[Note: the individual competencies within the categories below are not intended to be comprehensive and are potentially more time-dependent than the competency areas and categories. The individual competencies descriptions all start with "Graduates will be able to," which is not included to avoid repetition.]

- 1. Designing data communication networks and data center and server solutions
 - a. Understand the advantages and disadvantages of core design approaches for local area networks and select an appropriate design approach for a specific organizational situation.
 - b. Understand the advantages and disadvantages of core design options for wide-area networks and select an appropriate design approach for a specific organizational situation.
 - c. Select an appropriate server architecture for the purposes of the domain.
 - d. Design the characteristics of a network and data center solution based on the needs of the domain.
- 2. Selecting appropriate client devices to support the needs of a domain
 - a. Analyze the benefits and disadvantages of various client device types.
 - b. Select an appropriate set of acceptable client devices for a domain.
 - c. Determine whether or not the "bring your own device" model is acceptable for an organization.
- 3. Securing IT infrastructures
 - a. Understand how the infrastructure design solutions impact the security of a specific infrastructure design.
 - b. Apply security principles and policies effectively during the process of infrastructure design.
 - c. Implement foundational infrastructure security solutions based on contemporary technologies.

- 4. Specifying and monitoring infrastructure contracts
 - a. Determine service level agreement (SLA) details based on domain needs, including protections against service disruptions.
 - b. Evaluate actual service provision compared to the SLAs.
 - c. Apply relevant quality management tools and techniques.
- 5. Negotiating contracts and managing infrastructure vendors
 - a. Identify potential vendors.
 - b. Select a vendor for a particular infrastructure need and negotiate a contract with the vendor.
 - c. Maintain mutual understanding of key challenges of the domain.
 - d. Manage transitions from one vendor to another.
- 6. Managing infrastructure risks
 - a. Consider risks into account in the context of an infrastructure design solution.
 - b. Monitor infrastructure status from multiple perspectives and take appropriate action in case of irregularities.
 - c. Design and document appropriate processes for risk analysis and management.
- 7. Designing virtualization solutions
 - a. Understand the role of virtualization in the context of effective use of server capacity.
 - b. Select an appropriate virtualization approach to serve the organizational needs.
 - c. Implement and monitor the performance of the implementation solution.
- 8. Designing infrastructure solutions using external service provider(s) (cloud computing)
 - a. Understand and correctly apply the right factors to determine the suitability of a cloud computing solution for the infrastructure needs of the domain.
 - b. Analyze the specific infrastructure needs of the domain.
 - c. Prepare and submit a request for proposal (RFP) based on domain needs analysis.
 - d. Select a cloud service provider based on responses to the RFP and negotiate the final contract.
 - e. Implement the cloud computing solution and monitor its operational performance.
- 9. Maintaining a set of standards and policies and understand the key laws and regulations to relevant infrastructure decisions
 - a. Identify and specify the key elements of a policy for acquisition of IT resources.
 - b. Identify IT standards appropriate for the domain.
 - c. Understand the key laws and regulations relevant for the domain.

Competency Area: Systems Development and Deployment

Area description: Systems Development and Deployment encompasses the design of information systems, including the design of how humans interact with and how they experience IT artifacts. It also includes competencies related to systems implementation and the deployment of systems to organizational use.

High-level area competencies

The graduates are able to:

- 1. Analyze and specify requirements for IT artifacts thorough study and documentation of the whole or of part of some form of business activities (e.g., work unit, work team, process, organization, market, society setting) in terms of the actions they involve and the information they deal with. Define requirements for IT artifacts that are capable of enhancing the way existing business activities are structured and performed or enabling new forms of business activities.
- 2. Design and document IT artifacts that meet specified requirements taking into account non-functional requirements (including user experience design) and organizational, technical, infrastructural and other constraints.
- 3. In the context of iterative processes that integrate analysis, design, implementation and operations, develops and deploys IT applications that satisfy user needs.

[Note: the individual competencies within the categories below are not intended to be comprehensive and are potentially more time-dependent than the competency areas and categories. The individual competencies descriptions all start with "Graduates will be able to," which is not included to avoid repetition.]

- 1. Documenting existing systems
 - a. Select appropriate data collection methods and techniques for the investigation of business activities.
 - b. Investigate business activities in order to develop an in-depth understanding of those business activities.
 - c. Involve stakeholders in the investigation process, leading to a shared understanding of the business activities.
 - d. Document business activities, on their different relevant facets, using appropriate representation techniques.
- 2. Specifying and documenting systems requirements
 - a. Identify scenarios of IS/IT artifact use to enable and support domain activities.
 - b. Document the requirements for IS/IT artifacts based on the domain needs.
 - c. Makes and documents formal agreements with relevant stakeholders regarding project requirements in a form appropriate to the systems development approach.
 - d. Manages system change requirements in a form appropriate to the systems development approach.

- 3. Identifying and selecting from systems design and implementation alternatives
 - a. Identify multiple alternatives for systems design and implementation based on requirements and the systems development approach.
 - b. Select the most appropriate systems design and implementation approach in a specific organizational and system context.
- 4. Designing systems
 - a. Determine a design plan based on the requirements, organizational context, and the systems development approach.
 - b. Design the architecture and the components of IS/IT artifacts.
 - c. Validate the compatibility of the design with the user requirements using mechanism appropriate to the systems development approach.
 - d. Establish and maintain a communication model with various stakeholders that is appropriate to the systems development approach.
 - e. Apply organizational design methods, tools, and standards.
- 5. Designing user experiences
 - a. Design human-computer interfaces and interaction sequences taking into account the envisioned user experience.
 - b. Refine user interface designed based on results of user experience evaluation and feedback from users.
- 6. Implementing a systems solution using a modern programming language

- 7. Selecting between systems development approaches
 - a. Understand the benefits and disadvantages of plan-based, hybrid, and agile development approaches.
 - b. Determine the organizational and domain constraints to the use of planbased, hybrid, and agile development approaches.
 - c. Select a development approach for the organization and a system context.
- 8. Managing plan-based, hybrid, and agile development approaches
 - a. Understand the key principles of managing plan-based, hybrid, and agile development approaches.
 - b. Manage a simple project following one of the key development approaches.
 - c. Understand the key DevOps concepts for integration between development and operations and determine when they are relevant for application in a specific domain.
- 9. Specifying and documenting systems requirements
 - a. Selecting appropriate requirements specification methods considering the system type, organizational context, and selected systems development approach.
 - b. Determine the impacts of various requirement alternatives on the practice of the domain.
- 10. Designing systems
 - a. Estimate costs of various system design and implementation alternatives using formal estimation techniques appropriate to the systems development approach.

- b. Analyze the domain impact of various design and implementation alternatives.
- c. Evaluate and manage risks associated with various design and implementation alternatives.
- d. Ensure that the system design is compatible with both functional and nonfunctional requirements of the system.
- e. Integrate open source components in an appropriate way to the systems design.
- 11. Implementing and testing an application
 - a. Use a modern application development environment to produce an IS/IT artifact based on relevant design documentation.
 - b. Select a development approach appropriate to the characteristics of the IT application under considerations and to the existing resources and development team and conditions.
 - c. Plan development work according to the principles and guidelines of the selected development approach.
 - d. Document the implemented product for later reference and maintenance.
 - e. Plan and carry out tests for functional and non-functional requirements.
 - f. Carry out various tests (unit, integration, migration) of new software, new software modules and upgrades in a realistic environment.
- 12. Installing and integrating a new application
 - a. Perform acceptance testing of the application.
 - b. Install the application onto a computing platform.
 - c. Configure the application so it fits to the supporting computing platform and to other applications with which it must interact.
 - d. Configure the application so it fits to the organizational environment.
 - e. Plan and carry out tests to installation and configuration.
 - f. Migrate information stored in pre-existing applications to the new application.
- 13. Managing external systems development resources
 - a. Communicate requirements and designs effectively with external development resources.
 - b. Monitor the progress of external development resources.
 - c. Validate the outcomes of the work of external development resources.
- 14. Managing IS/IT development projects
 - a. Apply project management principles to a software development project understanding the requirements and constraints set by the systems development approach.
 - b. Use relevant tools and techniques to manage a software development tool.
 - c. Manage development resources in the context of a specific systems development approach.
 - d. Maintain a management culture and approach to personnel management compatible with the systems development approach.
- 15. Designing user experiences
 - a. Design user interfaces and user experiences so that they are appropriate for a specific local context.

5.2 Specifications of Individual Foundational Competencies

In this section, we will briefly suggest a list of specific individual foundational competencies that MSIS 2016 graduates are expected to attain. These competencies include the following:

- Analytical and critical thinking
- Creativity
- Collaboration
- Ethical analysis
- Leadership
- Mathematical competencies
- Negotiation
- Oral communication
- Problem solving
- Written communication

They will be specified at a more detailed level in later versions of the curriculum.