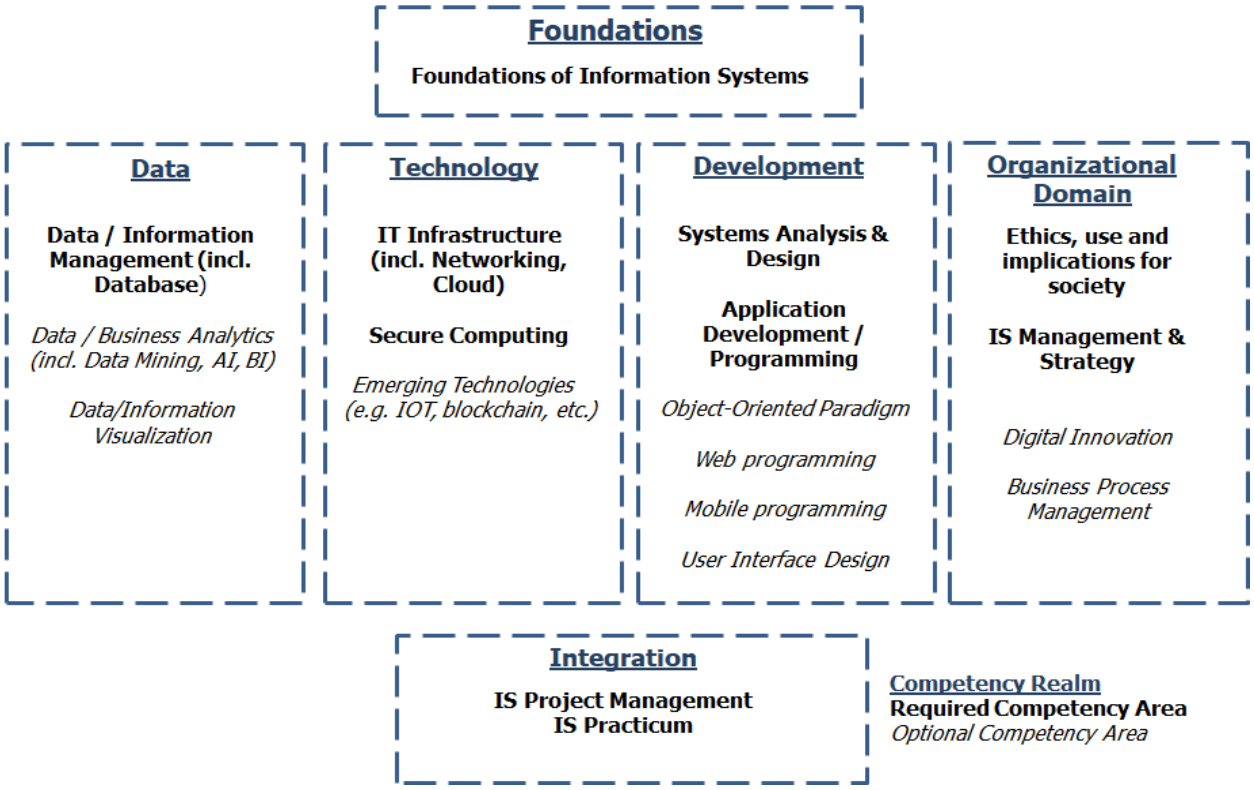
IS 2020 - ACM/AIS COMPETENCY MODEL FOR UNDERGRADUATE PROGRAMS IN INFORMATION SYSTEMS



Competency Realms and Competency Areas

Foundations Competency Realm

- **Foundations of Information Systems**

Data / Information Competency Realm

- **Data / Information Management** (incl. database)
- *Data / Business Analytics*
- *Data / Information Visualization*

Technology Competency Realm

- **IT infrastructure** (incl. networking, cloud)
- **Secure Computing**
- *Emerging Technologies*

Development Competency Realm

- **Systems Analysis and Design**
- **Application Development and Programming**
- *Object-Oriented Paradigm*
- *Web Development*
- *Mobile Development*
- *User Interface Design*

Organizational Domain Competency Realm

- **IS Ethics, Sustainability, Use and Implications for Society**
- **IS Management and Strategy**
- *Digital Innovation*
- *Business Process Management*

Integration Competency Realm

- **IS Project Management**
- **IS Practicum**

Competency Realms, Competency Areas and Competencies

A1.1 Foundations Competency Realm

A1.1.1 Competency Area - Foundations of Information Systems

1. Classify the components, elements, operations and impact of IS.
2. Understand the dimensions and value of information.
3. Explain the roles, responsibilities, and characteristics of the IS professional.
4. Recommend techniques for using information and knowledge for business decision making and strategic value.
5. Analyze a business case and critique appropriate IS solutions to common business problems, based on the different components, elements, types, and levels of IS.
6. Critique and recommend Enterprise Systems for a given business problem and processes.
7. Identify techniques for transmitting and securing information in an organization.
8. Demonstrate an ability to solve basic computational and design problems using IS development with appropriate methodologies, software tools and innovative methods for improving processes and organizational change.

A1.2 Data / Information Competency Realm

A1.2.1 Competency Area - Data / Information Management

1. Query the relational model.
2. Design relational databases
3. Program database systems using functions and triggers.
4. Secure a database.
5. Compare trade-offs of different concurrency models.
6. Develop non-relational models.

A1.2.2 Competency Area - Data / Business Analytics

1. Apply the principles of computational thinking (CT) to learning data science.
2. Analyze data science problems with a CT framework.
3. Express a business problem as a data problem.
4. Perform exploratory data analysis from inception to the value proposition.
5. Explain the core principles behind various analytics tasks such as classification, clustering, optimization, recommendation.
6. Articulate the nature and potential of Big Data.
7. Demonstrate the use of big data tools on real world case-studies.

A1.2.3 Competency Area - Data / Information Visualization

1. Explain the fundamentals of human perception and vision
2. Effective ways of displaying numeric data, counts, and proportion
3. Present information in an understandable, efficient, effective, and aesthetic manner, for the purposes of explaining ideas and analyzing data.
4. Use a tool such as R (or Python) to perform basic data manipulation such as filtering, aggregating, and organizing data sets
5. Produce graphics using a visualization tool
6. Develop transformations and model to fit, explore, check assumptions about data
7. Express the story of the data in a compelling narrative

A1.3 Technology Competency Realm

A1.3.1 Competency Area - IT infrastructure

1. Develop an understanding of infrastructure, including how it functions, how to define critical functions, and how to plan and manage infrastructure.
2. Understand the principles of layered network architectures.
3. Understand the components of IT infrastructure solutions from client/server, network hardware, (including wireless and wired).
4. Understand the principles of network software and configuration.
5. Understand network protocols and their configuration.
6. Have a clear understanding of security principles as they pertain to networks.
7. Examine and critique IT infrastructure for organizations.
8. Examine and critique IT server architecture (both physical or cloud-based.)
9. Understand concepts of Enterprise Architecture.

A1.3.2 Competency Area - Secure Computing

1. Explain the purpose of cryptography and how it can be used in data communications.
2. Describe the concepts of authentication, authorization, access control, and data integrity and how it helps to enhance data security.
3. Explain the security requirements that are important during software design.
4. Analyze the concepts of identification, authentication, and access authorization in the context of protecting people and devices.
5. Analyze the importance of social media privacy and security.
6. Illustrate how cyberattacks work, how to avoid them and how to counteract their malicious consequences.
7. Describe risk management techniques to identify and prioritize risk factors for information assets and how risk is assessed.
8. Illustrate the types of security laws, regulations, and standards within which an organization operates.

A1.3.3 Emerging Technologies

1. Research and identify a selection of current and emerging technologies
2. Evaluate technologies based on a range of business requirements
3. Make recommendations about the usage of technologies
4. Investigate technologies through a theoretical lens
5. Evaluate technologies from an ethical and sustainability perspective
6. Identify the impacts of technologies on society and business
7. Practically design and apply technologies to a business problem
8. Apply emerging technologies in a teamwork scenario

A1.4 Development Competency Realm

A1.4.1 Competency Area - Systems Analysis and Design

1. Explain what systems are and how they are developed.
2. Understand the SDLC phases and activities.
3. Understand SDLC Models (Agile, Waterfall, V-shaped, iterative, spiral, etc.).
4. Work effectively in a team environment.
5. Describe data modeling techniques.
6. Describe the role and responsibilities of the participants in the SDLC.
7. Explain the common ways projects fail and how to avoid these failures.
8. Understand Enterprise Architecture concepts related to SDLC phases.

A1.4.2 Competency Area - Application Development and Programming

Programming-Related Competencies:

1. Develop data storage strategies using primitive data types in a computer's volatile memory
2. Apply data transformations using arithmetic, assignment, and transpositional operators
3. Develop predicate expressions using relational and logical operators
4. Express algorithmic problem-solving using sequence, selection, and repetition structures
5. Modularize the algorithmic and operating capabilities of a program using functions, methods, subroutines or similar organizing structures.
6. Select and utilize appropriate linear and non-linear data structures to maintain and manage sets of related data in non-volatile memory.
7. Utilize Object-Oriented concepts in the organization and structuring of programs for behavior and concept management

Application Development Related Competencies:

8. Conduct a systematic requirements analysis to determine the basic facts used to organize the application of programming effort to solve a problem or reach a goal
9. Formalize and communicate requirements in a manner that is comprehensible for all stakeholders that will determine the success of the software system
10. Specify the software system architecture such that the principal components and dependencies of the system are visible and comprehensible for all involved in shaping the materials of design and construction
11. Identify lateral components and libraries that the designed and developed system will depend on
12. Develop the programming code implementation that realizes the system architecture and design.
13. Test all developed programming code components to ensure fidelity, consistency, and fit.
14. Maintain software throughout deployment and utilization such that extant or new intentions and requirements are accommodated such that the intended purpose will function.
15. Adopt, or adapt, an appropriate software systems process methodology such that people, resources, design requirements and other dynamic considerations allow for correctness and utility.
16. Establish and maintain the appropriate dialog among stakeholders that ensure a degree of communication and information transparency to maintain the viability of the software system.

A1.4.3 Competency Area - Object-Oriented Paradigm

1. Apply fundamental elements of objects and classes.
2. Understand and utilize instantiation modalities.
3. Utilize intra-entity communication and messaging.
4. Design for encapsulation.
5. Design for inheritance and dependency management.
6. Design for abstraction.
7. Understand and apply polymorphism.
8. Utilize design patterns.
9. Utilize objects and classes for entity modeling.

A1.4.4 Competency Area - Web Development

1. Understand how the Internet works.
2. Create and analyze an algorithm for effectiveness and efficiency.
3. Implement good documentation practices in programming.

4. Demonstrate teamwork, interpersonal group skills, and team software development.
5. Develop skills in client-side (Front-end) web application development technologies including HTML, CSS, JavaScript, and JavaScript libraries.
6. Develop skills in server-side (back-end) web application development technologies using a back-end programming language (i.e. Node/Express, Python/Django, etc.).
7. Create a functioning web application suitable for portfolio presentation including but not limited to skills shown using front-end, back-end, SQL, and current web development tools.
8. Gain knowledge of different internet design patterns (i.e. MVC, MVVM, etc.) and ability to know advantages and disadvantages of each.
9. Understand different design layouts and pros and cons of each.
10. Understand how to implement security measures for a website.
11. Learn how to debug syntactical and logical errors.
12. Understand Internet Copyright laws.
13. Learn how to deploy a website to a host server.

A1.4.5 Competency Area - Mobile Development

1. Understand the Internet of Things (IoT) enabled devices and the mobile industry.
2. Create and analyze an algorithm for effectiveness and efficiency.
3. Implement good documentation practices in programming.
4. Demonstrate teamwork, interpersonal group skills, and team software development.
5. Develop skills in commonly used mobile development languages like Kotlin, Java, JavaScript, C#, Objective-C, HTML5, Swift.
6. Create a functioning mobile application suitable for portfolio presentation including but not limited to skills shown using database management, hardware interaction, APIs, cross platform development and current mobile development tools.
7. Gain knowledge of different mobile development platforms.
8. Understand mobile user interface design and the user experience.
9. Understand how to implement cyber security measures for a mobile application.
10. Implement an understanding of memory allocation.
11. Learn how to debug syntactical and logical errors.
12. Understand Copyright laws.
13. Learn how to market and publish a mobile application.

A1.4.6 Competency Area - User Interface Design

1. Understand principles of user-centered design (UCD)
2. Understand User-system interaction principles
3. Design and create effective user-centered user interaction with an application
4. Identify attributes of good UX
5. Learn how user centered design affects the user experience (UX)

A1.5 Organizational Domain Competency Realm

A1.5.1 Competency Area - IS Ethics, Sustainability, Use and Implications for Society

1. Explore and understand aspects of ethical behavior regarding the collection of data.
2. Explore and understand the moral issues surrounding the storage and use of data.
3. Understand widely used ethical philosophies and how to apply them to situations that lead to ethical computing practices.
4. Investigate ethical codes of practice and their implications for society.
5. Understand aspects of sustainability and adaptable systems and data sources.
6. Explore stakeholders and their relevance to IS.
7. Investigate sustainable processes, actions, and performance to support organizations.
8. Investigate sustainable processes, actions, and performance to support the individual.
9. Investigate sustainable processes, actions, and performance to support society at large.

A1.5.2 Competency Area - IS Management and Strategy

1. Apply professional managerial skills to design and manage an effective IS organization.
2. Ensure operational efficiency and effectiveness in service delivery of organizational information.
3. Manage the information resources in coordination with line management.
4. Create and manage the oversight mechanisms by which an organization evaluates, directs, and monitors organizational information technology - managing decision rights and organizational information technology decision-making practices.
5. Understand strategic plans that have been created for the delivery and use of organizational information systems.
6. Ensure organizational information systems comply with policies, applicable laws and regulations.
7. Understand and manage organizational risk and develop risk mitigation plans.
8. Create IT procurement policies and understand and negotiate IT contracts.
9. Develop plans for workforce development, training, talent acquisition, and employee retention.
10. Understand how to use and apply leading service management frameworks, such as ITIL and CMMI.
11. Understand commonly used governance frameworks, such as COBIT and TOGAF, to align information systems with organizational requirements.

A1.5.3 Competency Area - Digital Innovation

1. Articulate and critically reflect on the unique features that an application of emerging technology may offer.
2. Demonstrate knowledge of the role of digital business technologies in social and mobile domains.
3. Identify and critique characteristics necessary for digital innovation.
4. Identify and validate an opportunity to develop a new digital business model
5. Identify and evaluate key issues related to implementation and infrastructure issues.
6. Identify and assemble the required resources, processes, and partners to bring a digital business model to fruition
7. Practically demonstrate the investigation and application of a new innovation

A1.5.4 Competency Area - Business Process Management

1. Explain the characteristics of a process and the different perspectives of a process model.
2. Use a BPM tool to design and implement business process models.
3. Choose appropriate process discovery techniques for different business scenarios.
4. Design a process architecture.
5. Analyze an AS-IS business process using appropriate techniques.
6. Demonstrate understanding of process improvement methods and implement TO-BE processes by eliminating the bottlenecks, enhancing, and innovating the AS-IS process.
7. Discuss techniques and tools that support the planning, design, analysis, operation, and monitoring of business processes.

A1.6 Integration Competency Realm

A1.6.1 Competency Area - IS Project Management

1. Understand basic project management concepts and terms.
2. Know and use integration management tools, techniques, and processes.
3. Understand scope management tools, techniques, and processes.
4. Estimate and track time thru tools, techniques, and processes.
5. Estimate and track cost thru tools, techniques, and processes.
6. Control quality and understand the change control process.
7. Implement human resource management tools, techniques, and processes.
8. Define and implement a communication management plan.
9. Predict and manage project risk through the use of tools, techniques, and processes.
10. Understand procurement management.
11. Identify stakeholders and learn how to manage within the phases of a project.
12. Learn the tools, techniques, and processes to manage project performance.
13. Understand agile project management principles and methods.
14. Understand the scrum development process.
15. Select an appropriate project management methodology based on project characteristics.

A1.6.2 Competency Area - IS Practicum

1. Apply the SDLC
2. Utilize a systems/software development methodology
3. Utilize tools for process management
4. Utilize tools for code and resource version control
5. Utilize tools for team collaboration and communication
6. Utilize tools for client collaboration and communication
7. Utilize tools for testing (unit, integration, acceptance)
8. Align and utilize UML, ERD, and Class/Object Design
9. Apply Object-Oriented principles in system/software design and implementation
10. Utilize Object-Relational Mapping tools
11. Apply principles of systems delivery and maintenance
12. Design for security