IS 765 - Quantitative Methods in Information Systems Research (3 credits)

Fall 2024

Course Syllabus

Organizational

Instructor: Dr. Margarita Vinnikov, margarita.vinnikov@njit.edu
Class time and location: CKB 303, Wednesday from 10:00 AM - 12:50 PM
Office hours: GITC, 3802. Monday from 1:00 p.m. to 2:00 p.m. and Thursday from 11:30 to 12:30 p.m. **By appointment only.**

Overview

This course introduces quantitative and qualitative methods in information systems (IS) research involving human subjects. The focus is on developing the capability to select and implement appropriate data collection and statistical analysis procedures for various research questions and to interpret the results of these procedures. The course is designed to provide students with the necessary background in information systems theory and qualitative and quantitative research methods to critically read and understand research articles published in leading IS journals such as MISQ, JMIS, Information Systems Research, ACM publications, and human-computer interaction journals. This foundation will enable students to keep up in the field after graduation and effectively conduct literature searches as the first step in future research projects.

Throughout the course, students will engage in hands-on projects that involve real-world data and research scenarios. The course emphasizes the practical application of quantitative methods, including statistical software such as Minitab, MATLAB, R, and SPSS. Additionally, students will gain skills in designing and conducting interviews, observational studies, surveys, and experiments, along with analyzing and presenting results. The course will cover ethical issues, IRB requirements, and the most common statistical tests used in IS research, focusing on when to use specific statistical procedures and how to interpret and report the results.

Material Covered During the Semester

- Introduction to Quantitative and Qualitative Research in Information Systems (Include Philosophical Perspectives and Theoretical Models)
- Research Process (Include IRB processes)
- Research Methods (Include Experimental Methods, such as factorial designs and quasi-experiments)

- Data Collection Methods (Include focus groups, surveys, interviews, and observational studies)
- Descriptive Statistics and Data Visualization
- Inferential Statistics
- Statistical Techniques
- Regression Analysis
- Analysis of Variance (ANOVA)
- Multivariate Analysis
- Structural Equation Modeling (SEM)
- Advanced Topics (Include time series analysis and big data analytics)
- Qualitative Methods (Include grounded theory, protocol analysis, and ethnographic research)
- Mixed Methods Research
- Research Ethics and Reporting (Include IRB requirements and ethical considerations)

Course Outcomes

Upon completing this course, students will:

- **C1.** Be able to critically evaluate and apply both quantitative and qualitative research methods in information systems.
- **C2.** Gain proficiency in using statistical software for data analysis.
- **C3.** Develop the ability to design, conduct, and present research studies using mixed methods.

Grading

Grades will be distributed as follows:

Weekly discussions/ Small projects		25%
Topic of Interest	10%	
Research Project		35%
Exam		25%
Participation in User studies		5%

Bonus Points

A list of studies will be presented to you during class. You can participate in any or all studies for bonus marks. You can schedule a time to study when it's convenient for you during the semester. Participating in a study will give you a learning experience into how UX research is done as part of the HCI component of the class. To verify completion, you must bring a waiver signed by an experimenter.

Weekly discussions/ Small projects (25%)

Throughout the semester, you will complete a series of individual and group assignments designed to deepen your understanding of key concepts in information systems research. These include a Research Article Critique where you will critically analyze a peer-reviewed article, a Data Analysis Exercise to perform statistical analysis using R or SPSS, and a Survey Design Assignment to develop a survey for a research question. You will also engage in an Ethics in Research case study, conduct a Regression Analysis Task, and complete a mock IRB Application to understand ethical considerations. These assignments will help you apply theoretical knowledge to practical research scenarios, fostering both critical thinking and technical skills.

Topic of Interest (10%)

During the semester, you will be asked to choose one topic not covered in class and give a 15-minute presentation + 5 minutes for a Q&A period. The project will be evaluated based on critical thinking and evaluation of the topic, as well as on oral presentation skills and PowerPoint presentation. Details about the project will be posted on Canvas. The mark would also include students' participation in the Q&A session for other presentations. You can choose to work in pairs or individually. The scope of the project will be proportional to the group size.

Research Projects (35%)

Throughout the semester, you will engage in a Research Project that applies key concepts and methods from the course. Working in groups, you will choose from one of four project types: an empirical study, a qualitative study, a mixed-methods study, or a big data analytics project. The project will be completed in stages, including topic selection, literature review, research design, data collection, analysis, and final presentation. Your final deliverable will be a 10-15 page research paper and an in-class presentation. Each stage must be discussed with the instructor, and all milestones must be submitted on time for full credit. The project will be evaluated on the quality of research, analysis, and presentation skills, with participation in Q&A sessions during other presentations also contributing to your final grade.

Grading Legend

Letter Grade to % Correspondence:

Grades	GPA	Percent Grade	Significance
A	4.0	90-100	Excellent
B+	3.5	86-89	Good

B	3.0	80-85	Acceptable
C+	2.5	76-79	Marginal Performance
C	2.0	70-75	Minimum Performance
F	0.0		Failure
I			Incomplete
W			Withdrawn
AU			Audited (no academic credit)

Late Grading Policy

- Late submissions will incur a 10% penalty per day. For instance, a one-day late submission will result in a maximum grade of 90%, two days late will result in 80%, and so on.
- Missed exams or presentations will result in a grade of 0 unless prior arrangements are made at least one week in advance. No make-up exams will be provided.

References

Suggested readings will be provided weekly on Canvas. No textbooks are required for purchase.

Academic Integrity

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. ***Any student found in violation of the code by cheating, plagiarizing or misusing any online software will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.*** *If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu*

Illustrative Schedule

Illustrative Schedule

Week 1: September 4, 2024

- Introduction
- Research Process
    - Introduction to research planning and design.
    - Defining research problems.
    - Initial discussion on sampling and data collection.
- IRB Discussion
    - Understanding the Institutional Review Board (IRB) process.
    - Ethical considerations in research.
    - Obtaining approval for studies involving human subjects.
- **Class activity:** Research Article Critique (Individual Assignment)
- **Due:** Citi IRB certification.

Week 2: September 11, 2024

- Research Methods: Include Experimental Methods, such as factorial designs and quasi-experiments.
- Reading a research paper
- **Due:** Research Article Critique I (Individual Assignment)

Week 3: September 18, 2024

- Data Collection Methods
    - include focus groups, surveys, interviews, and observational studies.
- **Due:** Research Article Critique II (Individual Assignment)

Week 4: September 25, 2024

- Scaling and Questionnaire Construction: Focus on scaling and developing surveys/questionnaires.

- Descriptive Statistics and Data Visualization: Summarizing data, graphical representations, and exploratory data analysis.

- **Due:** Survey Design Assignment (Individual Assignment)

Week 5: October 2, 2024

- Inferential Statistics: Hypothesis testing, confidence intervals, p-values, and interpreting statistical significance.
- Theoretical Models: Introduction to models like UTAUT.
    - Theory testing, causal inference, and designing research instruments.
- **Due:** Data Analysis Exercise I (Individual Assignment)

Week 6: October 9, 2024

- Statistical Techniques:
    - Regression Analysis: Simple and multiple regression, diagnosing regression models, interpreting coefficients.
    - Analysis of Variance (ANOVA): One-way and two-way ANOVA, interaction effects, and post-hoc tests.
    - Statistical Techniques: Integration of general linear models and non-linear models into the analysis.
- **Due:** Research Project Topic Proposal (Group Submission)

Week 7: October 16, 2024

- Multivariate Analysis:
    - Factor analysis, cluster analysis, discriminant analysis, and their applications in IS research.
    - Factor Analysis in Survey Research: Detailed application of factor analysis specifically to survey data.
- **Due:** Mock IRB Application (Individual Assignment); Experimental Procedure;

Week 8: October 23, 2024

- User Participation and Attitudes:
    - Measuring user participation, involvement, and attitudes in IS research.
- Advanced Statistical Methods:
    - Focus on using advanced statistical techniques in IS research.
- **Due:** Literature Review Submission (Group Submission)

Week 9: October 30, 2024

- Structural Equation Modeling (SEM):
    - Path analysis, confirmatory factor analysis, and model fit assessment.
- Qualitative Methods:
    - Protocol Analysis, Semi-Structured Interviews, Coding, and Grounded Theory
- **Due:** Research Design and Methodology Submission (Group Submission)

Week 10: November 6, 2024

- Mixed Methods Research:
    - Integrating quantitative and qualitative approaches, triangulation, and complementary methodologies.
- Research Ethics and Reporting:
    - Ethical considerations in data analysis and reporting, guidelines for academic writing.
- **Data Collection**

Week 11: November 13, 2024

- Focus Groups as a data collection method.
- Time series analysis, panel data analysis, and big data analytics in IS research.
- Grounded Theory: Application of grounded theory in IS research.
- **Data Collection**

Week 12: November 20, 2024

- **Topic of interest presentations**
- Case Studies and Ethnographic Research:
    - Detailed exploration of case studies and ethnographic research methods in IS.
- Designing a Complete Research Proposal OR Drafting a Conference Paper:
    - Detailed guidance on designing research proposals or drafting conference papers.
- **Due: Data Collection Report (Group Submission)**

Week 13: November 27, 2024 – no class

- **Due:** Initial Data Analysis and Results Draft (Group Submission)

Week 14: December 4, 2024

- **Topic of interest presentations**
- Mediators and Moderators in IS Research:
    - Understanding and applying these concepts in quantitative research.

- Survey and Experimental Methods:
    - Detailed exploration of survey methods and experimental design in IS.
- Scaling Techniques and Measurement:
    - Advanced techniques for scaling and measuring in IS research.
- Focus Groups and Group Methods:
    - Detailed exploration of focus groups and other group methods in data collection.

Week 15: December 11, 2024

- Research Project Presentations
- **Final Exam Review:** Comprehensive review of course material in preparation for the final exam.
- **Due:** Final Research Project Presentation (In-Class Presentation); Final Presentation Slides Submission (Group Submission); Research Project Final Paper Submission (Group Submission)