Korea Advanced Institute of Science and Technology
Global Information &Telecommunication Technology Program
Course Syllabus, Fall 2018

Course Information

- Course Title: **Research Design and Methods for Engineers**
- Course Number: **ITP705**
- Prerequisites: None
- Meeting Time: Tuesday, 12:00 – 15:00
- Classroom: Munji Campus, Room 701
- Course Web Pages: http://klms.kaist.ac.kr/

Instructor Information

- Name: Prayag Yadav, Ph.D.
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- Office Hours: Tuesday, 10:00 – 11:30
- TA: TBA

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- Office Hours: Tuesday, 15:30~17:00
- TA: TBA

Course Description and Learning Objectives

This course is designed to provide students a broad understanding of fundamental concepts to setup and perform a successful scientific study. The course will focus on various research designs including experimental and non-experimental, as well as quantitative and qualitative research methods. In addition, the course will focus on providing a practical understanding of main statistical tools used in social science research (e.g., SPSS, and PLS graph). The emphasis will be on knowing when to use the various tests, what they measure, and how to interpret results.

- Major learning objectives of this course are (1) acquiring skills and ability to conduct quality research, (2) conducting professional and globalized oral and written communications, and (3) acquiring creative and analytical thinking.
- Therefore, students are (i) required to write individual research proposals related to technology management including literature reviews, research hypothesis

development, data collection, empirical analysis, interpretation of empirical results, and conclusion. (ii) Students are required to make presentations of both academic papers and their term papers during this semester.

Expected Learning Outcomes

The learning objectives are in two folds. After completion of this course:

1. The student will be able to:
    a. Discuss various systematic approaches and assess the most appropriate approach to perform a scientific study
    b. Understand different steps involved in a scientific study beginning with a research question to the conclusions
    c. Distinguish different types of research designs and identify their strengths and weaknesses
    d. Develop scientific approach emphasizing simultaneous considerations of issues relating to research design, measurement, and statistical analysis, interpretation, and presentation of results pertaining to a specific research question
    e. Build knowledge on Smart PLS and carry out various statistical tests
    f. Assess when to use those tests, what they measure, and how to interpret results.

2. Each student will complete a piece of his/her own international-conference-level paper in his/her field. The research paper may be used as the basic framework of his/her thesis for graduation.

Course Materials

<u>Required Text Book</u>

[Part 1] Title: **Research Methods, Design, and Analysis**
Edition: 12th edition
Authors: Larry B. Christensen, R. Burke Johnson, Lisa A. Turner
Publisher: Pearson

Reference: **Research Methodology: A Step-by-Step Guide for Beginners**
Edition: third edition
Author: Ranjit Kumar

[Part 2] Title: **A Primer on Partial Least Squares Structural Equation Modeling** (PLS-SEM)
Edition: 2nd edition (2016)
Authors: Joseph F. Hair Jr., G. Tomas M. Hult, Christian M. Ringle, Marko Sarstedt
Publisher: SAGE

Additional Reading

1. Powell, R. R. (1999). Recent trends in research: a methodological essay. *Library & information science research*, *21*(1), 91-119.
2. Kanungo, S. (1993). Information systems: theoretical development and research approaches. *Information systems*, *18*(8), 609-619.
3. Hamilton, S., & Ives, B. (1982). MIS research strategies. *Information & Management*, *5*(6), 339-347.
4. Judd C. M. (2015). Social Psychology: Research Methods. (2001). *International Encyclopedia of the Social and Behavioral Sciences*, 14405-14409.
5. Westbrook, L. (1994). Qualitative research methods: A review of major stages, data analysis techniques, and quality controls. *Library & Information Science Research*, *16*(3), 241-254.
6. Whitman, J. C., & Woodward, T. S. (2012). Self-selection bias in hypothesis comparison. *Organizational behavior and human decision processes*, *118*(2), 216-225.
7. Cho, H. C., & Abe, S. (2013). Is two-tailed testing for directional research hypotheses tests legitimate? *Journal of Business Research*, *66*(9), 1261-1266.
8. Konold, T. R., & Fan, X. (2010). Hypothesis testing and confidence intervals.
9. Sieber, J. E. (2004). Empirical research on research ethics. *Ethics & Behavior*, *14*(4), 397-412.
10. Bollen, K. A. (2001). Indicator: Methodology. *International Encyclopedia of the Social and Behavioral Sciences*, 7282-7287.
11. Bartholomew, D. J. (2015). Factor Analysis and Latent Structure Analysis: Overview.
12. Law, K. S., & Wong, C. S. (1999). Multidimensional constructs M structural equation analysis: An illustration using the job perception and job satisfaction constructs. *Journal of Management*, *25*(2), 143-160.
13. Nielsen, B. B. (2014). Construct measurement in management research: The importance of match between levels of theory and measurement. *Journal of Business Research*, *67*(3), 403-406.
14. Williams, L. J., Edwards, J. R., & Vandenberg, R. J. (2003). Recent advances in causal modeling methods for organizational and management research. *Journal of management*, *29*(6), 903-936.
15. Stone-Romero, E. F., & Rosopa, P. J. (2010). Research design options for testing mediation models and their implications for facets of validity. *Journal of Managerial Psychology*, *25*(7), 697-712.
16. Judd C. M. (2015). Moderator variable: Methodology. *International Encyclopedia of the Social and Behavioral Sciences*, 672-674.
17. Rosopa, P. J., & Stone-Romero, E. F. (2008). Problems with detecting assumed mediation using the hierarchical multiple regression strategy. *Human Resource Management Review*, *18*(4), 294-310.
18. Chau, P. Y. (1999). On the use of construct reliability in MIS research: a meta-analysis. *Information & Management*, *35*(4), 217-227.
19. O'Leary-Kelly, S. W., & Vokurka, R. J. (1998). The empirical assessment of construct validity. *Journal of operations management*, *16*(4), 387-405.
20. Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of applied psychology*, *88*(5), 879.

21. Nadler, D. A. (1979). The effects of feedback on task group behavior: A review of the experimental research. *Organizational Behavior and Human Performance*, *23*(3), 309-338.
22. Karanja, E., & Zaveri, J. (2013). A comprehensive review of survey-based research in MIS. *Journal of Systems and Information Technology*, *15*(2), 159-188.
23. Brown, S. (1987). Drop and collect surveys: A neglected research technique? *Marketing Intelligence & Planning*, *5*(1), 19-23.
24. Bates, S. C., & Cox, J. M. (2008). The impact of computer versus paper–pencil survey, and individual versus group administration, on self-reports of sensitive behaviors. *Computers in Human Behavior*, *24*(3), 903-916.
25. Bennett (2001). Case Study: Methods and Analysis. *International Encyclopedia of the Social and Behavioral Sciences*, 3, 1513-1519.
26. Okoli, C., & Pawlowski, S. D. (2004). The Delphi method as a research tool: an example, design considerations and applications. *Information & management*, *42*(1), 15-29.
27. Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of mixed methods research*, *1*(2), 112-133.
28. Cameron, R., & Molina-Azorin, J. F. (2011). The acceptance of mixed methods in business and management research. *International Journal of Organizational Analysis*, *19*(3), 256-271.
29. Bartholomew, D. J. (2010). Analysis and interpretation of multivariate data. *International Encyclopedia of Education (Third Edition). Elsevier. 12-17.*
30. Hallahan, M., & Rosenthal, R. (2000). Interpreting and reporting results. In *Handbook of applied multivariate statistics and mathematical modeling* (pp. 125-149).
31. Talja, S. (1999). Analyzing qualitative interview data: The discourse analytic method. *Library & information science research*, *21*(4), 459-477.
32. Cash, T. F. (2009). Caveats in the proficient preparation of an APA-style research manuscript for publication.
33. Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the academy of marketing science*, *40*(3), 414-433.
34. Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice*, *19*(2), 139-152.
35. Henseler, J., Dijkstra, T. K., Sarstedt, M., Ringle, C. M., Diamantopoulos, A., Straub, D. W., Ketchen, D. J. J., Hair, J. F., Hult, G. T. M., and Calantone, R. J.: Common Beliefs and Reality about Partial Least Squares: Comments on Rönkkö & Evermann (2013), Organizational Research Methods, Volume 17 (2014), Issue 2, pp. 182-209.
36. Hair, J.F., Sarstedt, M., Pieper, T., Ringle, C.M.: The Use of Partial Least Squares Structural Equation Modeling in Strategic Management Research: A Review of Past Practices and Recommendations for Future Applications, Long Range Planning, Volume 45 (2012), Issue 5-6, pp. 320-340.
37. Ringle, C.M., Sarstedt, M., Straub, D.W.: A critical look at the use of PLS-SEM in MIS Quarterly, in: MIS Quarterly, Volume 36 (2012), Issue 1, iii-xiv.

Grading Policy

Final Term Paper (Written Paper (20%) + Presentation (10%))	30%
Critique and Presentation of Journal Papers	25%
Statistical Tools Practice	25%
Attendance/Participation	20%
Total	100%

Course Requirements

1. **Class Participation**: Students must read the assigned reading materials and handouts beforehand and actively participate during the class lectures, discussions and presentations. Quality and intensity of participation, discussion and contribution to the class throughout the semester will contribute to 20% of the course grade.
2. **Critique and Presentation of Journal Papers**: Students need to submit either critique of a published journal article or make a presentation of the article each week. Though it depends on class size, there will be tentatively FOUR critique assignments and TWO presentations in this class. The critique and presentation of published articles will contribute to 25% of the course grade.
3. **Critique of a Journal Paper**
   Every week students will review a journal article within their area of interest (or can chose one from the weekly assigned papers). They objectively analyze the structure (e.g., overall approach and theory) and methodology (i.e., model(s), experiment(s) and/or solution technique(s)) presented in the paper, and suggest improvements to the paper (as a reviewer) or to extend the research presented in the paper (as a proposer).

   The critique should have two parts. The first part should focus on the objective critique of the article, listing concerns and reasons for the concerns. This should focus on issues such as, but not limited to, the relevance and objectives of the research, theories used, assumptions made, modeling/experimental techniques used, solutions developed, statistical tests used, findings presented, and conclusions made. The second part should focus on how you propose to improve the paper or extend the results.

   Students are advised to use 12-point Times New Roman font, double-spacing, and one-inch margins in the critique write-up.

   The paper will be graded based on the following criteria:

   A. Relative depth and breadth of critical evaluation (40%)
   B. Writing composition (grammar, spelling, logic and ease of reading) (20%)
   C. How would you improve the methodological issues or extend the research noted in the paper? (40%)

4. **Final Term paper**
   As a final term assignment, each student will write a journal style paper and present it in class as a final term project. You may select any topic you wish. However, we encourage you to select a topic that you expect to pursue for your graduate studies.

The assignment is intended to:

a) Give you the opportunity to review, think deeply about, and synthesize the literature most relevant to your research interests
b) Aid you in developing your ideas for possible research projects
c) Help you develop your scientific writing
d) Help you develop your thesis presentation skills

Paper format

- The manuscript should be 12-point font, double-spacing, and one-inch margins.
- Include page numbers to facilitate review.
- The first page should provide the title, the author's name, affiliation, and email address.
- An abstract, of not more than 250 words, should precede the body of the paper.
- The body of the manuscript should be no more than 10 pages in length (~3,000 words). The abstract should contain study conclusions, not just list study topics.
- The body of the manuscript need follow the conventional Intro-Methods-Results-Discussion format.
- Literature cited should follow APA style references (see this guide (page 27): http://faculty.chass.ncsu.edu/garson/SSCORE/sage_guide_2011.pdf above)
- Order sections: title page, abstract, body, acknowledgements, literature cited, tables, figure legends, figures. Do not embed the figures into the body of the manuscript. Figures should be provided on separate pages at the end.

Submission

Paper should be submitted along with a cover letter addressed to the editor (assume that your instructor is a journal editor) stating the title and nature of the paper, and the number of tables and figures (Google examples of cover letters). You should also indicate if any of this material has been submitted or published elsewhere. You should also feel free to suggest possible reviewers and to indicate persons who you feel might have a conflict of interest, which might prevent them from providing a fair review.

Grading

The paper will be graded based upon the following criteria:

i) Is the author focused on a relevant problem/question? (30%)
ii) Does the author propose a unique approach that is feasible for them to carry out? (20%)
iii) Is the paper theoretically and methodologically sound? (30%)
iv) Writing composition (grammar, spelling, logic and ease of reading) (20%)

5. Paper Presentation

The assignment is to present the argument of a pre-assigned paper to the class in an oral presentation (10-15 minutes). Afterwards the class will have the opportunity to ask you a few questions. The purpose of this assignment is to help improve your public speaking skills, to share your research and ideas with the class, and to help you clarify the argument of your paper.

Your presentation will be graded based on the following criteria:

i) Introduction (15 pts.)

Weak	**Acceptable**	**Strong**
No introduction to the topic. (0-5 pts.)	Audience has some idea of the topic, but it is ambiguous or vague. Introduction is adequate but does not engage the audience. (6-10 pts.)	Speaker begins with an introduction that previews the content of the presentation and prepares the audience to receive the argument being presented. It is interesting and engaging. (11-15 pts.)

ii) Organization (20 pts.)

Weak	**Acceptable**	**Strong**
Disorganized or poorly organized. Audience does not understand the argument presented. (0-6 pts.)	Mostly organized, but sometimes confusing. Audience can follow most points. There are some instances of the presentation that don't seem to fit with the rest of the presentation. (7-16 pts.)	The presentation is well organized and easy to follow. The audience understands the argument and can formulate questions about it. (17-20 pts.)

iii) Content (20 pts.)

Weak	Acceptable	Strong
Little content. Lots of redundancy and repetition. Lots of assumptions are made without attempts to justify them. (0-6 pts.)	Many claims are not justified. Some content does not seem to help the presentation. (7-16 pts.)	The argument is interesting and engaging. All content is pertinent to the presentation and aids in understanding. (17-20 pts.)

iv) Delivery (20 pts.)

Weak	Acceptable	Strong
Speaker reads entire presentation, makes not eye contact. Speech is too slow or too fast. No eye contact. It appears this is the first time the presentation has been tried. (0-6 pts.)	Decent presentation, but not always clear or smooth. Too much reading. Little eye contact. Presentation does not look well rehearsed. (7-16 pts.)	Smooth, clear and articulate. Everyone in audience can hear the presentation. Eye contact is made. Presentation looks well rehearsed. (17-20 pts.)

v) Questions (15 pts.)

Weak	Acceptable	Strong
Misunderstands questions. Cannot answer even simple questions. (0-5 pts.)	Presenter does not answer some questions or does not understand them well. Presenter seems unable to talk	Presenter handles questions well. She answers with reference to her own work and shows

	about her topic outside of the presentation. Presenter is evasive or too glib. (6-10 pts.)	knowledge of her subject. Presenter is honest and forthcoming. (11-15 pts.)

vi) Time (10 pts.)

Weak	Acceptable	Strong
Presentation is either much to short or much too long. (0-3 pts.)	Presentation ends roughly within 15-20 minutes. I may appear forced or ended too abruptly. (4-7 pts.)	Time falls within 10-15 minutes. Presentation concludes within timeframe without being forced. (10-15 pts.)

Submission
Email your presentation file (and the paper) to your instructor before the class time.

Tentative Course Schedule

Week	Date	Topic	Reading, Assignment
1	Aug 28	**INTRODUCTION** • CHAPTER 1 Introduction to Scientific Research • CHAPTER 2 Research Approaches and Methods of Data Collection	Article # 1 – 5 *Other activities* • Presentation Assignment
2	Sep 4	**PLANNING THE RESEARCH STUDY** • CHAPTER 3 Problem Identification and Hypothesis Formation • CHAPTER 4 Ethics	Article # 6 – 9 *Other activities* • Presentation and Critique of Journal a Paper
3	Sep 11	**FOUNDATIONS OF RESEARCH** • CHAPTER 5 Measuring Variables and Sampling • CHAPTER 6 Research Validity	Article # 10 – 20 *Other activities* Presentation and Critique of Journal a Paper
4	Sep 18	**EXPERIMENTAL METHODS** • CHAPTER 7 Control Techniques in Experimental Research • CHAPTER 8 Experimental Research Design	Article # 21 *Other activities* Presentation and Critique of Journal a Paper
5	Sep 25*	**EXPLORATORY AND DESCRIPTIVE**	Article # 22 – 28

		METHODS • CHAPTER 12 Survey Research • CHAPTER 13 Qualitative and Mixed Methods Research	*Other activities* Presentation and Critique of Journal a Paper
6	Oct 2	**ANALYZING AND INTERPRETING DATA** • CHAPTER 14 Descriptive statistics • CHAPTER 15 Inferential statistics	Article # 29 – 31 *Other activities* Presentation and Critique of Journal a Paper
7	Oct 9*	**WRITING THE RESEARCH REPORT** • CHAPTER 16 Writing an APA Style Research Report	Article # 32
8	Oct 16	***Term paper Proposal Presentation (Progress 1)*** • From problem identification to research ideas (motivation & purposes) • Literature reviews • Research design • A target journal or a conference • Specific plan	
9	Oct 23	**Introduction to structural equation modeling** • Chapter 1: An Introduction to Structural Equation Modeling	Article # 33 – 34
10	Oct 30	[Part 1] **Specifying the Path Model and Collecting Data** • Chapter 2: Specifying the Path Model and Collecting Data [Part 2] **Useful Theories in Management I (Presentation)** • *Assignment :* 5 theories in the area	Article # 35
11	Nov 6	[Part 1] **Path Model Estimation** • Chapter 3: Path Model Estimation [Part 2] **Useful Theories in Management II (Presentation)** • *Assignment :* 5 theories in the area	Article # 36

12	Nov 13	[Part 1] **Reflective Measurement Models** • Chapter 4 Assessing PLS-SEM Results Part I: Evaluation of Reflective Measurement Models [Part 2] **Analysis of Key Papers & Next Plan I (Presentation)** • *Included:* at least 2 key papers, Your paper progress and future plan	Article # 37
13	Nov 20	[Part 1] **Formative Measurement Models** • Chapter 5 Assessing PLS-SEM Results Part II: Evaluation of the Formative Measurement Models [Part 2] **Analysis of Key Papers & Next Plan II (Presentation)** • *Included:* at least 2 key papers, Your paper progress and future plan	
14	Nov 27	[Part 1] **Evaluation of the Structural Model** • Chapter 6 Assessing PLS-SEM Results Part III: Evaluation of the Structural Model [Part 2] **SmartPLS Practice I**	Handouts provided forehand
15	Dec 4	[Part 1] **Mediator & Moderator Analysis** • Chapter 7 Mediator and Moderator Analysis [Part 2] SmartPLS Practice II	Handouts provided forehand
16	Dec 11	**Final Presentation & Term Paper**	

This schedule is subject to change if necessary. * Class may need a reschedule due to holiday.

Academic Honor Code of BTM (School of Business and Technology Management)

Academic integrity and honesty are critical values of KAIST community. It is essential to the academic integrity of this community that students do their own work and properly acknowledge the ideas, sources, and assistance upon which that work is based. As a member of KAIST BTM community, all students including those who take BTM courses

are expected to adhere to the principles of truth, integrity, and respect. Failure to comply with the Honor Code may result in disciplinary action including failure of the course.

Academic dishonesty includes but is not limited to the following:

- **Cheating**: Copying from another's examination paper, solutions, assignments, or allowing another to copy from one's own.
- **Plagiarism**: Using another person's original work without giving appropriate credit to or acknowledging the authors or sources
- **Self-plagiarism**: Submitting one piece of work in more than one course without the explicit permission of the instructors involved.
- **Misrepresentation of authorship**: Submitting work as one's own which has been prepared by or purchased from another.
- **Unpermitted collaboration or aid**: Giving or receiving unpermitted aid on exams or assignments.

Any member of the BTM community who believes that violation of academic dishonesty has occurred should bring the matter to the attention of the department chair. The department chair will assign members of Academic Review Committee (학사심의회) to conduct a thorough investigation and, if necessary, request a due process to university.