November 24, 2014

Re: Proposal for a certificate of **A**chievement in research skills for **Q**uantitative **M**ethodologies (AQM) cosponsored by the Schools of Management and Nursing, and directed at PhD/Masters/Advanced students on the CWRU campus.

Objective: To provide graduate and advanced students in the Schools of Management and Nursing, as well as more broadly for interested students across the University, an opportunity to achieve competence in quantitative research methodologies from a coordinated effort across Schools to pool resources and capitalize on joint capabilities

Definition: Quantitative methodologies are techniques for systematic empirical investigation of behavioral phenomena using statistical, mathematical, numerical or computational approaches. These techniques may operate on structured numerical or unstructured text data.

Motivation: Quantitative methodologies are essential skills in preparing graduate students for conducting and publishing scholarly research, and in fostering a learning environment that motivates original research across many social science disciplines with behavioral focus. In Education, Henson, Hull and Williams (2010, p. 229) observed that "how doctoral programs train future researchers in quantitative methods has important implications for the quality of scientifically based research … and a colossal impact on the collective research culture." In Management, Agunis and Edwards (2014) surveyed the field and noted that "methodological improvements are essential for the progress of management research… [and] is a prerequisite for theoretical progress and the accumulation of knowledge." In Nursing, the American Academy of Colleges of Nursing reported that the majority of recent dissertations were not based on advanced quantitative methodologies. The need for advanced training in quantitative methods is necessary for preparation of future Nurse Scientists. Additionally, the Frances Payne Bolton School of Nursing PhD program would be the only nursing PhD in the country that would offer the level of quantitative methodology training found in the AQM certificate. This would provide the nursing students with an opportunity that could not be found anywhere else.

In a survey of doctoral training programs, Aiken et al. (2008) found that individual departments are hard pressed to dedicate resources and faculty needed for adequate training of doctoral students in quantitative methodologies. However, by pooling resources, and coordinating quantitative methodology courses across Schools, academic institutions like Case can be more effective in preparing PhD students in quantitative methodologies.

The current proposal is motivated by Aiken et al.'s recommendation. More importantly, this program is largely driven by graduate students from a wide range of programs on CWRU campus requesting additional training in quantitative research methods above and beyond those courses available from their graduate program. The Schools of Management and Nursing will pool resources to coordinate and address this need for training in quantitative methodologies leading to certification (as detailed below).

Certification Requirements: To qualify for the Certificate, we propose that the students complete three requirements:

1. Successfully complete 5, 3 credit-hour approved quantitative methods courses offered on Case campus, for a total of 15 credit hours.
2. Obtain a cumulative GPA of 3.5 or higher in the approved courses included for this certificate.
3. Take at least 1 course each from approved Sets A and B. Each course is worth 3 credit hours.

Set A: Approved Quantitative Methods courses at the Weatherhead School of Management
   a. MGMT 571 – Measurement Theory and Method
   b. MGMT 573 – Applied Multivariate Data Analysis
   c. *EDMP 643 – Foundations of Quantitative Research Design
   d. *EDMP 646 – Advanced Analytical Methods
   e. *EDMP 649 – Causal Analysis of Business Problems II

Set B: Approved Quantitative Methods courses at the Frances Payne Bolton School of Nursing
   a. NURS 630 – Advanced Statistics: Linear Models
   b. NURS 631 – Advanced Statistics: Multivariate Analysis
   c. NURS 632 – Advanced Statistics: Structural Equation Modeling

Set C: Approved Quantitative Methods courses at other CWRU Schools
   a. SASS 618: Measurement Issues in Quantitative Research
   b. EPBI 500: Design and Analysis of Observational Studies
   c. EPBI 435: Survival Data Analysis
   d. SOCI 525: Multilevel Modeling

Eligibility:

1. The PhD students in Management, Nursing, other programs as well as Masters and other graduate students are eligible.
2. Eligible students will need to meet prerequisites for the approved courses that they plan to apply toward the AQM certification.
3. *These courses are restricted to students enrolled in the Doctor of Management program at Weatherhead.

Justification:

The certificate of **A**chievement in research skills for **Q**uantitative **M**ethodologies offers a unique opportunity for graduate students at Case Western Reserve University. The majority of courses for certification are centrally located in two schools, with the flexibility of taking additional

courses outside of Management and Nursing to suit the needs of the individual student. Additionally, students in most graduate programs do not have the opportunity to take five courses in advance quantitative methods, this certification fills that need for those students. To date, there are no certificates offered by the university in advanced quantitative methodologies directed at behavioral research. As competition for academic positions after graduation increase, the AQM certificate is likely to provide our students with an edge in the job market. This certificate would also provide the students with the statistical foundation for pursuing NIH and NSF grants, post-doctoral fellowship, and research positions in the management, healthcare, and government fields

Faculty:

The faculty have an extensive expertise in quantitative methodologies instruction with many having taught advanced quantitative methods for over five years. Their commitment to students includes serving on dissertation committees. The faculty have also served on editorial boards of major peer reviewed journals and are nationally and internationally recognized for their statistical expertise. Additionally, many of the faculty have experience in federal grant writing and have provided statistical support as team members on federally funded grants.

Governance:

1. Governance issues related to the proposed certificate will be handled by a committee consisting of (1) one faculty each from Management and Nursing, and (2) Director of the Research/PhD Program from either Weatherhead or Nursing (selected in rotation).
2. This proposal & certificate will be jointly sponsored by the Schools of Management and Nursing.
3. The governance committee will, on a regular basis, review additional courses for inclusion as approved certificate courses.

Resources:

No additional resources are envisaged as no new courses are being proposed. Additional resources will be needed to administer the certificate; however, these resources will pertain to administrative costs and are expected to be manageable. Individual Schools sponsoring this certificate will bear this additional administrative cost.

References:

Aiken, Leona, Stephen West and Roger Millsap (2008), "Doctoral Training in Statistics, Measurement, and Methodology in Psychology," American Psychologist, 63 (1): 32-50.

Aguinis, Herman and Jeffrey Edwards (2014), "Methodological Wishes for the Next Decade and How to Make them Come True," Journal of Management Studies, 51 (1): doi: 10.1111/joms.12058

Henson, Robin, Darrell Hull and Cynthia Williams (2010), "Methodology in our Education Research Culture: Toward a Stronger Collective Quantitative Proficiency," Educational Researcher, 39 (3): 299-240.

Robert E. Widing, Ph.D.
Dean and Albert J. Weatherhead III
Professor of Management

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October 8, 2014

Charles Rozek, PhD
Vice Provost and Dean of Graduate Studies
Case Western Reserve University

Dear Chuck,

As Dean of the Weatherhead School of Management and upon positive recommendation of
Kalle Lyytinen, Associate Dean of Research, I am pleased to write this letter of my
enthusiastic support for the Certificate of Achievement in Research Skills for Quantitative
Methodologies (AQM) Program. This program is co-sponsored by the Schools of Management
and Nursing at Case Western Reserve University to provide graduate and advanced students an
opportunity to achieve competence in quantitative research methodologies.

The Weatherhead School of Management at Case Western Reserve University is a
highly ranked management school in the United States and is committed to providing
an outstanding and innovative learning environment for students. We look forward to
working with the School of Nursing on this exciting and unique opportunity.

Sincerely,

Robert E. Widing

Mary E. Kerr, PhD, RN, FAAN
Dean
May L. Wykle Professor

Office of the Dean

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September 29, 2014

Charles Rozek, PhD
Vice Provost and Dean, Graduate Studies
Case Western Reserve University

Dear Dr. Rozek,

As Dean of the Frances Payne Bolton School of Nursing, I enthusiastically offer my support for the
Certificate of Achievement in Research Skills for Quantitative Methodologies (AQM) Program. This
program is co-sponsored by the Schools of Nursing and Management at Case Western Reserve
University to provide graduate and advanced students an opportunity to achieve competence in
quantitative research methodologies.

The Frances Payne Bolton School of Nursing at Case Western Reserve University is a highly ranked
nursing school in the United States and is committed to providing an outstanding and innovative
learning environment for students. We look forward to working with the School of Management on this
exciting and unique opportunity.

Sincerely,

Mary E. Kerr

Mary E. Kerr, PhD, RN, FAAN
Dean and May L. Wykle Endowed Professor

Kalle Lyytinen
Associate Dean of Research
Iris S. Wolstein Professor of Management
Design
Department of Design & Innovation

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September 25, 2014

To the Dean of Graduate Studies,

I am writing you with regard to the proposal 'Proposal for a certificate of **A**chievement in research skills for **Q**uantitative **M**ethodologies (AQM) cosponsored by the Schools of Management and Nursing, and directed at PhD/Masters/Advanced students on Case campus'. I have spoken this initiative with Dr. Singh who has been our representative in the preparing committee and we have also discussed the proposal in our School's Research Committee. The committee voted unanimously for the proposal and I also personally fully endorse the initiative. It is time to get a more structured and systematic method education going across the campus to improve our research competencies.

Kind Regards,

Kalle Lyytinen
Iris S. Wolstein Chair; Associate Dean of Research
Director of Academic Affairs Doctor of Management Programs
The Weatherhead School of Management
Case Western Reserve University

To the Dean of Graduate Studies,

Thomas E. Love, Ph.D.
Professor of Medicine
Epidemiology & Biostatistics
Director, Biostatistics and Evaluation Unit

E-mail: Thomas.Love@case.edu
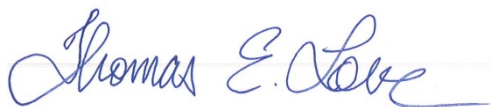Phone: 216-778-1265
Fax: 216-778-3945

I write today regarding the proposal for a Certificate of **A**chievement in research skills for **Q**uantitative **M**ethodologies (AQM) co-sponsored by the Weatherhead School of Management and the Francis Payne Bolton School of Nursing here at CWRU.

I would like to offer my strong support for this Certificate. This Certificate provides an appealing opportunity for our students to expand their training in advanced quantitative methods.

As an option for students interested in this, I have in past years and will again teach my course (which is currently cross-listed as CRSP 500 and EPBI 500) on the design and analysis of observational studies. A copy of the Spring 2014 syllabus for the course is attached.

Please let me know if there is any further information I can provide.

Sincerely,

Thomas E. Love, Ph.D.

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MetroHealth

CASE WESTERN RESERVE
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SCHOOL OF MEDICINE

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November 19, 2014

To the Dean of Graduate Studies,

I am writing to you regarding the proposal of The Certificate of **A**chievement in research skills

for **Q**uantitative **M**ethodologies (**AQM**) cosponsored by the Schools of Management and

Nursing, for PhD/Masters/Advanced students. I am enthusiastically offering my support for the

certificate and will be teaching a course in Epidemiology and Biostatistics on Survival Data

Analysis that will be included as a course option for students interested in the certificate. I am

including a copy of the syllabus for the class. This certificate is a unique opportunity for our

students to expand their training in advanced quantitative methods.

Sincerely,

Pingfu Fu, Ph.D.
Associate Professor of Biostatistics
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22 November 2014

Charles Rozek
Dean of Graduate Studies
Case Western Reserve University

Dear Dean Rozek:

I am writing to you in regard to the proposal for the Certificate of **A**chievement in research skills for **Q**uantitative **M**ethodologies (**AQM**) cosponsored by the Schools of Management and Nursing directed at PhD/Masters/Advanced students on Case campus. I am enthusiastically in support for the certificate and will be teaching a course on Measurement Issues in Quantitative Research (SASS 618) that will be included as a course option for students interested in the certificate. I am including a copy of the syllabus for the class.

I believe that the AQM certificate is a unique opportunity for our students to expand their training in advanced quantitative methods, and for a collaborative partnership among Schools in service of graduate education and research. Going forward, the Mandel School is planning to offer additional methods courses with quantitative focus which Dr. Jagdip Singh has indicated would be considered for inclusion as qualified courses toward the AQM certificate. I will be coordinating this process to grow our collaborative partnership.

Let me know if you have any questions.

Aloen L. Townsend

Aloen L. Townsend, Ph.D.
Professor
Chair, Ph.D. Program in Social Welfare
PH: 368-0373
aloen.townsend@case.edu

JACK, JOSEPH AND MORTON MANDEL
SCHOOL OF APPLIED SOCIAL SCIENCES

CASE WESTERN RESERVE
UNIVERSITY

Case Western Reserve University
Weatherhead School of Management
MGMT 571
MEASUREMENT THEORY AND METHOD
SUMMER, 2014

Instructor: Jagdip Singh
Office: #221, PBL
Email: jagdip.singh@case.edu
Office hours: Tuesdays, 10am to noon.

Meet in PBL 120, 1pm to 4.30pm.

A. *Seminar Objectives and Organization*

This seminar aims to provide a broad understanding of the theoretical and methodological issues involved in social science measurement and methodology. Specifically, the seminar will (a) cover the basic principles of construct measurement (e.g., PLS Measurement, Classical Test Theory, and Item Response Theory), and (b) emphasize an integrative view of substantive and methodological issues in using social science data to address measurement problems.

The seminar is designed in the lecture-discussion format. Individual students must thoroughly read the required readings before the assigned date, complete a draft of the analytical assignment and be prepared to discuss the material assigned. A list of reading and other assignments is provided below. You must anticipate the readings for each class and be well prepared to be an active participant.

B. *Texts and Manuals:*

- *Required Texts:*

    Raykov, Tenko and George Marcoulides (2011), *Introduction to Psychometric Theory*, Routledge, 978-0-415-87822-7 (referred hereafter as **TRGM**)
    Download datasets from book website:
       http://www.psypress.com/books/details/9780415878227/

    Byrne, Barbara (2011), "Structural Equations Modeling with Mplus: Basic Concepts, Applications and Programming," Routledge, 978-1-84872-839-4. (**BYRNE**)

C. *Analytical Assignments*

Two types of assignments are provided for each meeting period. Assignment type (a) involves reproducing analysis reported in TRGM on your own and to identify questions and issues for class discussion to enhance strong understanding and clarity of the focal concepts and procedures. No formal submission is needed for type (a) assignments.

Type (b) assignments require working with new data and problems. You will be asked to submit these assignments by email in a WORD file for grading. The assignments will usually require that you organize your analysis by outlining the procedures utilized, tabulating the relevant results, and an

explanation of your findings in AMJ style but with the briefest of discussion on theoretical model and hypotheses unless you will be proposing new hypotheses. Computer dumps are <u>not</u> acceptable. Each table and figure must be carefully developed to communicate the procedures, evidence, and insights. Include SPSS/Mplus syntax as appendix. These assignments will be due on Friday by 9pm for each week the class is held starting with May 19.

You are required to use the following format for labeling your assignment files.

"Assignment #_Your Name_Course Number.doc" ---- Example…. "AA1_Name_571.doc"

Analytical assignments contribute 50% toward your grade. Leading class discussion on an assignment will contribute another 10%.

<u>Goals for Assignments:</u>

- Learn by practice, Hone by iteration
- Focus on evidence, Deliver value

<u>Guidelines for Preparing Assignment Reports:</u>

Draft Report (due 24hours before class meeting):

1. Read the assigned materials including some recommended/other articles and draft a plan for analysis (e.g., different analysis to be performed, in what order, what to look for)
2. Develop "dummy" tables in excel to record the evidence that needs to be compiled.
   a. review a few relevant articles in AMJ to get a sense of tables.
   b. run preliminary analysis to get a sense of output obtained.
   c. review assigned and "new" materials to clarify what evidence will be needed to draw desired interpretations.
3. Conduct analysis and complete as much of the "dummy" tables as possible.
4. Make a list of questions, and points for clarification for class discussion.

During Class:

1. Student-led discussion of questions, clarifying points, & unexpected issues.
2. Time for comparing & building analysis.
3. Generate leads for extended learning by bringing in current literature.

Final Submission (due midnight, assigned day):

1. Organize submission as per AMJ style, with one exception: limit the introduction+theory+design to no more than 2pages, but do clearly state the hypotheses tested.
2. The "method of analysis, "results" and "discussion" section should constitute the bulk of your submission.
3. Label your submission as noted in syllabus.
4. All material submitted must be original and non-overlapping with any other published or unpublished material.
5. Tables and figures are the core of your submission. Give them attention.

6. Additional suggestions:
    a. Develop a plan for your analysis and include it in a graphical/figurative form.
    b. Identify important methodological decisions you would be making.
    c. Clearly state the criteria you used to make decisions (e.g., p-values, multicollinearity).
    d. Apply criteria consistently.
    e. Always, *always*, test the assumptions before interpreting the results.
    f. Focus on the evidence. Let the numbers tell the story.
    g. Carefully label, organize and compose your Tables/Figures to present this evidence.
    h. Interpret your results with depth to discuss insights not easily inferred from the tables.
    i. Entertain and test alternative hypotheses, explanations, and/or ideas.

D. ***Intellectual and Ethical Responsibility***.

All assignments are to be completed **independently** by each student. Consultation with other students regarding syntax and software problems are permitted, even encouraged. Likewise, discussions among students during and outside the class about interpretation of results and reconciling different perspectives are appropriate. However, each student is expected to develop his/her report independently with original contribution. Overlaps among student reports in the critical analysis and interpretation are not expected.

Each student is expected to maintain a high level of ethical conduct and clearly identify his/her original intellectual contributions for all work required for this seminar. Specifically, while you are encouraged to research for background information and additional sources to enhance your work, all such "borrowed" materials must be properly acknowledged (e.g., using references, quotes, etc) to distinguish from your own intellectual contributions. Likewise, you must complete "individual" assignments without collaborative efforts of others. Unless properly referenced, submitted work is assumed to be original contribution of the student.

E. ***Late Submissions***: Late submission will result in a letter-grade penalty. That penalty is one full letter grade for each day (or part thereof) that the submission is late. For example, an exercise would have earned a B if submitted on its due date of Thursday, will be graded C if submitted by Friday, D if submitted by Saturday, and an F if submitted thereafter. If a submission must be late due to circumstances beyond your control, contact the instructor. At his discretion and based on his assessment of the actual degree of uncontrollability of the situation, he may permit a special arrangement. The most typical special arrangement is for students who must miss class due to extreme circumstances. They are often permitted to submit the assignment *early*. It is extremely rare for the instructor to permit an extension of the due date.

F. ***Final Take-home Test.***

A final take home test is scheduled. **The test will constitute for 50% of your grade.**

G. ***Changes.*** The instructor reserves the right to make changes during the semester to any aspect of syllabus that, to his judgment, are needed to achieve the learning objectives of the course.

Week of	Subject/Reading Assignments

Unless noted in parenthesis, read all sections of the assigned chapters.

May 12-19   **BASICS**
                   a.   **TRGM: Chapters 1, 2** (Sections 2.1 to 2.7) **and 3**
                   b.   **BYRNE: Chapters 1 and 2**

Required Articles:

Bedian, Arthur (2014), "More Than Meets the Eye": A Guide to Interpreting the Descriptive Statistics and Correlation Matrices Reported in Management Research," *Academy of Management Learning & Education*, 13 (1): 121-135.
Spreitzer, Gretchen (1995), "Psychological Empowerment in the Workplace: Dimensions, Measurement and Validation," *Academy of Management Journal*, 38 (5): 1142-1465.

Study Questions:
- Evaluate the implications of the following statement for the empirical evidence a scholar has to provide in supporting the credibility of the measures used in a study:

  "Constructs cannot be defined only in terms of operational definitions but must also demonstrate relationships (or lack thereof) with other constructs and observable phenomenon" (p. 8).

- "When a studied random variable is binary… it is well known from introductory statistics discussions [that] the mean of the variable is the probability of response symbolized as 1… in psychometric theory, this probability can be of special importance" (p. 16).

  Explain why the mean is a "probability" and what makes this probability so special. Provide illustrative cases to develop this explanation. How is this "mean" different from the linear combination of random variables (see page 20) and how are they related?

- A fundamental property of factor analysis is conditional independence (section 3.3.3, page 42). State and describe this property in your own words. Explain how this property influences the different decisions you will make in conducting a factor analysis, and how do you make sure that this property is satisfied in any given analysis.

- "Rotation starts with an initial solution… and then changes direction of the initial factors so as to optimize a particular function that reflects distance to what is referred to as the "simple structure"" (p. 45).

What is the nature of "simple structure," and why is it a preferred optimization rule? Based on this rule, which rotation—orthogonal or oblique—is to be preferred under which conditions?

Assignment 1: (draft 1pm, 05/18, final 9am 05/23)

Reproduce EFA of Psychological Empowerment data from Sprietzer (1995). Compare and contrast the results obtained. A SPSS syntax file that processes the data from the article is attached. Interpret and summarize your results keeping the following questions in mind.

1. Do the four dimensions of PE show evidence of convergent and discriminant validity?
2. Are the items used to measure PE show evidence of validity?
3. Do the four PE dimensions show evidence of contextual consistency?
4. What are key areas of improvement in PE scale development?

May 19-27   **CLASSICAL TEST THEORY APPROACH TO MEASUREMENT**
(CONFIRMATORY FACTOR ANALYSIS)
a.   **TRGM: Chapters 4 and 5** (Sections 4.1 to 4.5.1; other sections optional; review section 4.6)
b.   **BYRNE: Chapters 3 and 4**

Required Articles:

Spreitzer, Gretchen (1995), "Psychological Empowerment in the Workplace: Dimensions, Measurement and Validation," *Academy of Management Journal*, 38 (5): 1142-1465.

Study Questions (for discussion on May 27 led by student team):

- "A generated hypothesis regarding the structure of a set of variables under consideration, as obtained from an EFA, is however not a hypothesis that can be relied upon. In order to consider it trustworthy, additional evidence in favor of it needs to be provided… in particular, the specific relationships between measures and factors are of special relevance when conducting CFA, because with their postulation one resolves the serious problem of infinitely many solutions in EFA" (p. 79).

  Explain. Why is EFA not a basis of "reliable hypothesis" and how does it affect research practice? What is the "serious problem" of infinite solutions in EFA, and how does CFA solve it? Does one need to perform EFA before CFA to get valid results, and what strategy do Raykov and Marcoulides recommend?

- "By freeing the loadings of all observe indicators of a given factor, while fixing the latent variances at 1…, we ensure that the factor covariance equals the factor correlation… and obtain at the same time a standard error for it." (p. 83).

  Explain the factor identification problem, and the different ways of specifying the CFA model to address this problem. Explain which approach is being discussed in the above statement. Discuss the pros and cons of these different approaches.

Provide examples of situations where one approach will be preferred over the other, and vice versa.

- "A different approach is therefore needed when one cannot assume that the instrument components (e.g., survey questions) are approximately continuous… it is based on the assumption of underlying, normally distributed variable behind each discrete item or instrument component… [in this approach] a CFA model can be fitted to data via a three step estimation procedure." (pp. 91-93).

  Explain the noted approach and each of the preceding three statements. Be careful to note in what ways this approach differs from the "standard" CFA approach. Identify practical situations where this approach would be useful, and how the results are likely to differ if the "standard" approach was used instead.

- Describe in your own words the four misconceptions that Raykov and Marcoulides outline for Classical Test Theory (CTT). To demonstrate that CTT assumptions are falsifiable and testable, the authors describe different models based on CTT. Explain the conceptual foundation for each model, its unique feature(s) and how it can be empirically specified and tested.

  Assignment 2:
  a.   Not to be submitted: Ex 4.2 on p. 63, Ex 4.4 on p. 81, Ex 4.5.1 on p. 87, and Ex 5.6.1 & 5.6.3 on p. 132-3 of **TRGM** (uses data in Table 4.3).
  b.   To be submitted (*draft 1pm, 05/27; final 9am, 05/30*): Analyze the Psychological Empowerment data from Sprietzer (1995) to evaluate the reliability and validity of the PE construct. Compare and contrast with results reported by Sprietzer (1995). Keep the following points in mind:
     1. What psychometric properties should the four dimensions of PE satisfy for the second-order factor to be meaningful? How well do the PE dimensions fare on these properties?
     2. What evidence is available to conclude that the four PE dimensions have sufficient discriminant validity to be examined as distinct concepts & are measured with sufficient reliability, while have reasonable convergent validity to constitute a higher order factor?
     3. Do the four PE dimensions show evidence of contextual consistency?
     4. What are key areas of improvement in PE scale development?

  Recommended Readings:
  - Widaman, "Common Factor Analysis Versus Principal Component Analysis," *MBR*, 1993: 263-311.
  - Campbell and Fiske (1959), "Convergent and Discriminant Validation by the Multi-Trait Multi Method," *Psychological Bulletin*, 56: 81-105.
  - Edwards, Jeffrey and Richard Bagozzi (2000), "On the Nature and Direction of Relationships Between Constructs and Measures," *Psychological Methods*, 5 (2): 155-174.
  - Law, Kenneth, S, Chi-Sum Wong and William H Mobley (1998), "Toward a Taxonomy of Multidimensional Constructs," *Academy of Management Review*, 23 (4): 741-755.

- Rindskopf and Rose (1988), "Some Theory and Applications of Confirmatory Second-Order Factor Analysis," *MBR,* 51-67
- Little, Todd, Ulman Lindenberger and John Nesselroade (1999), "On Selecting Indicators for Multivariate Measurement and Modeling with Latent Variables: When "Good" Indicators are Bad, and "Bad" Indicators are Good," *Psychological Methods*, 4 (2): 192-211.
- Borsboom, Denny, Gideon J. Mellenburgh and Jaap van Heerden (2003) "The Theoretical Status of Latent Variables," *Psychological Review*, 110: 2 203-219.
- Greenwald, Anthony G et al (1986), "Under What Conditions Does the Theory Obstruct Research Progress" *Psychological Review*, 93:2 216-229.

May 27-June 16   **CONSTRUCT RELIABILITY & VALIDITY**
      a.   **TRGM: Chapters 6, 7** (Sections 7.1 to 7.5) **& 8** (8.1 to 8.7, 8.9 to EOC)
      b.   **BYRNE: Chapters 7 and 10**

Required Articles:

Bove, Liliana, Simon Pervan, Sharon Beatty, and Edward Shiu (2009), "Service worker Role in Encouraging Customer Organizational Citizenship Behavior," *Journal of Business Research*, 62: 698-705.

Farrell, Andrew (2010), "Insufficient Discriminant Validity: A Comment on Bove, Pervan and Beatty," *Journal of Business Research*, 63: 324-327.

Shiu, Edward Simon Pervan, Liliana Bove and Sharon Beatty (2011), "Reflections on Discriminant Validity: Reexamining Bove et al. (2009) Findings," *Journal of Business Research*, 64: 497-500.

Streiner, David (2003), "Starting at the Beginning: An Introduction to Coefficient Alpha and Internal Consistency," *Journal of Personality Assessment*, 80 (1): 99-103.

    Study Questions (for discussion on June 16 led by student team):
- "reliability bears a distinct relationship to the predictive power with which one can predictive power with which one can predict observed score form true score…. Prediction error increases with diminishing reliability, and conversely decreases with increasing reliability… it is very convenient to apply α (Coefficient Alpha) for purposes of reliability estimation for the composite." (pp. 139-143).

    Explain what reliability means in the context of CTT, and what it does not. What precisely is the relationship between reliability and predictive power, and what threshold of predictive power is reasonable for effective measurement of constructs? What are the assumptions for estimating coefficient alpha, how is it estimated and what alternative estimate is available when these assumptions are not met (draw from chapter 7 as well)?

- Raykov and Marcoulides discuss six aspects of Coefficient Alpha—what it is, and what it is not (pp. 155-156), and three factors that impact reliability estimation (pp. 156-158).

  Discuss these aspects and factors in your own words, and its implications for reliability estimation and interpretation for research.

- "in order to claim validity for a given instrument, one may need to demonstrate more than one type of validity as being high. Furthermore… unlike the case with reliability, there is actually no single index that represents how high a given measuring instrument's validity is…. In fact [one] typically needs more than one study."

  Discuss the different types of validity and what distinct information they provide on validity, and their pros and cons. What crucial evidence is needed to confirm that a construct or constructs lack validity?

- Review the required articles regarding discriminant validity debate. Develop and argue your position on which of the two approaches—Farrell (2010) or Bove/Shiu et al. (2009/2011)—or a third approach (that you propose) is more meaningful for assessment of construct validity. Explain the pros and cons of different approaches, and why your suggested approach is more appropriate.

  Assignment 4:
  a. Not to be submitted: Ex 7.5.2 on p. 161, and Ex 7.6 on p. 169 of **TRGM,** and Ex 8.9.1 on p. 206, and Ex 8.9.2 on p 212 of **TRGM**
  b. To be submitted (*draft, 1pm, 06/15; final 9am, 06/20*): MTMM is a general approach for testing different measurement models, providing robust evidence of convergent and discriminant validity, and controlling for random/method/systematic sources of error. Review the Hsiao, Wu and Yao (2013) article and (a) run the MTMM models using Mplus, (b) reproduce the evidence on convergent and discriminant validity, and (c) extend the MTMM analysis by using other more robust and stronger procedures. Compare and contrast your findings with those reported by the authors. Interpret and summarize results obtained. (Hint: Use chapter 10 from **BYRNE** for guidance).

    Hsiao, Yu-Yu, Chia-Huei Wu and Grace Yao (2013), "Convergent and Discriminant Validity of the WHOQOL-BREF Using a Multitrait-Multimethod Approach," Social Indicators Research, DOI 10.1007/s11205-013-0313-z

  Recommended Readings:
  - Ree, M. J., & Carretta, T. R. (2006), "The Role of Measurement Error in Familiar Statistics," Organizational Research Methods, 9, 99-112.
  - McDonald, Roderick P. and Moon-Ho Ringo Ho (2002), "Principles and Practice in Reporting Structural Equation Analyses," Psychological Methods, 7 (1), 64-82.

- John, Oliver and Benet-Martinez, Veronica (2000), "Measurement: Reliability, Construct Validation, and Scale Construction," in *Handbook of Research Methods in Social and Personality Psychology*, Harry Reis and Charles Judd (Eds.,) Cambridge University Press, 2000.
- Vandenberg, R. J., & Lance, C. E. (2000), "A Review and Synthesis of the Measurement Invariance Literature: Suggestions, Practices, and Recommendations for Organizational Research," Organizational Research Methods, 3, 4-69
- Venkatraman and Grant, "Construct Measurement in Organizational Strategy Research: A Critique and Proposal," *AMR* 11 (1986, 1): 71-87.
- Singh, Jagdip (1991), "Redundancy in Constructs: Problem, Assessment and an Illustrative Example, "*Journal of Business Research*, 255-280.
- Foster, Sharon and John Cone (1995), "Validity Issues in Clinical Assessment," *Psychological Assessment*, 248-260
- Schwab (1980), "Construct Validity in Organizational Behavior," *Research in Organizational Behavior* Vol. 2, 3-43
- Clark, Lee Anna and David Watson (1995), "Constructing Validity: Basic Issues in Objective Scale Development," *Psychological Assessment*, 7 (3): 309-319.
- Messick, Samuel (1995), "Validity of Psychological Assessment," American Psychologist, 741-749.
- Bacharach, Samuel (1989), "Organizational Theories: Some Criteria for Evaluation," *AMR*, 496-515.
- Osigweh (1989), "Concept Fallibility in Organizational Science," *AMR,* 579-594.

June 2   **PLS APPROACH TO MEASUREMENT**

Required Articles:

a. Bollen, Kenneth and Shawn Bauldry (2011), "Three Cs in Measurement Models: Causal Indicators, Composite Indicators and Covariates," Psychological Methods, 16 (3): 265-284.
b. Ronkko, Mikko and Joerg Evermann (2014), "A Critical Examination of Common Beliefs About Partial Least Squares Modeling," Organizational Research Methods, DOI: 10.1177/1094428112474693
c. Henseler et al. (2014), "Common Beliefs and Reality About PLS: Comments on Ronkko and Evermann (2014)," Organizational Research Methods, DOI: 10.1177/1094428114526928
d. McIntosh, Cameron, Jeffrey Edwards and John Antonakis (2014), "Reflections on Partial Least Squares Path Modeling," Organizational Research Methods, DOI: 10.1177/1094428114529165
e. Hair, Joseph, Marko Sarstedt, Torsten Pieper and Christian Ringle (2012), "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*, 45: 320-340.
f. Rigdon, Edward (2012), "Rethinking Partial least Squares Modeling: In Praise of Simple methods," *Long Range Planning*, 45: 341-358

Assignment 3:
a. None. However, you are encouraged to analyze "corporate reputation" data provided at **http://www.smartpls.de/cr/** to practice this approach.

Study Questions (for discussion on June 2 led by student team):
- Measurement approaches provide methodologies for testing the validity of latent constructs. Is PLS a measurement approach—is it appropriate for testing the factorial validity of a multi-item scale? If yes, state the conditions that make this approach appropriate. If not, discuss what makes this approach inappropriate.

- Testing model fit allows us to falsify theory-based hypotheses. What is the approach for testing model fit in PLS and how should we assess model fit in PLS?

- Based on the currently available empirical studies, do some of the new innovations in PLS (e.g., consistent and efficient PLS) allow it to perform as well as other SEM estimators (e.g., ML, GLS)?

Recommended Readings:
- Howell, Roy (2013), "Conceptual Clarity in Measurement—Constructs, Composites and Causes—a Commentary on Lee, Codgan and Chamberlain," AMS Review, 3 (1): 18-23.
- Reinartz, Werner, Michael Haenlein and Jorg Henseler (2009), "An Empirical Comparison of the Efficacy of Covariance-based and Variance-based SEM," International Journal of Research in Marketing, 26: 332-344.
- Marcoulides, George, Wynne Chin and Carol Sanders (2009), "A Critical Look at Partial Least Squares," MIS Quarterly, 33 (1): 171-175.
- Bollen, Kenneth and Shawn Bauldry (2011), "Three Cs in Measurement Models: Causal Indicators, Composite Indicators and Covariates," Psychological Methods, 16 (3) 265-284.
- Bagozzi, Richard (2011), "Measurement and Meaning in Information Systems and Organizational Research: Methodological and Philosophical Foundations," MIS Quarterly, 35 (2): 261-292.
- Andreev, Pavel; Heart, Tsipi; Maoz, Hanan; and Pliskin, Nava, "Validating Formative Partial Least Squares (PLS) Models: Methodological Review and Empirical Illustration" (2009). ICIS 2009 Proceedings. Paper 193. http://aisel.aisnet.org/icis2009/193
- Hair, J.F./ Ringle, C.M./ Sarstedt, M.: PLS-SEM: Indeed a silver bullet, in: Journal or Marketing Theory and Practice (JMTP), Volume 19 (2011), Issue 2, pp. 139-151. http://www.metapress.com/content/q435pt848111/?p=443f599e156e4588aa7989a5f9b72ba8&pi=0
- Hair, J.F./ Sarstedt, M./ Ringle, C.M./ Mena, J.A.: An assessment of the use of partial least squares structural equation modeling in marketing research, in: Journal of the Academy of Marketing Science (JAMS), Volume 40 (2012), Issue 3, pp. 414-433., http://www.springerlink.com/content/t502155t60nv8005/
- Lara Lobschat, Markus A. Zinnbauer, Florian Pallas and Erich Joachimsthaler: Why Social Currency Becomes a Key Driver of a Firm's Brand Equity: Insights from the Automotive Industry, Long Range Planning, Volume 46 (2013), pp. 125-148.
- Sarstedt, M./ Henseler, J./ Ringle, C.M.: Multigroup analysis in partial least squares (PLS) path modeling: Alternative methods and empirical results, in:

Advances in International Marketing (AIM), Vol. 22, Bingley 2011, pp. 195-218. http://www.emeraldinsight.com/books.htm?chapterid=1947659
- Edwards, Jeffery (2011), "The Fallacy of Formative Measurement," *Organizational Research Methods*, 14 (2): 370-388.

June 16-23   **IRT APPROACH TO MEASUREMENT**
a.   **TRGM: Chapters 10 & 11**

Study Questions:

- Explain the GLIM framework, its three key elements and the underlying assumptions. How do you think this framework advances measurement of unobservable constructs? Evaluate its relevance and shows its link to the common factor and IRT model.

Recommended Readings:
- Tay, Louis, Daniel Newman and Jeroen Vermunt (2011), "Using Mixed-Measurement Item Response Theory with Covariates (MM-IRT-C) to Ascertain Observed and Unobserved Measurement Equivalence," *Organizational Research Methods*, 14 (1): 147-176.
- Kamata, Akihito and Daniel Bauer (2008), "A Note on Relation Between Factor Analytic and Item Response Theory Models," *Structural Equation Modeling*, 15: 136-153.
- Boorsboom, Denny, Gideon Mellenbergh and Jaap van Heerden (2003), "The Theoretical Status of Latent Variables," *Psychological Review*, 110 (2): 203-219.
- Reise, Steven, Keith Widaman and Robin Pugh, "Confirmatory Factor Analysis and Item Response Theory: Two Approaches for Exploring Measurement Invariance," *Psychological Bulletin*, 1993: 552-566.
- Singh, Jagdip, "Tackling Measurement Problems with Item response Theory: Principles, Characteristics, and Assessment with an Illustrative Example," *Journal of Business Research* (Special Issue on Measurement) 2004: 184-208.

Assignment 5:
a.   Ex 11.4.5.1 & 11.4.5.2 on p. 282 & 288, and Ex 11.5.3 on p. 296 of **TRGM**
b.   To be submitted +worked in class (*draft, 1pm, 06/22; no final*): A study aims to develop a multidimensional measure of entrepreneurial orientation for use in retail settings. The measure includes three well known dimensions of entrepreneurial orientation—innovativeness, proactiveness and risk taking—but assessed for two facets of retailing function—customer service and merchandising. Estimate the IRT parameters for the two facets of retailing entrepreneurial orientation (REO) and compare them with corresponding CTT parameters. What additional information about psychometric properties does IRT provide? What are your recommendations for a short form of REO scale based on IRT estimates, and how would this be different if based on CTT?

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- PLS-Report: Cross loadings, Communality, Redundancy, Cronbach's Alpha
- Workspace Selector
- New: Outline Window
- Indicators Window
- Improved Report Editor
- Bootstrapping
- Improved Data Editor
- Model Editor
- New: Report Menu
- Bugfixes

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We enhanced usability of parameter settings. The settings button in the task bar is removed. Instead, a parameter settings dialog pops up for every SmartPLS computation.

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- Download Samples
- User Manual

James Gaskin- Statwiki on using SmartPLS and YouTube Video:

http://statwiki.kolobkreations.com/wiki/PLS

SmartPLS: Here are video demonstrations using SmartPLS

- *VIDEO TUTORIAL:* **Getting Started**
- *VIDEO TUTORIAL:* **Basic Path Analysis**
- *VIDEO TUTORIAL:* **Factor Analysis**
- *VIDEO TUTORIAL:* **Moderation - Interaction**
- *VIDEO TUTORIAL:* **Mediation**
- *VIDEO TUTORIAL:* **Formative 2nd order Constructs**

Sample Syntax of Reading Correlation Matrix in SPSS, and use Correlation Matrix as Input for EFA and Regression Analysis:

```
matrix data variables = rowtype_ y1 y2 y3 x1 x2 x3.
begin data.
n 200 200 200 200 200 200.
stddev 1.0 1.0 1.0 1.0 1.0 1.0
means 0 0 0 0 0 0
corr 1
corr .502 1
corr .622 .551 1.0
corr .228 .272 .188 1.0
corr .307 .230 .249 .442 1.0
corr .198 .259 .223 .537 .413 1.0
end data.

FACTOR
  /MATRIX IN (COR=*)
  /PRINT UNIVARIATE INITIAL EXTRACTION ROTATION  DET
     KMO
  /FORMAT BLANK(.10)
  /PLOT EIGEN
  /CRITERIA factors(2) ITERATE(25)
  /EXTRACTION ml
  /CRITERIA ITERATE(25)
  /ROTATION PROMAX(4).

FACTOR
  /MATRIX IN (COR=*)
  /PRINT UNIVARIATE INITIAL EXTRACTION ROTATION  DET
     REPR KMO
  /FORMAT BLANK(.10)
  /PLOT EIGEN
  /CRITERIA factors(2) ITERATE(25)
  /EXTRACTION ml
  /CRITERIA ITERATE(25)
  /ROTATION PROMAX(4).

REGRESSION
  /MATRIX=IN(*)
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS CI R ANOVA COLLIN TOL CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT y1
 /METHOD=ENTER y2 y3 x1 x2 x3.
```

Sample Syntax for Simulating Raw Data based on an Input Correlation Matrix

```
set seed = 12343.
matrix.
compute n = 500.
compute exact = 1.
compute r =
{1, .4, -.3;
.4, 1, .6;
-.3, .6, 1}.
compute rn = nrow(r).
compute x1 = sqrt(-
    2*ln(uniform(n,rn)))&*cos((2*3.14159265358979)*uniform(n,rn)).
compute x1=x1*chol(r).
compute ones = make(n,1,1).
compute sigma = (t(x1)*(ident(n)-(1/n)*ones*t(ones))*x1)*(1/(n-1)).
do if (exact = 1).
call eigen(r, vc, vl).
compute sqrtr = vc*sqrt(mdiag(vl))*t(vc).
call eigen(sigma, vc, vl).
compute sqrts = vc*sqrt(mdiag(vl))*t(vc).
compute x1 = x1*inv(sqrts)*sqrtr.
compute ones = make(n,1,1).
compute sigma = (t(x1)*(ident(n)-(1/n)*ones*t(ones))*x1)*(1/(n-1)).
end if.
print r/title = "Population Matrix"/format = F16.4.
print sigma/title = "Sample Matrix"/format = F16.4.
print n/title = "number of cases created"/format = F16.0.
save x1/outfile = *.
end matrix.
```

Case Western Reserve University
Weatherhead School of Management

MGMT 573
MULTIVARIATE DATA ANALYSIS

FALL 2014: THURSDAYS, 12.30PM TO 3.30PM
(Meet in PBL 220)

Instructor: Jagdip Singh   Office Hours: By Appointment
Office: 221, PBL   Phone: 368-4270

A.   *Seminar Objectives*

The objectives of the seminar are to provide a broad understanding of the theoretical and methodological issues involved in *applied* multivariate data analysis. As such, the seminar aims to expose you to the assumptions, principles and applications of a selected set of multivariate techniques.

B.   *Seminar Organization*

1.   The seminar is designed in the lecture-discussion format. That is, you must be prepared to discuss the material assigned for each meeting period. To facilitate this, a list of chapter readings and other assignments is enclosed. You must anticipate the readings for each class and be prepared to be an active participant. Analytical assignments offer opportunity for students to develop hand-on skills and build mastery, while application articles extend the range of studied techniques to broader set of problems.

2.   *Required Text*

Tabachnick, Barbara and Linda Fidell *Using Multivariate Statistics*, Sixth Edition, (2013, Pearson); ISBN 0-205-84957-1 (**T&F**).

Supplemental References (not required):

Cohen, Cohen, West and Aiken, Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences, Third Edition, (2003, LEA), 0-8058-2223-2 (**CCWA**)

Hair, Anderson, Tatham and Black. *Multivariate Data Analysis*, Seventh Edition, (2010 Prentice Hall); ISBN 978-0138132637 (**HATB**).

Klein, Katherine and Steve W J Kozlowski, *Multilevel Theory, Research, and Methods in Organizations*, 2000, Jossey Bass, ISBN: 0-7879-5228-1 (K&Z)

Bryk, Anthony and Stephen Raudenbush, Hierarchical Linear Models, 2001, Sage Publications, ISBN: 978-0761919049

Stevens, James, Applied Multivariate Statistics for the Social Sciences, (Fifth Edition), 2009, Routledge, ISBN : 978-0805859034

Johnson, Richard A and Dean W Wichern, Applied Multivariate Statistical Analysis, Sixth Edition (2009, Prentice Hall)

C.   *Analytical Assignments*

Analytical assignments will require knowledge of SPSS, AMOS and/or Mplus. The data and SPSS files used by **T&F** may be downloaded from http://www.pearsonhighered.com/tabachnick/. In addition, other data may be provided for the purposes of some assignments and/or final exam. These may be downloaded from the course blackboard. However, the latter data sets *can not* be used for any other purpose without the consent of the instructor. You will be asked to submit assignments for grading. A few useful websites for advanced analysis: http://www.la.utexas.edu/research/faculty/dpowers/book for Logit and Probit models, and http://www.stats.ox.ac.uk/~snijders/ for multilevel analysis.

The assignments require that you organize your analysis by outlining the procedures utilized, tabulating the relevant results, and an explanation of your findings in AMJ style but with a brief discussion on theoretical model and hypotheses unless you will be proposing new hypotheses. Computer dumps are not acceptable. Each table and figure must be carefully developed to communicate the procedures, evidence, and insights. Include SPSS/Mplus syntax as appendix. *See more details below*.

Use the following format for labeling your assignment files.

**"Assignment #_Your Name_Course Number.doc" ----
Example…. "AA1_Name_573.doc"**

Also include your name and assignment # (& details) in the document itself.

Analytical assignments contribute 50% toward your grade.

D. Final Submissions:

Final submissions for analytical assignments will be due on Mondays (midnight) as per dates noted. Before the final submission, you will be required to submit an initial draft (usually on Wednesdays the week before) for class discussion of problems and concerns. The initial draft will not be graded but you will be penalized for failure to submit. The final submission will be graded. Guidelines for final submission:

1. Organize submission as per AMJ style, with this exception: limit the introduction+theory+design to no more than 2pages; but clearly state the hypotheses tested and the underlying rationale (what substantive idea the hypotheses will test).
2. The "method of analysis, "results" and "discussion" section constitute the bulk of your submission.
3. Label your submission as noted in syllabus.
4. All material submitted must be original and non-overlapping with any other published or unpublished material.
5. Tables and figures are the core of your submission. Give them attention.
6. Include SPSS/Mplus syntax as appendix

E. *Application Article & Discussion:*

You will also be leading class discussion of at least one application article during the semester. You may identify upto 3 possible articles published in a top journal in your field that use one or more of the methods discussed in the course. Consult with the instructor to select one for class discussion.

As lead discussant, your role & responsibilities include:

1. Thoroughly read the article.
2. Identify 3 to 5 methodology related questions that can be used to generate class discussion. These questions may involve (a) pros and cons of the chosen methodology, (b) correct and incorrect interpretations of results, (c) comparison with alternative methodologies, and (d) missed opportunities in sound and rigorous analysis.
3. Distribute the article and discussion questions to the class 1 week before the discussion date.
4. For your presentation, research one or more methodology related ideas that are triggered by the article, and go beyond what we have learnt in the course.
5. Present a brief summary of the article, emphasizing its objective, hypotheses, nature of data, methodology used, and a critical analysis of the results and interpretation. Make your presentation interactive by involving other students in the class.
6. Focus your discussion around the methodology questions circulated. Generate discussion and provide your insight.
7. Conclude with key points of learning.

For students *not* leading the discussion, your role and responsibilities are as follows:

1. Thoroughly read the article.
2. Participate in the class discussion based on your understanding of the article, and preparation of discussion questions provided.
3. Think of other application areas.
4. Raise other relevant questions and issues.

Application Article & Discussion will contribute 10% toward your grade.

F. *Final Take-home Test.*

A final take home test is scheduled. The test will be given out on December 4 and will be due on December 15. **This test will constitute for 40% of your grade.**

G. *Intellectual and Ethical Responsibility.*

All assignments are to be completed __independently__ by each student. Consultation with other students regarding syntax and software problems are permitted, even encouraged. Likewise, discussions among students during and outside the class about interpretation of results and reconciling different perspectives are appropriate. However, each student is expected to develop his/her report independently with original contribution. Overlaps among student reports in the critical analysis and interpretation are not expected.

Each student is expected to maintain a high level of ethical conduct and clearly identify his/her original intellectual contributions for all work required for this seminar. Specifically, while you are encouraged to research for background information and additional sources to enhance your work, all such "borrowed" materials must be properly acknowledged (e.g., using references, quotes, etc) to distinguish from your own intellectual contributions. Likewise, you must complete "individual" assignments without collaborative efforts of others. Unless properly referenced, submitted work is assumed to be original contribution of the student.

H. *Late Submissions:*

Late submission will result in a letter-grade penalty. That penalty is one full letter grade for each day (or part thereof) that the submission is late. For example, an exercise would have earned a B if submitted on its due date of Thursday, will be graded C if submitted by Friday, D if submitted by Saturday, and an F if submitted thereafter. If a submission must be late due to circumstances beyond your control, contact the instructor. At his discretion and based on his assessment of the actual degree of uncontrollability of the situation, he may permit a special arrangement. The most typical special arrangement is for students who must miss class due to extreme circumstances. They are often permitted to submit the assignment *early*. It is extremely rare for the instructor to permit an extension of the due date.

I. *Helpful Links*

Multivariate Normality: *Use SPSS Macro and associated articles for multivariate normality by using NORMTEST at http://www.columbia.edu/~ld208/normtest.sps*.

Reading Assignments and Due Dates

Week of	*Subject/Assignment*

August 28:

I: **Causal Claims**

Antonakis, J., Bendahan, S., Jacquart P., and LaLive, R (2010), "On Making Causal Claims: A Review and Recommendations," *The Leadership Quarterly*, 21: 1086-1120.

Thoroughly review pp. 1086-1106; the rest of Section 4 is important as well but more challenging. Sections 5-7 are reporting results and conclusions, & should be easy to follow.

Guiding Questions for Review

1. What is the problem of omitted variables in regression? How does it lead to inconsistent estimates, and why does randomized experiment avoid it without having to identify omitted variables?
2. What is the difference between fixed and random effects in regression? What are the advantages with random effects and how does Hausman test examine the consistency of models with random effects?
3. What is the problem with using CMV method for estimating common source variance? What are instruments and how do they provide an alternative in controlling for common method?

September 4

IR: Multiple Regression (Review)

T&F: Chapter 5

Spiller, S., Fitzsimons, G., Lynch Jr., J., McClelland, G. (2013), "Spotlights, Floodlights, and the Magic Number Zero: Simple Effects Tests in Moderated Regression," *Journal of Marketing Research*, April: 277-288.

Practice Assignment:
Q 5.7, T&F, p. 161++

Analytical Assignment:

Ex Hw #1: first submission: Sept 3 (noon); final due Sept 8 (graded)

September 19
(PBL 258)

II: **Modeling Sources of Random and Systematic Error (8am to 4pm).**

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), 879-903.

Discussion Questions:
1. What are method effects and why can they bias research findings?
2. What are the most common method effects due to the respondent, questionnaire items, and the survey context?

3.   What can be done to control for method effects?

Baumgartner, Hans and Jan-Benedict E.M. Steenkamp (2001), "Response Styles in Marketing Research: A Cross-National Investigation," Journal of Marketing Research, 38 (May), 143-156

Discussion Questions:
1.   Define the response styles of (dis)acquiescence, net acquiescence, extreme responding, and midpoint responding, discuss their relationship, and explain how they can be measured.
2.   Under what circumstances do these response styles contaminate research findings.

Weijters, Bert and Hans Baumgartner (2012), "Misresponse to Reversed and Negated Items in Surveys: A Review," Journal of Marketing Research, 49 (October), 737-747.

Discussion Questions:
1.   What are reverse-key items? What are the advantages and disadvantages of using reverse-keyed items in surveys? How can items be reversed?
2.   What types of misresponse can result from using reversed and/or negated items?
3.   What are some of the psychological mechanisms that can lead to misresponse to reversed and negated items?
4.   What can a researcher do to avoid misresponse to reversed and negated items?

Analytical Assignment
Ex Hw #2: Section I due Sept 18, Complete final submission Sept 22 (graded)
          Data: swb.sav

Sept 25/Oct 2   **II. Logistic Regression**

T&F: Chapter 10

Application Article and Discussion: TBD for Oct 2

Practice Assignment:
Q 10.7, T&F, p. 472++

Analytical Assignment:
Ex Hw #3: Initial submission: Oct 1; Final submission: Oct 6 (graded)

Oct 9/Oct 16   **III. Survival/Failure Analysis**

T&F: Chapter 11

Application Article and Discussion: TBD for Oct 16

Practice Assignment:
Q 11.7, T&F, p. 545++,

Analytical Assignment:
Ex Hw #4: Initial submission: Oct 15; Final submission: Oct 20 (graded)

Oct 23/Oct 30   IV. **Mediation & SEM**

         T&F: Chapter 14

Zhao, X., Lynch Jr., and Chen, Q. (2010), "Reconsidering Baron and Kenny: Myths and Truths about Mediation Analysis," Journal of Consumer Research, August: 197-206.

Application Article and Discussion: TBD for Oct 30
KEIMEI S.
KEVIN C.

Practice Assignment:
Q 14.6, T&F, p. 737++

Analytical Assignment:
Ex Hw #5: Initial submission: Oct 29; Final submission: Nov 3 (graded)

Note: 10/30 class will be held in PBL 105

Nov 6/Nov 13   V. **Multilevel Linear Modeling**

         T&F: Chapter 15

Application Article and Discussion: TBD for Nov 13
HAK YOON KIM
HONGGOU W.

Practice Assignment:
Q 15.7, T&F, p. 839++

Analytical Assignment:
Ex Hw #6: Initial submission: Nov 12; Final submission: Nov 17 (graded)

Nov 20   VI. **Modeling Change: Professor Silke Forbes**
         (http://weatherhead.case.edu/faculty/silke-forbes)

Dec 4:   *FINAL EXAM (due Dec 15)*

1. **Multiple Regression (**Sept 8 due)

   An industrial organization selling high-value systems to high tech clients surveys its salespeople to understand determinants of their satisfaction (SLSSAT), which is key to retention. Based on intuition, the Sales VP hypothesizes that:

   a. degree to which the salespeople engage in relational behaviors (SLSREL)—behaviors that facilitate long term relationships with customers—will have a positive effect on salesperson satisfaction.
   b. degree to which the salespeople engage in opportunistic behaviors (SLSSE)—behaviors that make the salesperson look "good" in meeting targets—will have a negative effect on salesperson satisfaction.
   c. interaction between SLSREL and SLSSE will also have an effect on salesperson satisfaction.

   The Sales VP also wants to control for salesperson's learning (SLSSUP), innovation (SLSINNO) and ethical orientations (SLSLIE) to mitigate confounding effects and alternative explanations. Salesperson experience (EXP) and age (AGE) are demographic controls.

   Analyze the data to provide robust test of Sales VP's hypotheses. Show all key steps and interpret the results both technically and for managerial practice in retaining high performance salespeople. The SPSS data is SLSREG.sav.

2. **Modeling Sources of Random and Systematic Error** (Sep 22 due)

A survey was conducted to assess people's subjective well-being. Data are available for 1181 U.S. respondents. Participants completed the Satisfaction with Life Scale (Diener et al. 1985), which is a well-known instrument used to assess the cognitive component of subjective well-being. The scale consists of the following five items:

(1) In most ways my life is close to my ideal.
(2) The conditions of my life are excellent.
(3) I am satisfied with my life.
(4) So far I have gotten the important things I want in life.
(5) If I could live my life over, I would change almost nothing.

Respondents indicated their agreement or disagreement with these statements using the following five-point scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree.

Respondents also rated their current level of general happiness based on how often they experienced five positive affective states (i.e., clear-headed, confident, enthusiastic, free-and-easy, and good-natured) and five negative affective states (e.g., confused, depressed, discontented, helpless, and hopeless). These items are a subset of the items contained in the Affectometer 2 scale (Kammann and

Flett 1983). The ratings were collected on five-point scales ranging from 1 = none of the time to 5 = all the time.

The survey also contained other items from which the following scale scores were computed:

IM average of 10 items from the impression management subscale of the Balanced Inventory of
     Desirable Responding, with higher scores indicating greater impression management (BIDR,
     Paulhus 1991; coefficient alpha=.72)

ERS frequency of use of the most extreme scale positions, either strongly disagree or strongly agree
     (coefficient alpha=.73)

MID frequency of use of the midpoint (coefficient alpha=.63)

ACQ average of acquiescent responses, where 'agree' was weighted as 1, 'strongly agree' as 2, and the
     other response options as zero (coefficient alpha=.52)

DISACQ average of disacquiescent responses, where 'disagree' was weighted as 1, 'strongly disagree' as 2,
     and the other response options as zero (coefficient alpha=.56)

NETACQ ACQ minus DISACQ (coefficient alpha=.55)

The 5 response style measures (ERS, MID, ACQ, DIACQ, NETACQ) were computed based on participants' responses to 16 substantively uncorrelated items (measured with the same response scale used for the Satisfaction With Life Scale).

The file 'swb.dat' contains the raw data. The sequence of the variables in the file is as follows:

id   identifier variable
ls1-ls5 the 5 life satisfaction items
pa1-pa5 the 5 positive affect items
na1-na5 the 5 negative affect items
IM, ERS, MID, ACQ, DISACQ, NETACQ

Using these data, perform the following analyses:

(1) In the first part of the assignment, we will investigate the effects of random measurement error on various statistics of interest.

  a. Let's assume that you only have single-item measures of life satisfaction, positive affect, and negative affect. Specifically, use ls3 as a measure of life satisfaction, pa2 as a measure of positive affect, and na2 as a measure of negative affect. Compute the means, standard deviations, and correlations of the three variables.

  b. Calculate the average life satisfaction (LSmean), average positive affect (PAmean) and average negative affect (NAmean) of each respondent. Then compute the means, standard deviations, and correlations of the three averages.

  c. Correct the observed correlations between LSmean, PAmean, and NAmean for attenuation. You can do this using the formula for correction for attenuation or, preferably, use a structural equation modeling program (Hint: Specify a three-factor model where each factor is measured by a single indicator, that is, LSmean, PAmean, or NAmean, fix the error variances to (1-alpha)*(variance of LSmean, PAmean, or NAmean), set the factor loadings to one, and freely estimate the factor variances).

  d. Estimate a factor model with three factors (fLS, fPA, and fNA), in which each construct is measured by 5 indicators each.

e. Compare the means, standard deviations, and particularly the correlations depending on how these statistics were computed. Interpret the results.

(2) In the second part of the assignment, we will investigate the effects of systematic measurement error on various statistics of interest. In particular, we will assess the relative merits of the various statistical remedies described in the article by Podsakoff et al. (2003, pp. 888-895).

    a. Perform Harman's single-factor test using both exploratory and confirmatory factor analysis.

    b. Compute the partial correlations between LSmean, PAmean, and NAmean in the following three ways and compare the partial correlations with the zero-order correlations.

        i. Partial out social desirability (IM). Do the results change if you also partial out ERS, MID, ACQ, and DISACQ?
        ii. Partial out NETACQ (i.e., use NETACQ as a "marker" variable).
        iii. Partial out the general factor underlying participants' responses to all 15 LS, PA, and NA items (based on single-factor confirmatory factor analysis). Compute the correlations between the general factor and IM, ERS, MID, ACQ, DISACQ, and NETACQ in an effort to understand what the general factor represents.

    c. Control for the effects of a directly measured method factor (using IM as the method factor) on the indicators of LS, PA, and NA at the item level in a three-factor confirmatory factor analysis of the 15 LS, PA and NA items. Do this with and without correction for attenuation in IM, using the method described previously (under 1c).

    d. Conduct a confirmatory factor analysis in which method effects are controlled for by the introduction of a single unmeasured latent method factor. Compute the correlations between the method factor and IM, ERS, MID, ACQ, DISACQ, and NETACQ in an effort to understand what the general factor represents.

    e. Specify a three-factor model for LS, PA, and NA and look at the modification indices for the correlations among the measurement errors. Are there any correlated uniquenesses that hint at method effects?

    f. What other analyses could be conducted to control for systematic method biases?

    g. Based on all these analysis, do you think these data are contaminated by method effects? If so, which correction for method effects would you suggest to eliminate the contamination? What's your best estimate of the correlations between life satisfaction, positive affect, and negative affect?

3. **Logistic Analysis** (Oct 1/Oct 6)

A service organization that offers customer memberships at different levels of service packages (e.g., basic, plus, and platinum) wants to understand what drives customer's decision to upgrade their service (UPD coded as 0 for not upgrade, and 1 as likely upgrade). Because the services offered have social and environmental focus (i.e., zoological society), the intuition is that consumer's decision will depend more on customer's identification with, and knowledge of service organization's mission and contributions (IDENTITY, KNOW) than their evaluations of service use and interactions (e.g., BENEFITS, COSTS, VALUE, SAT, FLE, TRUSTFOR). In addition, it is expected that "identity" and "know" may have quadratic and interaction effects although this intuition is conjectural. Finally, it would be useful to know if demographic variables such as income, number of children, distance, and times visited influence upgrade decision although the intuition is that they influence the decision to stay (a member) but not to upgrade (membership).

Using data from a random sample of service members (ZOOLOG.sav) test the preceding hypotheses and conjectures. Be sure to address the following:

    a. Building robust model of upgrade decision
    b. Goodness of fit and contribution of modeled predictors
    c. Multicollinearity and influential cases
    d. Interpretation and validation
    e. Robustness of results when an ordered upgrade decision is considered (UPO where $0 =$ not upgrade, $1 =$ maybe upgrade, and $2 =$ very likely upgrade).

4. **Survival Analysis** (Oct 15/Oct 20)

Data are collected from 100 volunteers in a 20-week "Smoking Cessation" study where the volunteers are assigned to three different treatments: (1) treatment $1 =$ nicotine patches, (2) treatment $2 =$ hypnotherapy (2 sessions with hypnotist), and (3) treatment $3 =$ cold turkey (self-discipline). Time-to-Failure (TTF) is measured as the weeks before a relapse occurs, but there are many censored cases who remain off smoking by the end of the 20 month observation period (identified as RELAPSE $= 1$; $n = 41$). Two covariates are also measured including average daily consumption in the month before the start of the experiment (NUMBER) and the number of years since they began smoking (YEARS).

Run a survival analysis to examine (a) hazard rates across experimental treatments, and if they are statistically significant—that is, does the hazard of relapsing to smoking differ across the treatments, and which treatment is most effective, and (b) to what extent covariates matter and alter the hazards of relapsing in the three treatments.

5. **Mediation in SEM** (Oct 29/Nov 3)

Data are collected from 400 frontline employees working for Fortune 500 service organizations to understand factors that influence turnover (average duration of a service employees tenure is 2.1 years, and high performing employees last even less longer). A conceptual model is hypothesized to explain stay intentions based on employee focus groups and interviews. The SPSS data set titled, "HBAT_SEM_NMISS_NFS_2013" includes details of the questions used to assess the individual constructs in the model and nonmissing responses from 399 employees.

a.   Estimate an EFA followed by a CFA of the measures of the 5 study constructs to examine their measurement properties. Evaluate each construct for its reliability and validity. Are the measures and construct suitable for testing model hypotheses? Discuss why. Be sure to check the appropriate assumptions and compute the necessary metrics.

b.   After appropriate refinements to the measurement model, include the structural paths in accord with the hypotheses proposed in the conceptual model. Be sure to include control variables. Evaluate if the hypothesized model fits the data, and the adequateness of model fit. Are any modifications needed?

c.   Test the significance of the 7 structural paths implied by the conceptual model. How well does the model explain stay intentions of frontline employees? What are the key mechanisms that

explain why frontline employees stay or leave? Identify and discuss the interesting and counter-intuitive results from your analysis.

d.   Also note the limitations of your analysis.

Conceptual Model for Predicting Stay Intentions
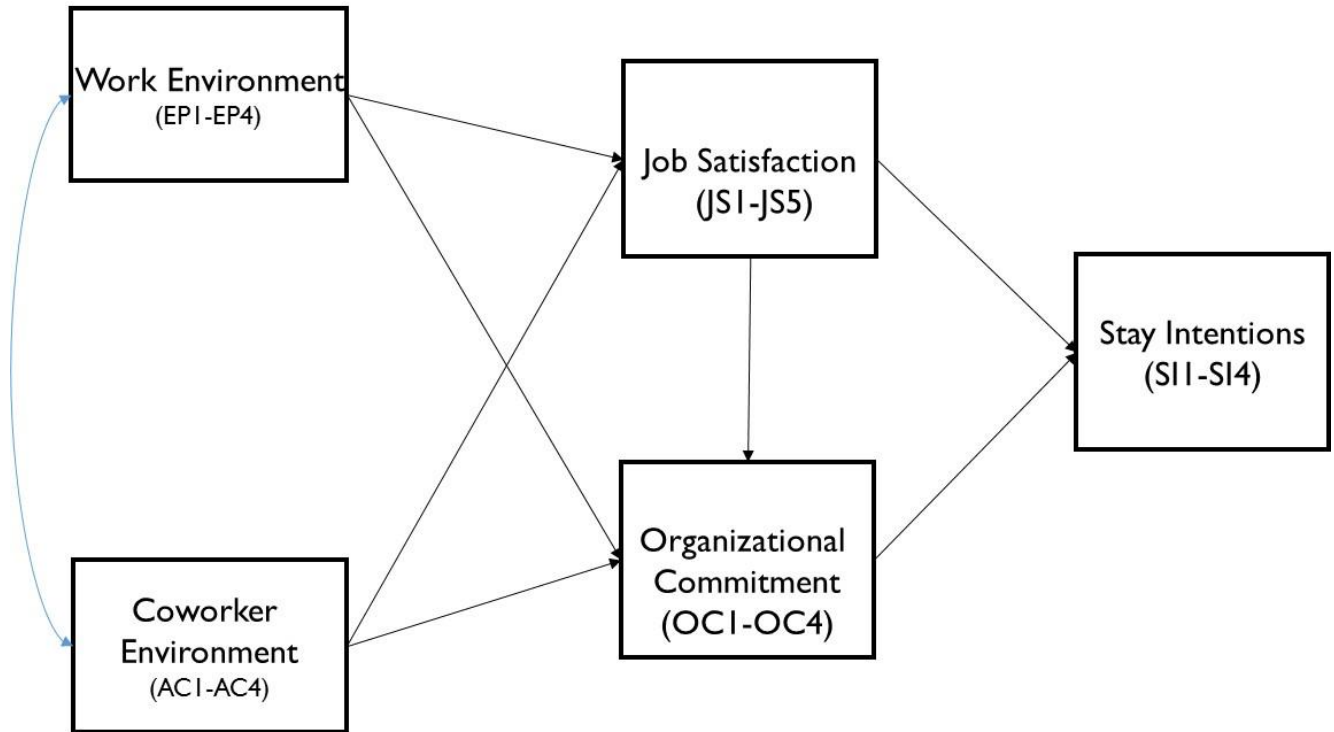
Controls: AGE, EXP, GENDER, JOB PERFORMANCE

6. **MULTILEVEL** (Nov 12/Nov 17)
   A study is conducted to understand determinants of individual helping behavior in teams by collecting data from 20 individuals each nested within 50 teams. An individual level variable, mood, is obtained to predict helping behavior. At the team level, proximity among group members is obtained to develop a multi-level model. Write a report based on your original empirical analysis that tests & interprets the results of the following three hypotheses:

   1.   Mood is positively related to helping
   2.   Proximity is positively related to helping after controlling for mood
          »   On average, individuals who work in closer proximity are more likely to help; a group level main effect for proximity after controlling for mood
   3.   Proximity moderates mood-helping relationship
          »   The relationship between mood and helping behavior is stronger in situations where group members are in closer proximity to one another

Notes: Be sure to check for assumptions and center the variables appropriately.

"Foundations of Quantitative Research Design: From Idea to Data Collection"
EDM 643

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Objective:

There are two major goals for the year II inquiry sequence: (a) to build competence in research design and methodology for collecting and analyzing quantitative data, and (b) to develop a foundation for formulating questions for quantitative inquiry and critically interpreting products of such inquiry.

This seminar focuses on developing the basic foundation for designing quantitative studies. It aims to help you develop skills that will enable you to design, conduct, report, and critically review quantitative studies. The participants will be able to use these skills to develop a research design for their work and generate an appropriate instrument for data collection. Participants relying on secondary data sources will be able to use these skills to ascertain their data needs, locate appropriate data sources, and assess the data quality.

We will focus on research design and discuss conceptual and practical facets of the process of framing a research question and up to developing and validating an instrument for data collection. The consequent data analysis for hypothesis testing will be the focus of a parallel class (EDM class on MULTIVARIATE ANALYTICAL METHODS). Foundations that will be discussed include: research design, survey research and scales, field work and data collection, secondary research issues, and manuscript writing. We will also cover the foundations of quantitative measurement of social science phenomena with emphasis on reliability and validity of constructs, as well as generalizability issues. In all, we will strive to balance between theory and practice of quantitative social research.

Course Outcomes:

Upon successful completion of this course, you will be able to:

- indicate and apply the components of survey research
- demonstrate an understanding of sampling and of sampling techniques
- design and evaluate survey questions (e.g. different types of questions; decisions about question content; decisions about question wording; decisions about response format; and, question placement and sequence in your instrument).
- demonstrate and understanding of the strengths and weaknesses of electronic surveys
- demonstrate an understanding of Web Survey tools (e.g., Qualtrics, Zoomerang, Survey Monkey, Question Pro)
- develop a reliable and valid survey instrument.

- demonstrate an understanding of and control for common methods bias
- demonstrate an understanding of both nonresponse and response rate issues
- demonstrate an understanding of how to analyze survey data
- describe the ethical and legal challenges inherent in survey research
- demonstrate an understanding of measurement reliability and validity concepts and assessment
- demonstrate an understanding of where to find actual survey instruments used in published research and identify sources for scales.
- demonstrate an understanding of the various biases in survey research

Textbooks:
- DeVellis, R.F. (2003) *Scale Development: Theory and Application*, 2nd Ed., Sage
- Byrne, B.M. (2010) Structural Equation Modeling with AMOS
- Hair J., Anderson R., Tatham R., Black W.: *Multivariate Data Analysis,* 7th edition, Prentice Hall, New Jersey (selected chapters)

Software & AMOS Guide:
- SPSS Version 18.0 (or 19) and AMOS 18.0 (or 19)
- Arbuckle, J. L. (2009). *Amos 18 User's Guide*. Chicago, IL.: SPSS Inc

Data Sets:
The data sets necessary to complete the assigned exercises are posted on the course BlackBoard site. There are two separate data sets that we will conduct analyses on: SOHANA and BENCARE (see descriptions below). We will mostly use the BENCARE data during the class exercises but switch to the SOHANA data for assignments. We may also use smaller data sets specifically designed for in-class exercises. These will be provided by the instructor when necessary. SOHANA and BENCARE data are private data sets and should not be copied or given to others without permission.

Exercises:

Exercises 1 through 6 are due at the specified date.

Residency	Topic	Assignment & Due dates
1 (1/21)	Basic concepts of theory, measurement and model building, Exploratory factor analysis, Intro to CARMA	Assignment 1- EFA **(Due 1/11)** Comments by 1/15 EX. 1-Final Revision (due 1/18)
2 (2/11)	Construct development, reflective and formative constructs, Confirmatory factor analysis using AMOS	Assignment 2-CFA **(Due 2/1)** Comments by 2/5 Ex. 2- Final Revision (due 2/8)
3 (3/3) **VIRTUAL**	Measurement reliability and validity	Assignment 3- Formative and Reflective constructs **(Due 2/22)** Comments by 2/26 Ex. 3-Final Revision (due 2/28)
4 (3/24)	Scale development and refinement	Assignment 4- Scale refinement **(Due 3/14)** Comments by 3/18 Ex. 4-Final Revision (due 3/21)
5 (4/14) **VIRTUAL**	Field work, scale pre-testing and adaptation	Assignment 5-Scale pre-testing **(Due 4/4)** Comments by 4/8 Ex. 5-Final Revision (due 4/11)
6 (5/5)	Research project design fine-tuning workshop	Assignment 6-Research Design **(Due 4/25)** -Be ready to present your project! Ex. 6-Final Revision (due 4/30)

These exercises are carefully designed to complement the class sessions. A timely preparation and submission of the exercise is not only critical for your overall class experience, but also to your ability to apply the learned theory and analysis techniques in subsequent research projects.

Virtual Residencies:

There are **two virtual residencies (3/3 and 4/14).** Lectures will be available on Blackboard as an audio-visual presentation. These lectures are available 24-7 and you can view/listen at your convenience before/during the weekend we would normally meet. Although we are not meeting, assignment and due dates still apply as listed on the schedule above.

Seminar Outline:

► **Basic Concepts Of Theory, Measurement And Model Building, Exploratory Factor Analysis And Factor Scores◄**	
Res. 1	**January 21 – Saturday, 8:00 a.m. – 3:30 p.m.**
Topics	Theory development, constructs, measurement Exploratory Factor Analysis (EFA) using SPSS, Factor Scores, Instrument Development
Read:	**Required** Hair et al. Chapter 3, pp. 91-150 Hair et al. Chapter 12, Structural Equation Modeling Overview, chapter 12, pp. 611-631, 635-653 DeVellis Ch 1-2
Articles:	**Required** Kristopher J. Preacher And Robert C. Maccallum Repairing Tom Swift's Electric Factor Analysis Machine" Understanding Statistics, *2*(1), 13–43 Floyd and Widaman (1995) "Factor Analysis in the Development and Refinement of Clinical Assessment Instruments." *Psychological Assessment*, 7(3): 286-299. Russell (2002) "In Search of Underlying Dimensions: The Use (and Abuse) of Factor Analysis in Personality and Social Psychology Bulletin," *Personality and Social Psychology Bulletin*, 28: 1629-1646. Fabrigar, Wegener, MacCallum, and Strahan (1999) "Evaluating the Use of Exploratory Factor Analysis in Psychological Research," Psychological Methods, 4 (3): 272-299. Anna B. Costello and Jason W. Osborne (2005) Best Practices in Exploratory Factor Analysis: Four Recommendations for Getting the Most From Your Analysis," *Practical Assessment Research & Evaluation* 10 (7): 1-9.

► **Construct Development, Reflective And Formative Constructs Confirmatory Factor Analysis (CFA) Using AMOS** ◄	
Res. 2	**February 11 – Saturday, 8:00 a.m. – 3:30 p.m.**
Topic:	Construct development, reflective and formative constructs Confirmatory factor analysis using AMOS
Read:	Hair et al. Chapter 13 Confirmatory Factor Analysis pp. 668-704 Text books: Byrne Ch 1-3 (skip AMOS Basic text);
Articles:	**Required articles on Construct Development** Coltman, T., Devinney, T., Midgley, D and Venaik, S (2008) Formative versus reflective measurement models: Two applications of formative measurement. *Journal of Business Research*. 61, 1250–1262. Baxter R, (2009). Reflective and Formative Metrics of Relationship Value: A Commentary Essay. *Journal of Business Research.* 62(12): 1370-1377 Diamantopoulos, A., Riefler, P., Roth, K (2008) "Advancing formative measurement models," *Journal of Business Research,* 61, 1203–1218. Diamantopoulos, A., and Siguaw, J.A. (2006) "Formative Versus Reflective Indicators in Organizational Measure Development: A Comparison and Empirical Illustration," *British Journal of Management,* 17, 263–282. Podsakoff, P.M., MacKenzie, S.B., and Jarvis, C.B., (2005) "The Problem of Measurement Model Misspecification in Behavioral and Organizational Research and Some Recommended Solutions," *Journal of Applied Psychology*, 90(4): 710–730 Churchill (1979) "A Paradigm for Developing Better Measures of Marketing Constructs," *Journal of Marketing Research*, 16: 64-73.
Articles:	**Required research articles on CFA** Bryant, Yarnold and Michelson (1999) "Using Confirmatory Factor Analysis (CFA) in Emergency Medicine Research." *Academic Emergency Medicine*, 6(1): 54-66.

► **Measurement Reliability And Validity** ◄	
Res. 3	**March 3 –VIRTUAL RESIDENCY**
Topic:	Measurement reliability and validity
Read:	Textbooks: Reliability and validity; scales ; DeVellis 3-4, 6;
Articles:	**Required articles on measurement reliability and validity** Richins and Dawson (1992) "A Consumer Values Orientation for Materialism and Its Measurement: Scale Development and Validation." *Journal of Consumer Research*, 19(3): 303-316.
► **Survey Instruments** ◄	
Res. 4	**March 24 – Saturday, 8:00 a.m. – 3:30 p.m.**
Topic:	Scale refinement and scale development, common-method bias or common method variance?
Read:	Required : DeVellis 5
Articles:	**Required** Clark L.E., Watson D. (1995) "Constructing validity- basic issues in objective scale development", *Psychological Assessment*, 7(3): 309-319 Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y., and 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): 879-903. Hinkin T. (1998) "A Brief tutorial on the development of Measures for Use in Survey Instruments", *Organizational Research Methods*, 1(1): 104-121 Hinkin, T. R. (1995). "A Review of Scale Development Practices in the Study of Organizations," *Journal of Management* 21, 967-988 Doty and Glick (1998) "Common Methods Bias: Does Common Methods Variance Really Bias Results?" *Organizational Research Methods,* 1: pp. 374-406.

►Fieldwork and Data Collection◄	
Res. 5	**April 14 – VIRTUAL RESIDENCY**
Topic:	Data collection & pre-testing techniques, common -method bias, AMOS, Multiple imputation
Read:	DeVellis 7-8
Articles:	**Required** Jansen, K. Corley, K., Jansen, B. (2007) "E-Survey Methodology" Krosnick, J. A., & Presser, S. (in press). Questionnaire design. In J. D. Wright & P. V. Marsden (Eds.), <u>Handbook of Survey Research</u> (Second Edition). West Yorkshire, England: Emerald Group. Lietz, P., (2010) "Research into questionnaire design: A summary of the literature" *International Journal of Market Research*, 52(2), 249-272 J. A. Krosnick (1999) "Survey Research," Annu. Rev. Psychol. (50): pp. 537-567 J. Lindsay (2005) "Getting the Numbers: The Unacknowledged Work in Recruiting for Survey Research," Field Methods, 17, 119-128. Bolton (1993), "Pretesting Questionnaires: Content Analysis of Respondents' Concurrent Verbal Protocols," Marketing Science, 12 (3): 280-303. Armstrong, J.S., and Overton, T.S. (1977) "Estimating Non-response Bias in Mail Surveys," *Journal of Marketing Research,* 14(3): 396-402. Birnbaum, M.H. (2004) Human Research And Data Collection Via The Internet" Annu. Rev. Psychol. 803-832.
►Research Project's Design Fine-Tuning, Discussion And Presentations◄	
Res. 6	**May 5 – Saturday, 8:00 a.m. – 3:30 p.m**
Topic:	Research Design fine-tuning workshop
Read:	**Required** Dutton (2003) "Breathing Life into Organizational Studies." Journal of Management Inquiry, 12(1), pp. 5-19

Evaluation:

Each written assignments will be reviewed and graded. Possible grades are "Very Good" (3 points), "Acceptable" (2 points), and "Not there yet" (1 point). The first two imply that one demonstrates respectively excellent or adequate understanding of the underlying topic. The last one implies that a major revision is required to address some critical issues.   After receiving the comments on an assignment, students are expected to send a final revised report that addresses the necessary issues. The final grade of an assignment is the grade of the last submission prior to the respective class. To satisfactorily complete the requirements of the course, you should earn

no NPs <u>and</u> no more than two P-s on submitted assignments. As noted above, you will have chance to revise your submission after receiving feedback. I will grade the first submission for your information only, but only the grade on the final submission will count.

Code of Ethics:
Discussion of the assignments in collaborative workgroups is encouraged; however the final analysis and the subsequent reports should be done independently by each student.

Datasets:
The provided datasets are exclusively for the class exercises and capstone assignment. Please do not make use of these datasets for any other purpose without the explicit consent of the instructor.

Capstone Assignment:
Satisfactory completion of the requirements of EDMP 643 and EDMP 644 requires a satisfactory performance on the III Year Quantitative Inquiry Capstone assignment. The assignment is based on the material covered in the two courses and should be completed by each student individually. The Capstone assignment will be distributed in the last residency.

WSOM Statement of Academic Integrity:
All students in this course are expected to adhere to university standards of academic integrity. Cheating, plagiarism, and other forms of academic dishonesty will not be tolerated in this course. This includes, but is not limited to, consulting with another person during an exam, turning in written work that was prepared by someone other than you, and making minor modifications to the work of someone else and turning it in as your own. Ignorance will not be permitted as an excuse. If you are not sure whether something you plan to submit would be considered either cheating or plagiarism, it is your responsibility to ask for clarification. Either ask me about it or consult credible sources of information on the subject. Two useful internet sites are http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml and http://www.unc.edu/depts/wcweb/handouts/apa.html. Please remember that you have agreed to Standards Regarding Academic Integrity (a copy of which can be found at http://weatherhead.case.edu/pdpao/policy/policyhome.html) which outlines your responsibility in greater detail.

Assignment 1 – Exploratory Factor Analysis and Measurement Quality

The underlying working assumption of Del was that a measure of performance should include both a measure of productivity and a measure of quality and their antecedents, related individual orientation. It was assumed in Sohana that at a given level of effort, an increase in quality of service would come at the expense of productivity caused by the variance in the individual orientation.

While productivity focuses on meeting quantitative and measurable targets of the service workers, quality is concerned with softer facets of their work that are more difficult to express in quantitative terms. The same applies to individual orientation. In addition, Del noted that the research company had identified several sub-dimensions of individual orientation. The measurement of performance and its antecedents appeared to be complex.

Although conceptual distinction between productivity and quality and their sub-dimensions made sense, Del was not sure whether the service workers at Sohana maintained such fine distinctions. The same applied to ways in which individual workers behaved and responded. He wondered whether the distinctions about individual orientation were consistent with service workers' actual mental models, and whether they treated these different concepts of individual orientation separately. Especially the concerns were about Resource demands (RD1-RD4), Work uncertainty (RA1-RA2), Role conflict (RC1-RC3), Customer rejection (CR1-CR4), Lack of control (LC1-LC4), Dead end job (DE1-DE2), and Apathy (AP1-AP3).

Using exploratory factor analysis and the corresponding data from the Sohana Outfitters case, you are asked to help address Del's concern for conceptual-empirical consistency related to individual orientation for the given items. Be sure to develop and implement a research plan along with interpretation of results that addresses the following questions:

1. Is the data suitable for factor analysis? Provide evidence.
2. How many factors should be extracted for Individual orientation?
3. Interpret and label the resulting factors. What criteria did you use for deleting items? How did you balance the needs for conceptual clarity and statistical soundness?
4. Estimate the reliability of the individual orientation measures.
6. Assess the convergent validity and discriminant validity of individual orientation measures.
7. How can these factors be used for further analysis? Develop a nomological net. What kind of independent variables could be used by Del to predict productivity or performance?

Assignment 2 – Confirmatory Factor Analysis

The board of the Sohanna Outfitters recognized the critical role of the individuals in influencing organization's performance. The underlying working assumption of Del was that a measure of organization's performance should include both a measure of their learning and a measure of their job satisfaction. It was assumed in Sohana that at a given level of effort, an increase in job-satisfaction would also imply some level of learning orientation.

The measurement of these aspects of performance appeared to be complex. Following a debate about the topic in the boardroom, Sohanna hired the Del for conducting a study that would examine dimensions of performance. While learning orientation focuses on outcome related aspect of job performance of the workers, job-satisfaction is concerned with softer facets of their work that are more difficult to express in quantitative terms. In addition, Del noted that the research company had identified 2 sub-dimensions of job satisfaction (SW1-SW3, SC1-SC3), and one dimension of learning orientation (L1-L3).

Using EFA (SPSS) and CFA (AMOS), please answer the following questions based on the data collected in response to the client survey.

1. Can Sohanna distinguish between learning orientation and job satisfaction based on the measures used?

2. Develop a table that summarizes the key evidence for the reliability, convergent and discriminant validity of the constructs.

3. Critically evaluate the conceptual and empirical evidence for the individual constructs. Provide specific suggestions for further development of the constructs so that they are useful for practice & theory.

4. How efficient are the measurement instruments? Can you fine tune the scales further?

5. What can you say about the relationships among the constructs? (e.g. correlations etc.)

Assignment 3 – Reflective and formative construct development

The board of the Sohanna Outfitters recognized the role of productivity in influencing organization's performance. The underlying working assumption of Del was that a measure of organization's productivity should include all dimensions and facets.

While examining the proposed productivity measures Del noted that the survey instrument developed used 7 items (P1-P7), to measure productivity. He noted that the items P1-P7 clearly did not tap into the same facets of the phenomenon and their relationships appeared to be more complex. Following a debate about the topic in the boardroom, Sohanna decided that a study was needed to analyze these dimensions of productivity and how they are measured. Without proper measurement, managerial decisions are likely to be misguided.

Moreover, the Board felt that a single best metric of productivity would be most useful to focus the efforts on the organization and be input into strategic thinking. While they understand the power and psychometrics of distinct dimensions, the Board concluded that they need to remain focused on the forest rather than the trees.

So Del embarked on analyzing the productivity items and their composition into appropriate productivity constructs. Using EFA (SPSS) and CFA (AMOS), please answer the following questions based on the data collected in response to the client survey.

1. Can items P1-P7 be used to identify a clear set of productivity constructs that are meaningful and valid?

2. Are the items P1-P7 best viewed as as formative or reflective measures? Explain.

3. Compile the evidence to support your conclusion in 2 above. Show if the substantive aspects of the evidence vary for CSRs & BCRs.

4. How would you build a single metric for the productivity construct and how can you validate that it is a valid construct?

5. Critically evaluate your conclusion and suggest how the productivity should be measured and scaled to be used over time and in other contexts as a dependent variable?

<u>Assignment 4 – Scale Development and Refinement</u>

Online Training at Cleveland Clicks and Bricks Company (CCBC)

CCBC is a large multinational with more than 80,000 employees. The company is ISO 9000 certified and as such it requires that each employee passes a periodical examination about the principles of ISO 9000. So far, once a month, the company has conducted on site preparation classes for interested employees. With escalating prices, the average direct cost per attending student has crossed the $250 threshold.

The VirtualPro offered CCBC an online training service that covers the desired ISO 9000 material at a cost of $45 per each student. The substantial direct savings, let alone the many indirect benefits to the company and employees, were obvious. Nonetheless, in spite of the enthusiasm among many employees in an informal opinion poll, the conservative HR Director of CCBC was still skeptical about the capabilities and promise of online training.

After reading about the latest advances in distance learning and considering the payoff, the HR Director agreed to offer the internet-based training to employees on a trial basis for four months and to adopt the service at the end of the term provided that VirtualPro can substantiate the value of the rendered service with empirical evidence.

Donna Hann, the Marketing Manager of VirtualPro who was assigned to CCBC, was determined to provide the required evidence. She adapted a survey from a study she found on the web and asked each trainee to fill it up at the end of the online session. After two months, Donna collected a substantial dataset but felt unsure about how the interpretation of the result. She hired you as a consultant and asked the following questions:

1. What is the quality of the data collected so far?

2. How many dimensions emerge in the data and how should I interpret them?

3. Can you provide evidence of validity and reliability of the measures?

4. Can you make the measure more efficient?

5. What can you tell about the relationships among the variables?

6. Does the survey provide evidence concerning the value of the online training?

7. What can I do to improve the survey?

8. Can you suggest an alternative research design(s) to provide evidence of the added value?

1. On a scale of 1-5, please mark 1 if you "Strongly Disagree" and up to 5 if you "Strongly Agree."
      1a. Website design appealed to me
      1b. Website was easy to navigate
      1c. Website pages loaded quickly
      1d. I was able to complete the entire lesson in one session
      1e. The course content was relevant to me
      1f. The course content helped me improve understanding of the subject

2. On a scale of 1-5, please rate the effectiveness of the following course features. Mark 1 if the feature has been "Not Effective at All" and up to 5 if it has been "Extremely Effective."
      2a. Practical case scenarios
      2b. Questions and answers with feedback
      2c. "Drag and drop" interactively
      2d. Clicking/Rolling the mouse or an icon or a picture
      2e. Plain text format

3. Please rate the course as follows:
      3a. On a scale of 1-5, please rate the difficulty level of the course. Mark 1 if the course was "Too difficult" and up to 5 if it has been "Too Easy."
      3b. On a scale of 1-5, please rate the level of details in the course. Mark 1 if the details level was "Absolutely Insufficient" and up to 5 if it has been "Too Excessive."

4. Please rate your preference of online training as follows:
      4a. On a scale of 1-5, please rate your preference of online courses over traditional classroom instruction. Mark 1 if you "Strongly Prefer Traditional Classroom Course" and up to 5 if you "Strongly Prefer Online Course."
      4b. On a scale of 1-5, please rate the overall effectiveness of online training as employees training method. Mark 1 if online training is "Not Effective at All" and up to 5 if it is "Extremely Effective."

5. On a scale of 1-5, please mark 1 if you "Strongly Disagree" and up to 5 if you "Strongly Agree."
      5a. I am an expert user of computers
      5b. I have much experience in using computers for research or educational purposes
      5c. I use computers very often
      5d. I have high comfort level in using computers
      5e. I'm very motivated to learn new topics
      5f. I have preference for active participation in learning
      5g. I am able to learn alone

6. On a scale of 1-5, please mark 1 if you "Strongly Disagree" and up to 5 if you "Strongly Agree."
      6a. I am very satisfied with the ISO 9000 online course
      6b. If courses that I need for professional development are offered online, I will definitely take them.

Assignment 5 – Common Method Bias

The board of the Sohanna Outfitters has some concerns how much the results of their survey are influenced by the use of self-report measures from a single respondent and method.   They felt that going forward multi-source data that overcomes biases from the use of cross-sectional studies would provide a better foundation for investment decisions.

So Del embarked on analyzing the impact of common method bias in the present study. Del was especially concerned that the study of stress factors—the antecedents to productivity and quality—may be especially susceptible to common method bias and could artificially inflate the relationships observed in the data. Thus, Del decided to re-estimate the psychometric properties of constructs (stressors) and their influence on productivity and quality after controlling for common method bias.

Using AMOS, please answer the following questions based on the data collected in response to the client survey.

1. Model a common method factor for the stress factors, job satisfaction and learning orientation used in Assignments #1 & #2.

2. Summarize the evidence of the reliability, convergent and discriminant validity of the included constructs after controlling for common method bias. How do the results change (provide evidence)?

3. What can you say about the relationships among the variables and to what extent can you guarantee that the use of a single method has not introduced bias into your data and its interpretation?

3. Critically evaluate your conclusions and draw implications to your own QNT project.

Assignment 6 – Scale Pre-Testing and Further Refinement

This exercise is designed to help you practicing the final touches of scale adaptation and refinement.

Develop a draft survey instrument for your project by (a) identifying already developed scales that roughly correspond to each of the key constructs in your conceptual model, (b) critically examining the psychometric properties of these scales, and (c) based on your II year project, knowledge, and literature, adapt the available scales for your research purpose and context.

1. Conduct 3 to 4 expert's evaluations to review your initial items pool. Ask experts to (a) assess face validity, (b) evaluate items' clarity, and (c) suggest new items that you may have overlooked.

2. Then, conduct 4 to 6 interviews with target respondents to pretest the adapted instrument using guidelines provided in Bolton (1993). Identify, code, and <u>document</u> problems of (a) comprehension, (b) retrieval, (c) judgment, and (d) response difficulties. Based on the obtained results, further modify the adapted scales.

3. Plan on having the instrument ready for review and discussion with your colleagues in class.

Note: I recognize that some of you are not ready yet for pre-testing of a survey instrument or do not plan to have one. In that case, try practicing with any other raw material or join a peer who is ready. Although this is an excellent opportunity to refine your survey, the main purpose of this exercise is practicing the final touches of scale adaptation and refinement.

Sohana Outfitters

A Weatherhead School of Management Case Study

Introduction

Del Kundan sat contemplating the second resignation letter he had received during the past week. Resignations were to be expected in Del's business, but the two resignations this week were from long time employees who were excellent customer service representatives. If these two individuals felt that things were getting so bad that they had to leave, then Del wondered what the other, less experienced employees might be thinking. Whatever was going on, Del had to get to the root cause of the issue quickly. The busy Christmas season was just around the corner. He could not afford unforeseen problems—not this time of the year.

Background

Not long ago, Del Kundan became the Vice-President of customer service for Sohana Outfitters, a national retailer of specialty clothing and sporting goods. Sohana Outfitters had started as a small surf shop during the 1950s catering to the needs of local surfers in the San Diego coastal area. Sohana had prided itself on its ability to keep up with the equipment and clothing needs of its fast paced clientele. During its first twenty years of existence, Sohana Outfitters had gone from a single store doing less than $100,000 in business to a network of stores in Southern California with retail sales of over $10,000,000. In 1975 when Hana Marcos, the founder of Sohana Outfitters, looked back on his first twenty years of operation he could justifiably be proud of the growth and reputation of his business.

Sohana Outfitters' success attracted the interest of several large national retailers. These retailers were looking for ways to diversify out of their traditional downtown department stores and reach the growing market of "baby boomers." Specialty retailers like Sohana Outfitters were especially attractive because of their young clientele that normally did not shop at the department stores. Until 1975, Sal hadn't given a second thought to any offer to buy him out. However, after twenty years in the business Sal was looking to slow down and enjoy the fruits of his labor.

The Jostin Company, a Cleveland, Ohio based retail giant offered Hana $28,000,000 for Sohana Outfitters. Hana felt that he might get more if he held out for other bids, but Jostin was a "class" organization and Hana felt that it would continue the high quality and service image that had come to characterize Sohana Outfitters. Hana signed the final papers for the sale on September 19th and Sohana Outfitters went from a locally managed operation to a corporate-controlled subsidiary of the Jostin Company.

The Jostin Company management had bought Sohana Outfitters because of its focus on a specific market niche. The youth oriented, Southern California image of Sohana could be leveraged by Jostin to sell a much expanded line of clothing and accessories. To capitalize on what Jostin felt was the burgeoning market for youth oriented clothing, Jostin established a national catalog sales operation in 1978 to capitalize on the brand equity of Sohana Outfitters.

The catalog sales of Sohana Outfitters did not immediately create a sensation at Jostin headquarters. Numerous problems with merchandising, stocking, logistics management, sales order management and sales operations created a customer service nightmare. Jostin went through several management teams and numerous organizational alignments before hiring Juan Nistandra to oversee the troubled catalog division. In the restaurant business where Juan made his mark, he was known as "magic john" because of his success in running an operation that was

not only highly efficient but also excelled in providing a delightfully memorable customer experience. Juan's magic touch consistently produced highly profitable returns in an industry that was known for unpredictability and stiff competition. Once Juan arrived at Sohana, he set about to duplicate his success. Juan cleaned up the back office operations, established a professional merchandising staff, built a world-class distribution center, and created a formal customer service organization to handle customer inquiries and issues. From 1982 when Juan was first hired through the end of 1997, Sohana Outfitters' sales grew from $12,000,000 to $75,000,000 annually.

In an interview to Forbes in 1995, Juan had described the keys to the phenomenal success of Sohana Outfitters. Juan stated that Sohana's youth oriented clothing and accessories, its Southern California lifestyle theme, and it's almost fanatical focus on customer service were the key contributors to its growth. Juan also pointed out that the principal problem facing his competitors was not that they couldn't imitate his youth oriented product line. Nor was it in developing an effective theme to capture a niche. Rather, it was the strong customer focus of his Sohana Outfitters' customer service staff that would be difficult to duplicate without enormous investments. Privately, Juan recognized that operations like Sohana would make or break their future depending on their ability to enhance the productivity of their operations and provide a high level of service quality to ensure customer loyalty. The magic, of course, lay in the optimal balance between these two, often conflicting, forces of productivity and quality.

Summer 1998

The summer of 1998 would go down in Sohana Outfitters' history as the year that was "hung in the balance." Concerned about failure to maintain productivity gains in catalog operations, Juan was eager to implement an enterprise resource planning system that was to have been completed in the Spring but was delayed because the needed computer systems failed to arrive on schedule. Trying to change the routine of any finely tuned operation is problematic enough. Doing so in the midst of the busy summer months made it only worse. Del tried to get the implementation of the new ERP system delayed for the Fall, but executive and information technology management felt that the changes needed to be made without delay. Juan understood Del's concern but favored implementation at the earliest as well because of fears of reduced profitability due to low productivity of service workers. Besides, Jostin had spent in excess of $5,000,000 on management consulting to ensure that every one would be ready for the new system.

System implementation began in late June and problems started to surface immediately. The new system worked differently from the existing system and customer inquiries could not be handled as rapidly as before. In addition, customer histories had not been completely transferred into the new system's database. As a result, long time customers had to be asked to resupply information about themselves, something that they had not had to do in a long while.

However, a key difference in the new ERP system was that it automatically and unobtrusively recorded over one hundred indicators of service worker's productivity. Many of the measures were based on time-and-motion studies (e.g., number of keystrokes used, number of sub-menus downloaded) and response times (e.g., time to complete transaction, time between calls). In addition, using sophisticated speech recognition technology, the ERP system was able to code the verbal communication between the service worker and customer, and textually analyze such data

for the frequency and regularity of "customer-friendly" words and the "warmth" of the tone. Together these measures were used to tabulate a productivity and quality index for each customer service worker that was supplemented by customer satisfaction surveys. To further the "open and learn" environment at Sohana, Juan had insisted that the new ERP system be equally accessible by all service workers so that they could examine their own performance indicators as well as of their colleagues. Juan felt that this openness would foster a climate of learning and helping. These indices were used directly in the newly revamped compensation and incentive scheme. A single standard deviation change in one of these indices could result in a 25% change in the total compensation of a service worker.

Because of the numerous problems that arose during the system's implementation, significant pressure had been placed on Sohana's customer service organization. Between irate customer calls, normal customer requests, and management requests for information, the customer service personnel had been stretched to their limit. A number of new hires had to be added to handle the increased workload that resulted from the system transition and these new hires further taxed the existing employees since most job training occurred on the job. All in all it had not been an easy summer for anyone.

Despite the problems presented by the new system, Del's organization had managed to book $30,000,000 in sales during the summer. This figure was a record for the period and showed an increase of 5% over the last year. Juan was especially happy with the performance since this was achieved in the face of significant technological problems and the loss of at least two very significant accounts that left for another supplier. Juan momentarily dwelled on the possible reasons for the loss of these significant accounts, but with the record sales could not find the motivation to pursue it further.

The Customer Service Nexus

Sohana Outfitters' customer service organization was the linchpin of its success. Sohana's customer service personnel received outstanding ratings from customers for their professionalism, knowledge, enthusiasm, and commitment for going the extra mile. As Juan Nistandra, the President of Sohana Outfitters had stated on numerous occasions, Sohana's success was the result of a highly dedicated group of employees who refused to make any compromises when it came to customer service.

Sohana Outfitters provided its customer service employees with a significant number of perks. Customer service representatives worked in a campus like setting using state of the art equipment and, even given the problems with the recent implementation of the ERP system, representatives were given daily breaks to walk around, collect their thoughts and relax away from the pressure of being on the spot to handle customer problems. A cafeteria with free soft drinks and coffee was also provided so that workers could get refreshments when they went on break. A competitive pay and benefits package was also provided to each qualifying employee.

Despite the amenities provided to the customer service employees, the customer service job was not easy. A typical customer service representative spent six hours per day handling customer requests, complaints, or issues. In addition, their workday was highly structured with strict enforcement of the frequency, length and number of breaks. In addition, breaks could be curtailed when unexpected "peaks" of incoming calls occurred. Sometimes the customers could

be rude and discourteous. Customer service representatives, however, could not let a customer's demeanor affect their handling of a situation. They were expected to be courteous at all times. Any customer complaint about the way an issue was handled required management involvement and could result in the dismissal of the responsible customer service representative if the representative had not followed the practices set down by management. Service roles in call centers required cool heads that can balance between highly demanding (sometimes irate) customers and following company laid rules and procedures.

Given the characteristics of the job it was not uncommon to for the organization to experience high turnover in new hires, sometimes in excess of 50%. The pressure of always "being on" could burn out someone not experienced with the world of customer service. However, once a trainee had been on the job for over a year, turnover rates declined substantially to less than 10%. It was this core of seasoned veterans that allowed Sohana Outfitters to consistently exceed customer expectations and generate year after year of record sales.

Del wondered where he should begin and what issues he should look at. After careful reflection, he realized that one of the key concerns he had had to do with the consequences of the new ERP system. After all, he had some reservations regarding the implementation of this system in the Summer of 1998 and he had disagreed with Juan about the timing and the speed with which the new system was brought in. Several problems had occurred after the implementation of the system. Customer complaints about resupplying data, inefficiencies in handling new customer inquiries, significant levels of burnout among customer service representatives, high turnover rates in new hires, and eventually, and most importantly, the loss of two major accounts and two unexpected resignations.

Only if he had some data. Data to explore what was going on, and where to focus his energy. It wouldn't be bad to run SPSS again. He was getting rusty. "The new system itself could not be the problem, after all it was just a system," Del thought, "perhaps the problem was how the system affected people and the way they performed their tasks." Did the loss of two major accounts and the two resignations have something in common? Did they reflect something bigger? Problems with clients and customer service representatives seemed to have started at the same time. Were client losses and intentions to resign significant patterns across the representatives? Could they become more widespread? He badly needed some data to get started.

Then it struck him. The ERP system had an in built biyearly employee tracking survey for which the initial benchmarking phase was completed recently. No one had bothered to analyze the data yet. He recalled approving a detailed questionnaire. Del wondered if he could gain some insights by conducting some exploratory analyses. Although the responses were self-report and perhaps biased, they did include questions about service representatives' perceptions of satisfaction and burnout levels in their interactions with the customers, the quality and productivity of their work, and a range of potential role stressors. In fact, Sohana's bill collection representatives were also surveyed at the same time to provide comparative data. All he had to do was to locate the questionnaire, download the data and relearn the SPSS. He knew that the first of these three jobs was going to be the hardest.

Code sheet for SOHANA data set

Variable Name	Description
Id	Four Digit Respondent Identification
Job Performance… Quality (Q1 to Q17)	17 items measuring the quality of service on 7-point scale 1=bottom 20%, 7=top 5%. Q1 to Q5 measure Reliability, Q6 to Q8 measure Trust, Q9 to Q13 measure Promptness and Q14 to Q17 measure Individualized attention.
Productivity… (P1 to P7)	7 items measuring productivity of service on a 7 point scale 1=bottom 20%, 7=top 5%. P1 to P4 measures Output, P5 to P7 measures Backroom productivity.
Job Satisfaction… Satisfaction with Work (SW1 to SW3)	3 items measuring satisfaction with work itself 5 point scale; 1=extremely dissatisfied, 5=extremely satisfied.
Satisfaction with Customers (SC1 to SC3)	3 items measuring satisfaction with customers 5 point scale; 1=extremely dissatisfied, 5=extremely satisfied.
Burnout Tendencies… Burnout–Customers (BC1 to BC6)	6 items measuring burnout tendencies resulting from interacting with customers; 6 point scale; 1=very much unlike me, 6=very much like me. BC1 and BC2 measure Emotional Exhaustion (EE), BC3 and BC4 measure Reduced Personal Accomplishment (RPA), BC5 and BC6 measure Depersonalization (DP).
Burnout–Management (BM1 to BM6)	6 items measuring burnout tendencies resulting from interacting with company management; 6 point scale; 1=very much unlike me, 6=very much like me. BM1 and BM2 measure Emotional Exhaustion (EE), BM3 and BM4 measure Reduced Personal Accomplishment (RPA), BM5 and BM6 measure Depersonalization (DP).
Individual Orientation… Learning Orientation (L1 to L3)	3 items measuring disposition toward learning from challenging tasks 5 point scale; 1=never do this, 5=always do this.
Stress Factors… Resource-Demand (RD1 to RD4)	4 items measuring the frequency of resource-demand gap. 5 point scale; 1=never, 5=always.
Work Uncertainty (RA1 to RA2)	2 items measuring the frequency of role ambiguity 5 point scale; 1=never, 5=always.
Role Conflict (RC1 to RC3)	3 items measuring the frequency of role conflict 5 point scale; 1=never, 5=always.
Work-Family (WF1 to WF2)	2 items measuring the frequency of work-family conflict 5 point scale; 1=never, 5=always.
Customer Rejection (CR1 to CR4)	4 items measuring the frequency of customer rejections. 5 point scale; 1=never, 5=always.
Ethical Concerns (EC1 to EC5)	5 items measuring the frequency of ethical concerns. 5 point scale; 1=never, 5=always.
Mgmt Unfairness (MU1 to MU2)	2 items measuring the frequency of top management unfairness. 5 point scale; 1=never, 5=always.

Lack of Control	4 items measuring the frequency of lack of task control.
(LC1 to LC4)	5 point scale; 1=never, 5=always.
Dead End Job	2 items measuring the frequency of lack of opportunities.
(DE1 to DE2)	5 point scale; 1=never, 5=always.
Unsupportive Coworkers	3 items measuring frequency of unsupportive coworkers.
(UC1 to UC3)	5 point scale; 1=never, 5=always.
Unsupportive Boss	4 items measuring the frequency of unsupportive boss.
(UB1 to UB4)	5 point scale; 1=never, 5=always.
Apathy	3 items measuring disposition of apathy toward stressful tasks;
(AP1 to AP3)	5 point scale; 1=never do this, 5=always do this.

Job Characteristics…

Feedback	4 item measuring the amount of feedback obtained at work
(F1 to F4)	5 point scale; 1=strongly disagree, 5=strongly agree.
Participation	4 items measuring the frequency of participation in various decisions;
(PP1 to PP4)	5 point scale; 1=strongly disagree, 5=strongly agree.
Autonomy	3 items measuring the amount of freedom and independence at work;
(A1 to A3)	5 point scale; 1=strongly disagree, 5=strongly agree.

Individual Characteristics…

Age	In years
Gender	1=male; 2=female.
Marital Status	1=married, 2=divorced, 3=widowed, 4=single, 5=living together
People in Household	Numerical value
Years in current job	Numerical value in years
Customer Interaction	Number of customers handled per day
Years in current firm	Numerical value in years
Education	1=high school, 2=1-3 years of college…5=masters
Income	1=<$9999, 2=$10,000--$19,999…6=>$50,000
Category	0 = Customer Service (CSR); 1 = Bill Collectors (BCR)

Code sheet for BENCARE data set

Variable name	Scale	Description
id		four digit respondent identification
atrust	interval	a summary score for consumer's trust in the agent
ctrust	interval	a summary score for consumer's trust in the company policies and practices
valshort	interval	a summary score for consumer's evaluations about the short term benefits and costs for continue to be the insurance company's customer
vallong	interval	a summary score for consumer's evaluations about the long term benefits and costs for continue to be the insurance company's customer
value	interval	overall value score (mean of valshort and vallong)
loyrep	interval	a summary score for consumer's behavioral loyalty toward the insurance company for repeat business
loylong	interval	a summary score for consumer's behavioral loyalty toward the insurance company for a long term relationship
loyalty	interval	overall loyalty score (mean of loyrep and loylong)

age	Scale	Age of the respondent; 1 = 18-24 yrs; 2 = 25-34 yrs; 3 = 35-44 yrs; 4 = 45-54 yrs; 5 = 55+ yrs
sex	Nominal	Gender of the respondent; 1=Male; 2=Female
educ	Scale	Highest level of education completed by the respondent; 1 = High School; 2 = Some College; 3 = College Degree; 4 = Graduate School.
income	Ordinal	Total annual household income of the respondent 1= less than 35,000; 2=35,000-44,999; 3=45,000-54,999; 4=55,000-64,999; 5=65,000-74,999; 6=75,000-84,999; 7=85,000-94,999; 8=95,000-104,999; 9 = 105,000-114,999; 10 = 115,000-124,999; 11 = 125,000-134,999; 12 = 135,000 or more
val1 to val3	internal	3 Likert scale items measuring economic value obtained
loy1 to loy8	interval	8 Likert scale items measuring sense of loyalty to company
rep17 to rep20	Interval	1-10 semantic differential scale for measuring consumers' trust in the representative
prac17 to prac20	Interval	1-10 semantic differential scale for measuring consumers' trust in the company's policies and practices

EDMP/MGMT 646 – Applied Advanced Research Analytics
Fall 2014

Instructor: Professor Jagdip Singh
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Assistant: Aron Lindberg, Doctoral Candidate
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Objectives:

We will focus on analytical skills for rigorous, publishable research in the scholar-practitioner mode. Our intention is not to learn new analytical techniques or methods. Instead, we will work with analytical techniques and methods you have learnt in EDMP 648, 649 and 643. Our goal is to develop a more foundational and deep understanding of these techniques and methods, and to interpret the results to extract insights for theory and practice. Our approach is to have students review and critically re-analyze data from published research, conduct independent analysis to address problems of practice, and develop an appreciation of analytical issues for wide applicability and relevance. Application to the participant's own research work will be supported by sharing and discussing common themes and problems.

Format and Assignments:

An assignment will be due for each residency. All assignments are to be completed independently by each student. Consultation with other students regarding syntax and problems in generating output are permitted, even encouraged. To build a community for posing questions and obtaining answers that are commonly shared and developed, use wsom-dm-2015@case.edu to email questions/comments/suggestions. Resist individual emails to the instructor/assistant.

Each assignment will be completed in three steps: (a) Each student will complete initial development of the ideas and make as much progress on the analytics as possible and submit it 24 hours before arriving at the residency, (b) Conduct analytical work to fully develop the assignment at the residency following classroom discussion and consultation, and (c) Prepare and submit a final, independently developed report for submission within 48 hours of the end of the residency for that assignment.

To emphasize, each student is expected to develop his/her report independently and with original contribution. Overlaps among student reports are neither acceptable nor appropriate.

Moreover, each individual student is strongly encouraged to go beyond the specific assignment questions to develop and address analytical issues, topics and concerns that s/he believes are relevant in the specific assignment. Going beyond would involve drawing on the literature and/or implementing new analytical procedures.

Usually and unless otherwise noted, the final report will require one iteration of feedback-revision. That is, each student is expected to revise her/his assignment submission. Selected students will be requested to present a brief report from their work at the following residency.

Please submit your homework as a single (1) PDF file to dm646@sendtodropbox.com. Name your file:

"Lastname Firstname - Assignment #X.pdf".

In the header of each page, please put "Lastname Firstname – Assignment #X".

Evaluation:

Each homework assignment will be reviewed and graded. Possible grades are "Good, with minor changes needed" (3 points), "Acceptable with minor/major changes" (2 points), and "Not there yet and needs serious work to be acceptable" (1 point). A score of 1 implies that a serious re-do is needed since the submitted assignment is incomplete, inadequate and/or inappropriate as noted in the feedback provided. Grading of the first submission is not final and is provided for guidance purposes only. The final grade of an assignment is the grade of the revised submission. **Student must earn either "2" or "3" scores for every assignment in order to pass the course. Failure to submit assignments on time will earn a score of 0.**

Presentation:

Every residency, one or more participants would be invited to make a presentation to the class about their assignment work. The purpose of these presentations is not democratic; rather it is meritocratic. Participants who take risks and creatively experiment with or explore data using modified or new-to-class analytical procedures, or conduct insightful and rigorous analysis with known-to-class-procedures would be asked to make a presentation. Each participant has an opportunity to demonstrate such meritorious work in at least one if not more of the assignments.

Textbooks:

These books will be useful as reference materials:

Byrne, B. M. 2009. *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (2nd ed.). New York: Routledge Academic.

Hair, J. F., Jr., Black, W. C., Rabin, B. J., & Anderson, R. E. 2010. *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Prentice Hall.

Software:

We will be using PASW (SPSS) and AMOS versions 20+. Students are expected to bring laptops to class with the software installed and working properly.

WSOM Statement of Academic Integrity:

All students in this course are expected to adhere to university standards of academic integrity. Cheating, plagiarism, and other forms of academic dishonesty will not be tolerated in this course. This includes, but is not limited to, consulting with another person during an exam, turning in written work that was prepared by someone other than you, making modifications to the work of someone else and turning it in as your own, and using someone else's work as the basis of developing your own. Ignorance will not be permitted as an excuse. If you are not sure whether something you plan to submit would be considered either cheating or plagiarism, it is your responsibility to ask the instructors for clarification. Two useful internet sites are http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml and http://www.unc.edu/depts/wcweb/handouts/apa.html. See Standards Regarding Academic Integrity (http://weatherhead.case.edu/pdpao/policy/policyhome.html).

Residencies

No.	Date	Topics	Assignment Due Date	Feedback by	Revision Due	Readings*
1	August 27	CFA and Scale Validation: Review and Q&A	**08/26 (CFA)** 09/02 (CFA)	09/08	09/12	• **Spreitzer (1995)** • Hair et al. ch 3, 12, & 13 • Byrne ch. 3-5, 10, 13
2	August 29	CFA: Extension				• **Spreitzer (1995)** • Hair et al. ch. 12, & 14 • Byrne ch. 6, 10
3	Sept 18	Modeling Sources of Random and Systematic Error	**9/17 (part 1)**			
4	Sept 19	Modeling Sources of Random and Systematic Error	**9/23 (part 1+2)**	9/29	10/05	• **Podsakoff et al. (2003)** • **Baumgartner & Steenkamp (2001)** • **Weijters & Baumgartner (2012)**
5	Oct 11-12	Own Data Analysis-1 (ODA1)				(application of class concepts to own research)
6	Oct 30	Review Mediation in SEM	**10/29** (SEM)			• **Germann et al. (2013)** • **Zhao et al. (2010)** • **Williams et al. (2003)** • Hair et al. pp. 646-659 (Appendix 12c), 743-757 • Byrne ch. 7-9
7	Oct 31	Review Mediation in SEM	**11/04** (SEM)	11/10	11/16	• **Germann et al. (2013)** • **Zhao et al. (2010)** • **Williams et al. (2003)** • Hair et al. pp. 646-659 (Appendix 12c), 743-757

						• Byrne ch. 7-9 • **Tekleab et al. (2005)** • **Rindfleisch et al. (2008)**
8	Nov 22-23	Own Data Analysis-2 (ODA2)				(application of class concepts to own research)
9	Dec 11-12	Review Longitudinal SEM	**12/10** (Longitudinal SEM)	In class	12/16	• **Tekleab et al. (2005)** • **Rindfleisch et al. (2008)** • Hair et al. ch. 14-15

* Required readings are marked in bold

Each residency will consist of a) review of topic and assignment form last residency, and b) introduction of a new topic and next assignment

Assignments (Subject to change)

For each assignment you will be expected to reanalyze the data from a published article, and provide your perspective on the conclusions of the authors. Assignment #2 is an exception to this rule, since Prof. Baumgartner has provided specific instructions (attached at the end of this syllabus).

Assignment #1 – CFA

- Spreitzer, G. 1995. "Psychological empowerment in the workplace: Dimensions, measurement, and validation," Academy of Management Journal (38:5), pp. 1442–1465.

Assignment #2 – Modeling Sources of Random and Systematic Error

- Baumgartner, H., and Steenkamp, J. 2001. "Response Styles in Marketing Research: A Cross-National Investigation," Journal of Marketing Research (XXXVlll:May), pp. 143–156.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., and 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), pp. 879–903.
- Weijters, B., and Baumgartner, H. 2012. "Misresponse to Reversed and Negated Items in Surveys: A Review," Journal of Marketing Research (XLIX:October), pp. 737–747.

Assignment #3 – SEM

- Germann, F., Lilien, G. L., and Rangaswamy, A. 2013. "Performance implications of deploying marketing analytics," International Journal of Research in Marketing (30:2), pp. 114–128.

Assignment #4 – Longitudinal analysis in SEM

- Tekleab, A. G., Takeuchi, R., & Taylor, M. S. 2005. Extending the Chain of Relationships Among Organizational Justice, Social Exchange, and Employee

Reactions: the Role of Contract Violations. Academy of Management Journal, 48(1): 146-157.

Sample Syntax of Reading Correlation Matrix in SPSS, and use
Correlation Matrix as Input for EFA and Regression Analysis
(for illustrative purposes only; it can't be used directly for course assignments)

```
matrix data variables = rowtype_ y1 y2 y3 x1 x2 x3.
begin data.
n 200 200 200 200 200 200.
stddev 1.0 1.0 1.0 1.0 1.0 1.0
means 0 0 0 0 0 0
corr 1
corr .502 1
corr .622 .551 1.0
corr .228 .272 .188 1.0
corr .307 .230 .249 .442 1.0
corr .198 .259 .223 .537 .413 1.0
end data.

FACTOR
 /MATRIX IN (COR=*)
 /PRINT UNIVARIATE INITIAL EXTRACTION
    ROTATION  DET KMO
 /FORMAT BLANK(.10)
 /PLOT EIGEN
 /CRITERIA factors(2) ITERATE(25)
 /EXTRACTION ml
 /CRITERIA ITERATE(25)
 /ROTATION PROMAX(4).

FACTOR
 /MATRIX IN (COR=*)
 /PRINT UNIVARIATE INITIAL EXTRACTION
    ROTATION  DET REPR KMO
 /FORMAT BLANK(.10)
 /PLOT EIGEN
 /CRITERIA factors(2) ITERATE(25)
 /EXTRACTION ml
 /CRITERIA ITERATE(25)
 /ROTATION PROMAX(4).

REGRESSION
 /MATRIX=IN(*)
 /DESCRIPTIVES MEAN STDDEV CORR SIG N
 /MISSING LISTWISE
 /STATISTICS COEFF OUTS CI R ANOVA COLLIN TOL
    CHANGE
 /CRITERIA=PIN(.05) POUT(.10)
 /NOORIGIN
 /DEPENDENT y1
 /METHOD=ENTER y2 y3 x1 x2 x3.
```

Assignment for Sept 19th Workshop with Prof. Baumgartner

Modeling Sources of Random and Systematic Error

A survey was conducted to assess people's subjective well-being. Data are available for 1181 U.S. respondents. Participants completed the Satisfaction with Life Scale (Diener et al. 1985), which is a well-known instrument used to assess the cognitive component of subjective well-being. The scale consists of the following five items:

   (1) In most ways my life is close to my ideal.
   (2) The conditions of my life are excellent.
   (3) I am satisfied with my life.
   (4) So far I have gotten the important things I want in life.
   (5) If I could live my life over, I would change almost nothing.

Respondents indicated their agreement or disagreement with these statements using the following five-point scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree.

Respondents also rated their current level of general happiness based on how often they experienced five positive affective states (i.e., clear-headed, confident, enthusiastic, free-and-easy, and good-natured) and five negative affective states (e.g., confused, depressed, discontented, helpless, and hopeless). These items are a subset of the items contained in the Affectometer 2 scale (Kammann and Flett 1983). The ratings were collected on five-point scales ranging from 1 = none of the time to 5 = all the time.

The survey also contained other items from which the following scale scores were computed:

   IM   average of 10 items from the impression management subscale of the Balanced
                Inventory of Desirable Responding, with higher scores indicating greater impression
                management (BIDR, Paulhus 1991; coefficient alpha=.72)

   ERS   frequency of use of the most extreme scale positions, either strongly disagree or
                strongly agree (coefficient alpha=.73)

   MID   frequency of use of the midpoint (coefficient alpha=.63)

   ACQ   average of acquiescent responses, where 'agree' was weighted as 1, 'strongly agree' as
                2, and the other response options as zero (coefficient alpha=.52)

   DISACQ   average of disacquiescent responses, where 'disagree' was weighted as 1, 'strongly
                disagree' as 2, and the other response options as zero (coefficient alpha=.56)

   NETACQ   ACQ minus DISACQ (coefficient alpha=.55)

The 5 response style measures (ERS, MID, ACQ, DIACQ, NETACQ) were computed based on participants' responses to 16 substantively uncorrelated items (measured with the same response scale used for the Satisfaction With Life Scale).

The file 'SWB.sav' contains the raw data. The sequence of the variables in the file is as follows:

   id   identifier variable

   ls1-ls5   the 5 life satisfaction items

   pa1-pa5   the 5 positive affect items

na1-na5   the 5 negative affect items

IM, ERS, MID, ACQ, DISACQ, NETACQ

Using these data, perform the following analyses:

(1) In the first part of the assignment, we will investigate the effects of random measurement error on various statistics of interest.

   a. Let's assume that you only have single-item measures of life satisfaction, positive affect, and negative affect. Specifically, use ls3 as a measure of life satisfaction, pa2 as a measure of positive affect, and na2 as a measure of negative affect. Compute the means, standard deviations, and correlations of the three variables.

   b. Calculate the average life satisfaction (LSmean), average positive affect (PAmean) and average negative affect (NAmean) of each respondent. Then compute the means, standard deviations, and correlations of the three averages.

   c. Correct the observed correlations between LSmean, PAmean, and NAmean for attenuation. You can do this using the formula for correction for attenuation or, preferably, use a structural equation modeling program (Hint: Specify a three-factor model where each factor is measured by a single indicator, that is, LSmean, PAmean, or NAmean, fix the error variances to (1-alpha)*(variance of LSmean, PAmean, or NAmean), set the factor loadings to one, and freely estimate the factor variances).

   d. Estimate a factor model with three factors (fLS, fPA, and fNA), in which each construct is measured by 5 indicators each.

   e. Compare the means, standard deviations, and particularly the correlations depending on how these statistics were computed. Interpret the results.

(2) In the second part of the assignment, we will investigate the effects of systematic measurement error on various statistics of interest. In particular, we will assess the relative merits of the various statistical remedies described in the article by Podsakoff et al. (2003, pp. 888-895).

   a. Perform Harman's single-factor test using both exploratory and confirmatory factor analysis.

   b. Compute the partial correlations between LSmean, PAmean, and NAmean in the following three ways and compare the partial correlations with the zero-order correlations.

      i. Partial out social desirability (IM). Do the results change if you also partial out ERS, MID, ACQ, and DISACQ?
      ii. Partial out NETACQ (i.e., use NETACQ as a "marker" variable).
      iii. Partial out the general factor underlying participants' responses to all 15 LS, PA, and NA items (based on single-factor confirmatory factor analysis). Compute the correlations between the general factor and IM, ERS, MID, ACQ, DISACQ, and NETACQ in an effort to understand what the general factor represents.

   c. Control for the effects of a directly measured method factor (using IM as the method factor) on the indicators of LS, PA, and NA at the item level in a three-factor confirmatory factor analysis of the 15 LS, PA and NA items. Do this with and without correction for attenuation in IM, using the method described previously (under 1c).

   d. Conduct a confirmatory factor analysis in which method effects are controlled for by the introduction of a single unmeasured latent method factor. Compute the correlations between the method factor and IM, ERS, MID, ACQ, DISACQ, and NETACQ in an effort to

understand what the general factor represents.

e. Specify a three-factor model for LS, PA, and NA and look at the modification indices for the correlations among the measurement errors. Are there any correlated uniquenesses that hint at method effects?

f. What other analyses could be conducted to control for systematic method biases?

g. Based on all these analysis, do you think these data are contaminated by method effects? If so, which correction for method effects would you suggest to eliminate the contamination? What's your best estimate of the correlations between life satisfaction, positive affect, and negative affect?

Causal Analysis of Business Problems II
EDMP 649 Syllabus
Spring 2015

Latest Update 11.16.14

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Learning Outcomes for EDMP649:

1. Design a quantitative research project that furthers the understanding of a problem of practice in the field of management. Specifically:
   - Use theory to frame the study
   - Develop hypotheses
   - Identify the unit of analysis
   - Build the hypothesized model
   - Identify the study sample
     - Survey participants
     - Sampling method
   - Choose the optimal analysis
     - Focus on SEM
     - Discuss other analysis techniques as time and interest allows
   - Recognize that designing a quantitative research project is an iterative process

2. Build skills that convert data into knowledge
   - Develop competency in using SPSS as a tool
   - Prepare raw data for analysis
     - Move data into SPSS for analysis
     - Understand the raw data
       - Missing data
       - Univariate
       - Mulit-variate
   - Create constructs from items
   - Analyze complex models using multivariate techniques
     - Mediation
       - Preacher & Hayes including bootstrapping
     - Moderation

- Multi-Group
- Interaction
- Controls
  - Moderated Mediation

- Validate and interpreting the significance of findings
- Troubleshoot common problems in multivariate analysis

3. Understand how to structure and write a quantitative research paper
   - Students will be expected to design their own quantitative research project during the course of the semester
   - Class time will be used to review progress on each student's research design

EDMP649 and the DM Quantitative Inquiry Sequence:

There are two overarching goals for the quantitative inquiry sequence:

1. Build competence in research design and methodology

2. Develop a foundation for formulating questions for causal quantitative inquiry, learning skills to test and analyze such causal questions, and critically interpreting outcomes of such inquiry.

EDMP649 is one of 4 courses in the quantitative inquiry sequence. This course follows EDMP648 and is taught in parallel with EDMP643.

During the previous course in this sequence, (EDM 648, "Causal Analysis of Business Problems I"), you were introduced to common statistical methods of analysis and ideas of hypothesis testing and main concepts underlying causal models. These topics were introduced to get you acquainted with the statistical models, tools and thinking and our treatment of them hovered on the surface. Specific competencies expected for each student as a result of completing EDMP648 are:

- Basic understanding of quantitative analysis
- Understanding common terminology including IV's, DV's, mediators.
- Understanding simple path models, linear regression, multivariate analysis, significance, and variance explained
- AMOS Competency including:
  - Accessing data
  - Building basic models
  - Running analysis
  - Understanding model
    - Significant paths

- o   Variance explained
- o   Model fit
  - ▪   Basic interpretation
  - ▪   Improving fit
- •   Troubleshooting common AMOS problems

Textbooks:

Hair, J. F., Jr., Black, W. C., Rabin, B. J., & Anderson, R. E. 2010. *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Prentice Hall.

Hayes, Andrew. F., 2013. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach,* New York: The Guilford Press.

Optional Textbooks:

Byrne, B. M. 2009. *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (2nd ed.). New York: Routledge Academic, 416 pages.

Privitera, G. J. 2015. *Statistics for the Behavioral Sciences*, (2nd ed.). Los Angeles, SAGE Publications, Inc.

Van de Ven, A. (2007). *Engaged scholarship: A guide for organizational and social research*: Oxford University Press, USA.

Websites:
Two websites were created specifically for the quantitative courses of the DM program by Dr. James Gaskin:

- o   http://statwiki.kolobkreations.com
- o   http://www.youtube.com/Gaskination

More helpful sites:

- o   http://www.statsoft.com/Textbook/Elementary-Statistics-Concepts
- o   http://www.quantpsy.org/interact/index.html
- o   http://www.quantpsy.org/calc.htm

Software:
SPSS and AMOS versions 17+
-Note: students are expected to bring laptops or notebooks to class with software installed and working properly.
Excel (e.g. for the Stats Tools Package available on Statwiki)

Readings:
The required readings in this class include the Hayes and Hair books and selected articles. The readings identified as "Supporting Literature" include many of the readings from the previous semester. The supporting literature is also meant to serve in a helpful role, i.e., if you are struggling with a topic, here is where you should begin your search for an answer.

Data Sets:
The data sets necessary to complete the assigned exercises are posted on the course BlackBoard site. There are two separate data sets that we will conduct analyses on: SOHANA and BENCARE (see descriptions at the end of the syllabus). We will mostly use the BENCARE data during the class exercises but switch to the SOHANA data for assignments. We may also use smaller data sets specifically designed for in-class exercises. These will be provided by the instructor when necessary. SOHANA and BENCARE data are private data sets and should not be copied or given to others without permission. The provided datasets are exclusively for the class exercises and capstone assignment. Please do not make use of these datasets for any other purpose without the explicit consent of the instructor.

Assignments & Exercises:
In-class assignments are small and worth 1 point, graded on completion, are mostly mechanical, and are due by the end of the residency. Homework assignments are much more complex and require depth of thought in addition to mechanical precision. These homework assignments are worth 3 points and in most cases are due within ten days of the last day of the residency. Assignments will be outlined at the end of each class (and are available on Blackboard).

Please submit your homework as a single (1) PDF file by email to dm649@sendtodropbox.com. Name your file " Lastname Firstname - Assignment #X.pdf". In the header of each page, please put "Lastname Firstname – Assignment #X".

Think of assignments more as writing the methods section of a real paper, rather than writing mock "homework exercises". Therefore, please format all assignments according to the AMJ Style Guide. When you submit to AOM, this formatting will be required.

Evaluation:

Each homework assignment will be reviewed and graded. Possible grades are "Very Good" (3 points), "Acceptable" (2 points), and "Not there yet" (1 point). The first two imply that one demonstrates respectively excellent or adequate understanding of the underlying topic. The last one implies that a major revision is required to address some critical issues. After receiving feedback on an assignment, students are expected to send a final revised version that addresses the necessary issues. The final grade of an assignment is the grade of the last submission prior to the respective class.

Students must earn either "2" or "3" score for EVERY assignment in order to pass the course and move to the capstone assignment. If the student regularly fails to submit assignments on time the student will risk failing the course. A formal discussion may be necessary between DM faculty and the student before moving into the capstone.

Capstone Assignment:

Satisfactory completion of the requirements of EDMP 643 and EDMP 649 requires a satisfactory performance on the III Year Quantitative Inquiry Capstone assignment. The assignment is based on the material covered in the two courses and should be completed by each student individually. The Capstone assignment will be distributed in the last residency. As noted, students must receive acceptable grades for each assignment in order to be eligible to take the Capstone.

Code of Ethics:

Discussion of the assignments and their solutions in collaborative workgroups is encouraged; however the final analysis and the subsequent reports should be done independently by each student.

WSOM Statement of Academic Integrity:

All students in this course are expected to adhere to university standards of academic integrity. Cheating, plagiarism, and other forms of academic dishonesty will not be tolerated in this course. This includes, but is not limited to, consulting with another person during an exam, turning in written work that was prepared by someone other than you, and making minor modifications to the work of someone else and turning it in as your own. Ignorance will not be permitted as an excuse. If you are not sure whether something you plan to submit would be considered either cheating or plagiarism, it is your responsibility to ask for clarification. Either ask me about it or consult credible sources of information on the subject. Two useful internet sites are http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml and http://www.unc.edu/depts/wcweb/handouts/apa.html. Please remember that you have agreed to Standards Regarding Academic Integrity (a copy of which can be

found at http://weatherhead.case.edu/pdpao/policy/policyhome.html) which outlines your responsibility in greater detail.

Schedule and Assignment Due Dates

	Topic	Required Readings	Supporting Literature
Residency 1 Thursday, January 15, 2015 8A-12P 2-6P	1) Course Overview 2) Quantitative research 3) Data Screening	• Judge, Hurst & Simon, 2009 • Hair Chapters 1 and 2	• Teaching Notes #1&2 (on blackboard) • Van de Ven, A. Engaged Scholarship: Ch 5&6 • Privitera, Chap. 6 - 8
Assignment 1	**Data Screening and Model Development**		**Due Tuesday, January 27, 2015**
Residency 2 Thursday, February 5, 2015 8A-12P 2-6P	1) Multivariate path analysis 2) Mediation 3) Presentation of Models	• Hair Chap. 4 • Hayes Chapter 1 to 4 (pages 3 - 122)	• Hair pp. 751-755 (mediation)
Assignment 2	**Regression and Mediation Testing**		**Due Tuesday, February 17, 2015**
VIRTUAL Residency February 27, 2015	Designing the Quantitative Project	• Hayes Chapter 5 (pages 123 - 163) • Publishing in AMJ Part 2: Research Design* • Publishing in AMJ Part 4: Grounding Hypotheses*	

Assignment 3	Quant Study Design	Due Tuesday, March 10, 2015	
Residency 3 Thursday, March 19, 2015 8A-12P 2-4P	1) Moderation Multi-Group and Interaction 2) Mediated Moderation	• Hayes Chap. 7-9 (pages 207-324) • Hayes Chap. 10-12 (pages 325-415)	• Hayes Chapter 6 • Preacher et al. (2007)
Assignment 4	**Moderation: Multi-group and Interaction**	**Due Tuesday, March 31, 2015**	
VIRTUAL Residency April 10, 2015	**Writing the Quant Paper**	• Publishing in AMJ Part 3: Setting the Hook • Publishing in AMJ Part 5: Crafting the Methods and Results • Publishing in AMJ Part 6: Discussing the Implications	
Assignment 5	**The Whole Enchilada: Hypotheses, model and analysis for a management problem**	**Due Tuesday, April 21, 2015**	

Residency 4 Thursday, April 30 2015 8A-12P 2-4P	1) Putting it all together 2) Capstone review 3) Presentation of Models	• Hayes Chapter 10 (pages 325-355) • Hair Chap. 10 and 12

Note: An "*" indicates that a pdf copy of the article can be found on the course BlackBoard site.

NURS 630 - Advanced Statistics for Nursing Research: Linear Models
Fall, 2014

Credit Hours: 3 semester hours

Faculty: Chris Burant, PhD
                     Office #: 204F
                     Phone #: (216) 368-0730
                     Email: cxb43@case.edu
                     Office hours by arrangement

CLASS TIME: Thursday, 1:00-6:00 in computer lab in the learning center on ground floor of School of Nursing; 1-4 actual class and lecture; 4-6 (optional, but recommended) review of homework assignment for upcoming week

Course Description:
This course is focused on advanced procedures for data analysis and statistical inference in health research. The course is devoted to discussion of linear models, including simple and multiple regression, logistic regression and application to study design. The role of assumptions and theory in guiding the analysis plan is emphasized through lecture, readings, and critical evaluation of published research in the student's area of interest.

Pre-requisites: NURS 532

Course Objectives:
Upon successful completion of this course, the student will be able to:

1.   Examine the underlying assumptions of linear models.

2.   Using theory as the basis for developing and testing linear models.

3.   Critically evaluate the appropriateness and accuracy of the data analysis in published research in the student's area of nursing research and practice.

4.   Apply appropriate scientific data analysis techniques to answer research questions.

Classwork: The classroom portion of this course will consist of lecture presentations, class discussion, software demonstrations and data analysis. Discussion and questions are encouraged as class participation is a key component of the overall evaluation of the student. To be prepared to participate, the reading assignments need to be completed before class. Computer assignments are due the week after class.

      Assignments are oriented toward application of the content rather than pure statistical understanding.

Evaluation: Students will be evaluated on the basis of attendance, class participation, quizzes and weekly computer exercises as follows:

             Class Attendance/Participation   25%
             Weekly Computer Homework Assignments   75%

General Policy: In order to be fair to all students and computer homework assignments must be turned in on the due date. A *full letter grade per day penalty* will be charged *for late materials* and *exceptions* will only be made with written request and for reasons of *serious medical or family emergency that is verified by the Dean's office.* Make up homework assignments will only be allowed if a serious medical emergency or family emergency has been verified by the Dean's office. Grades of incomplete will follow the same policy, and a written plan for completion must be provided before a grade will be turned in (I turn in grades 48 hours after the final date of exams. A "0" will be assigned for materials not received, and averaged into the final grade.

Attendance: Attendance is mandatory. This course is very discussion oriented and the nature of the complex material necessitates this requirement. Students will be treated as active members of a research team and will be expected to contribute to the learning process, providing feedback, sharing ideas, and possibly leading and teaching class material. Students will be allowed to miss 1 class before this impacts their attendance grade. Attendance will be based on total number of class sessions and students will receive credit for the 1 missed day. Mandatory attendance may seem a little strict, but remember 25% of your grade is just showing up for class and participating.

Weekly Computer Assignments: One of the most important parts of learning multiple regression is learning to run SPSS. It is important to become proficient in these techniques, in order to help build an academic career. This material is the most labor intensive of the semester; therefore it will count as 50% of your grade. I believe that students should get credit for the hard work devoted to completing these assignments. Students will be expected to provide a copy of the SPSS syntax used for the homework, the SPSS output, and a write-up for each assignment.

Important: Students will be expected to complete their own work. This **does not mean** that one person will complete the assignment and pass it around to the other members. (It's been known to happen.) This constitutes cheating. Every student is expected to become proficient running SPSS and maybe expected at any time to demonstrate these skills to the instructor or to the class. Therefore, it is extremely important that a student knows how to complete an assignment. If a person or group is suspected of cheating, these students will be expected to demonstrate to the instructor the ability to properly analyze and explain the computer homework assignments. Issues of academic integrity are addressed in the section labeled ADMINISTRIVIA.

Any student receiving a grade of C or lower by the mid-term of the semester should schedule an appointment with the instructor as soon as possible to discuss ways for the student to improve their scores. In general, students are encouraged to seek faculty help when they are having difficulty with the content or a specific assignment. **Seek help early**. Don't wait until you are too deeply in trouble to be bailed out!

The grading scale used for this course is as follows:

A = 93-100;   B = 85-92;   C = 77-84;   D = 69-76;   F < 69

BLACKBOARD: Students should get familiar with Blackboard and Check it at least weekly, if not more frequently for assignments and readings

Contact/appointments:
The best way to reach me is to call me (368-0730) or email, which is noted above. If you want to see me, please schedule an appointment in advance.

ADMINISTRIVIA

Educational Support (for academic accommodations such as issues concerning disability)
The course faculty is available to meet to discuss requests for academic accommodations after the student has registered with the Office of Disability Resources (ESS, Sears 470). Accommodations cannot be provided retroactively.

Academic Integrity:
All students are expected to maintain academic integrity, including the avoidance of cheating and plagiarism. Students are required to adhere to all academic integrity policies as published in the School of Nursing Handbook and School of Nursing Bulletin, the University Bulletin (http://www.case.edu/bulletin/generalbulletin20062009.pdf) and at http://studentaffairs.case.edu/ai. Violations of academic integrity will be addressed by the course faculty in accordance with the policies on academic integrity.

Long-term Illnesses or Family Issues: If a student becomes ill for a period of longer than 2 weeks or a serious family issue occurs, the student should contact your Advisor.   The office of Graduate Studies will assess the situation and make recommendations to handle the situation.

Educational Support Services: Educational Support Services will help students with learning skills. Any student having problems studying can contact Educational Support Services (368-5230).

Writing Center: The center is available to help students having trouble with their writing skills (368-3799).

MOST IMPORTANTLY, I HOPE THAT THIS COURSE WILL HELP YOU BECOME EXCITED ABOUT THE RESEARCH PROCESS AND DATA ANALYSIS.

Textbooks

Required:

Fields, A. (2013). Discovering Statistics using IBM SPSS Statistics, 4th ed. London: Sage.

Recommended:

Mertler, C. A. & Vannatta, R. A. (2005). Advanced and Multivariate Statistical Methods: Practical Application and Interpretation. 3rd Ed. Glendale, CA: Pyrczak Publishing

Books that are good to have:

Hair, Black, Babin, Anderson, and Tatham (any recent edition, hardbound or paperback). Multivariate Data Analysis. (various companies have published this book).

Tabachnick, B. G. & Fidell, L. S. (2007). Using Multivariate Statistics. 5th Ed. Needham Heights, MA: Allyn & Bacon.

Downs, F. (1999). Readings in Research Methodology. 2nd Ed. Philadelphia: Lippincott

Also of interest—classical works:

Green, S. B. & Salkind, N. J. (2003). Using SPSS for Windows and Macintosh. Analyzing and understanding data. Upper Saddle River, NJ: Prentice Hall.

Achen, C.H. (1982). Interpreting and using regression. Beverly Hills: Sage.

Berry, W.D. & Feldman, S. (1985). Multiple regression in practice. Beverly Hills: Sage.

Lewis-Beck, M.S. (1980). Applied regression: An introduction. Beverly Hills: Sage.

Fox, J. (1991). Regression Diagnostics. Beverly Hills: Sage.

Jaccard, J., Turrisi, R., & Wan, C.K. (1990). Interaction effects in multiple regression. Beverly Hills: Sage.

Asher, H.B. (1983). Causal modeling. Beverly Hills: Sage.

Schroeder, L.D., Sjoquist, D.L., & Stephan, P.E. (1986). Understanding regression analysis. Beverly Hills: Sage.

Pedhazur, E. J. (1997). Multiple Regression in Behavioral Research. 3rd Ed. Fort Worth: Harcourt Brace.

Required readings (other than Fields) will be on BLACKBOARD.

Tentative Lecture Schedule

Aug 28   **Class assessment and introduction/review of SPSS**

Sept 4   **SPSS syntax, Review of bivariate statistics**

Sept 11   **Paired t-tests and Repeated Measures**

Sept 18   **Testing some Underlying Assumptions in Bivariate Regression**

Sept 25   **Testing some Underlying Assumptions in Multiple Regression**
  &
Oct 2

Oct 9   **Multiple Regression Methods of Selecting Variables for Prediction vs. Explanation**

Oct 16   **Multiple Regression Tests for Nonlinearity, Multicollinearity, and Insufficient Power I**

Oct 23   **Multiple Regression Tests for Nonlinearity, Multicollinearity, and Insufficient Power II**

Oct 30   **Multiple Regression Tests for Statistical Interaction (nonadditivity)**

Nov 6   May be at GSA Conference

Nov 13   **Non- Random Missing Data**

Nov 20   **Logistic Regression**

Nov 27   **Thanksgiving Holiday – No Class**

Dec 4   **Catch-up – Class choice of Topic**

Case Western Reserve University
Frances Payne Bolton School of Nursing

NURS 631 - Advanced Statistics for Nursing Research: Multivariate Analysis
Spring, 2014

Credit Hours: 3 semester hours

Faculty: Chris Burant, PhD
                    Office #: 204F
                    Phone #: (216) 368-0730
                    Email: cxb43@case.edu
                    Office Hours by arrangement

CLASS TIME: Thursday, 1:00-4:00   in computer lab in the learning center on ground floor of School of Nursing

HOMEWORK HELP: Thursday, 4:00-6:00   in computer lab in the learning center on ground floor of School of Nursing

CREDIT/CLOCK HOURS:

	Total	Theory/classroom	Clinical	Lab
Credit hours:	3	3		
Clock hours:	3 + 2 (optional Homework Help)			

Course Description:

This course focuses on selected advanced multivariate topics and procedures in health research. Topics will be covered through lecture, readings, computer analysis as well as critical analysis of published research in the health sciences fields. Topics to be covered in this course include: survival analysis, factor analysis, path analysis, repeated measures ANOVA and advanced regression techniques (logistic, loglinear, mixed models).

Pre-requisites: NURS 531, NURS 630, NURS 532, and NURS 530.

Course Objectives:
Upon successful completion of this course, the student will be able to:

1. Understand the theory behind and how to run an Exploratory Factor Analysis.

2. Using logic, theory, and prior empirical evidence as the basis for developing and testing Structural Equation Models.

3. Determine the appropriateness of using Mixed Models and Survival Analysis vs. Regression techniques.

4. Apply appropriate scientific data analysis techniques to answer research questions.

Classwork: The classroom portion of this course will consist of lecture presentations, class discussion, software demonstrations and data analysis. Discussion and questions are encouraged as class participation is a key component of the overall evaluation of the student. To be prepared to participate, the reading assignments need to be completed before class. Computer assignments are due the week after class.

Assignments are oriented toward application of the content rather than pure statistical understanding.

Evaluation: Students will be evaluated on the basis of attendance, class participation, quizzes and weekly computer exercises as follows:

Class Attendance /Participation	25%
/Weekly Computer Homework Assignments	75%

General Policy: In order to be fair to all students, computer homework assignments must be turned in on the due date. A *full letter grade per day penalty* will be charged *for late materials* and *exceptions* will only be made with written request and for reasons of *serious medical or family emergency that is verified by the Dean's office.* Make up homework assignments will only be allowed if a serious medical emergency or family emergency has been verified by the Dean's office. Grades of incomplete will follow the same policy, and a written plan for completion must be provided before a grade will be turned in (I turn in grades 48 hours after the final date of exams. A "0" will be assigned for materials not received, and averaged into the final grade.

Students will have a 2 week limit to dispute grades. Grade changes can be difficult and time consuming, especially if a grade change is requested 10 weeks after the original assignment. Two weeks should give students enough time to review their work and dispute grades.

Attendance: Attendance is mandatory. This course is very discussion oriented and the nature of the complex material necessitates this requirement. Students will be treated as active members of a research team and will be expected to contribute to the learning process, providing feedback, sharing ideas, and possibly leading and teaching class material. Students will be allowed to miss 1 class before this impacts their attendance grade. Attendance will be based on total number of class sessions and students will receive credit for the 1 missed day. Mandatory attendance may seem a little strict, but remember 25% of your grade is just showing up for class and participating.

Weekly Computer Assignments: One of the most important parts of learning multiple regression is learning to run SPSS. It is important to become proficient in these techniques, in order to help build an academic career. This material is the most labor intensive of the semester; therefore it will count as 50% of your grade. I believe that students should get credit for the hard work devoted to completing these assignments.

Important: Students will be expected to complete their own work. This **does not mean** that one person will complete the assignment and pass it around to the other members. (It's been known to happen.) This constitutes cheating. Every student is expected to become proficient running SPSS and maybe expected at any time to demonstrate these skills to the instructor or to the class. Therefore, it is extremely important that a student knows how to complete an assignment. If a person or group is suspected of cheating, these students will be expected to demonstrate to the instructor the ability to properly analyze and explain the computer homework assignments. Issues of academic integrity are addressed in the section labeled ADMINISTRIVIA.

Any student receiving a grade of C or lower by the mid-term of the semester should schedule an appointment with the instructor as soon as possible to discuss ways for the student to improve their scores. In general, students are encouraged to seek faculty help when they are having difficulty with the content or a specific assignment. **Seek help early**. Don't wait until you are too deeply in trouble to be bailed out!

The grading scale used for this course is as follows:

A = 93-100; B = 85-92; C = 77-84; D = 69-76; F < 69

BLACKBOARD: Students should get familiar with Blackboard and Check it at least weekly, if not more frequently for assignments and readings

Contact/appointments:

The best way to reach me is to call me (368-0730) or email, which is noted above. If you want to see me, please schedule an appointment in advance.

ADMINISTRIVIA

Educational Support (for academic accommodations such as issues concerning disability)
The course faculty is available to meet to discuss requests for academic accommodations after the student has registered with the Office of Disability Resources (ESS, Sears 470). Accommodations cannot be provided retroactively.

Academic Integrity:
All students are expected to maintain academic integrity, including the avoidance of cheating and plagiarism. Students are required to adhere to all academic integrity policies as published in the School of Nursing Handbook and School of Nursing Bulletin, the University Bulletin (http://www.case.edu/bulletin/generalbulletin20062009.pdf) and at http://studentaffairs.case.edu/ai. Violations of academic integrity will be addressed by the course faculty in accordance with the policies on academic integrity.

Long-term Illnesses or Family Issues: If a student becomes ill for a period of longer than 2 weeks or a serious family issue occurs, the student should contact your Advisor. The office of Graduate Studies will assess the situation and make recommendations to handle the situation.

Educational Support Services: Educational Support Services will help students with learning skills. Any student having problems studying can contact Educational Support Services (368-5230).

Writing Center: The center is available to help students having trouble with their writing skills (368-3799).

MOST IMPORTANTLY, I HOPE THAT THIS COURSE WILL HELP YOU BECOME EXCITED ABOUT THE RESEARCH PROCESS AND DATA ANALYSIS.

Textbooks

Required:

Twisk JWR. (2006). Applied multilvel analysis. A practical guide. Cambridge University Press, Cambridge UK. ISBN 9780521614986

Byrne, B.M. (2010). Structural equation modeling with AMOS. Basic concepts, application, and programming. Routledge/Taylor & Francis, New York. ISBN10: 0805863737; ISBN13: 9780805863734

Fields, A. (2009). Discovering Statistics using SPSS. London: Sage. ISBN 9781847879073

Kline, R. B. (2010). Principles and practice of structural equation modeling - 2. ed. - New York : Guilford Press, ISBN-10:1606238760; ISBN-13: 9781606238769

Recommended:

Robert Bickel, (2007). Multilevel Analysis for Applied Research: It's just regression. New York: Guilford Press. ISBN 978-1-59385-191-0.

Mertler, C. A. & Vannatta, R. A. (2005). Advanced and Multivariate Statistical Methods: Practical Application and Interpretation. 3rd Ed. Glendale, CA: Pyrczak Publishing

Books that are good to have:

Hair, Black, Babin, Anderson, and Tatham (any recent edition, hardbound or paperback). Multivariate Data Analysis. (various companies have published this book).

Tabachnick, B. G. & Fidell, L. S. (2007). Using Multivariate Statistics. 5th Ed. Needham Heights, MA: Allyn & Bacon.

Required readings (other than Fields, Byrne, & Kline) will be on BLACKBOARD.

<center>**Tentative Lecture Schedule**</center>

Jan 16 **Class assessment and introduction/review of Underlying Assumptions in Multiple Regression/ Testing some Underlying Assumptions in Multiple Regression**

Jan 23 - **Exploratory Factor Analysis**
Jan 30

Feb 6 **Using Cronbach's Alpha to Assess Reliability of Composite Score**

Feb 13 **Constructing Composite Scales and Assessing Their Construct Validity through Links to External Variable**

Feb 20 **Establishing a measurement Model through Exploratory Factor Analysis and Tests for Reliability**

Feb 27 **Multiple Regression Using AMOS**

Mar 6 **Confirmatory Factor Analysis Using AMOS**

Mar 13 Spring Break

Mar 20 **More on Confirmatory Factor Analysis Using AMOS**

Mar 27 **Combining Structural and Measurement Models Using AMOS**

Apr 3 **Using AMOS with Longitudinal Data** (TENTATIVELY)

Apr 10 **Mixed Models with Continuous and Dichotomous Outcomes**

Apr 17 **Survival Analysis**

Apr 24 (TENTATIVELY) **Repeated Measures Mixed Models (3 X 3 X 2) example**

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Case Western Reserve University
Frances Payne Bolton School of Nursing

NURS 632–Advanced Statistics: Structural Equation Modeling
Spring, 2014

Credit Hours: 3 semester hours

Faculty:

CLASS TIME: Friday, 1:00-4:00   in computer lab in the learning center on ground floor of
School of Nursing

HOMEWORK HELP: Friday, 4:00-6:00   in computer lab in the learning center on ground floor of
School of Nursing
CREDIT/CLOCK HOURS:

	Total	Theory/classroom	Clinical	Lab
Credit hours:	3	3		
Clock hours:	3 + 2 (optional Homework Help) per week			

Course Description:

This course focuses on advanced data analytic procedures using Structural Equation Modeling
in health research. Content will be explored through lecture, readings, computer analysis as well
as critical analysis of published research in the health sciences fields. Topics to be covered in this
course include: structural equation modeling with latent variables, path analysis adjusting for
measurement error, nested models, and advance structural equation modeling techniques
(exploratory structural equation modeling, autoregressive models, latent growth curves, and
latent class analysis using mixture modeling).

Pre-requisites: NURS 630

Course Objectives:
Upon successful completion of this course, the student will be able to:

1. Use logic, theory, and prior empirical evidence as the basis for developing and testing Structural
Equation Models.

2. Understand the theory behind latent variables and how to run Confirmatory Factor Analyses.

3. Determine the appropriateness of using Autoregressive Models and Latent Growth Curve
Analyses to analyze longitudinal data

4. Apply appropriate scientific structural equation techniques to answer research questions.

Classwork: The classroom portion of this course will consist of lecture presentations, class discussion, software demonstrations and data analysis. Discussion and questions are encouraged as class participation is a key component of the overall evaluation of the student. To be prepared to participate, the reading assignments need to be completed before class. Computer assignments are due the week after class.

Assignments are oriented toward application of the content rather than pure statistical understanding.

Evaluation: Students will be evaluated on the basis of attendance, class participation, quizzes and weekly computer exercises as follows:

Class Attendance /Participation	25%
/Weekly Computer Homework Assignments	75%

General Policy: In order to be fair to all students, computer homework assignments must be turned in on the due date. A *full letter grade per day penalty* will be charged *for late materials* and *exceptions* will only be made with written request and for reasons of *serious medical or family emergency that is verified by the Dean's office.* Make up homework assignments will only be allowed if a serious medical emergency or family emergency has been verified by the Dean's office. Grades of incomplete will follow the same policy, and a written plan for completion must be provided before a grade will be turned in (I turn in grades 48 hours after the final date of exams. A "0" will be assigned for materials not received, and averaged into the final grade.

Students will have a 2 week limit to dispute grades. Grade changes can be difficult and time consuming, especially if a grade change is requested 10 weeks after the original assignment. Two weeks should give students enough time to review their work and dispute grades.

Attendance: Attendance is mandatory. This course is very discussion oriented and the nature of the complex material necessitates this requirement. Students will be treated as active members of a research team and will be expected to contribute to the learning process, providing feedback, sharing ideas, and possibly leading and teaching class material. Students will be allowed to miss 1 class before this impacts their attendance grade. Attendance will be based on total number of class sessions and students will receive credit for the 1 missed day. Mandatory attendance may seem a little strict, but remember 25% of your grade is just showing up for class and participating.

Weekly Computer Assignments: One of the most important parts of learning multiple regression is learning to run SPSS. It is important to become proficient in these techniques, in order to help build an academic career. This material is the most labor intensive of the semester; therefore it will count as 75% of your grade. I believe that students should get credit for the hard work devoted to completing these assignments.

Important: Students will be expected to complete their own work. This **does not mean** that one person will complete the assignment and pass it around to the other members. (It's been known to happen.) This constitutes cheating. Every student is expected to become proficient running SPSS and maybe expected at any time to demonstrate these skills to the instructor or to the class. Therefore, it is extremely important that a student knows how to complete an assignment. If a person or group is suspected of cheating, these students will be expected to demonstrate to the instructor the ability to properly analyze and explain the computer homework assignments. Issues of academic integrity are addressed in the section labeled ADMINISTRIVIA.

Any student receiving a grade of C or lower by the mid-term of the semester should schedule an appointment with the instructor as soon as possible to discuss ways for the student to improve their scores. In general, students are encouraged to seek faculty help when they are having difficulty with the content or a specific assignment. **Seek help early**. Don't wait until you are too deeply in trouble to be bailed out!

The grading scale used for this course is as follows:

A = 93-100; B = 85-92; C = 77-84; D = 69-76; F < 69

BLACKBOARD: Students should get familiar with Blackboard and Check it at least weekly, if not more frequently for assignments and readings

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MOST IMPORTANTLY, I HOPE THAT THIS COURSE WILL HELP YOU BECOME EXCITED ABOUT THE RESEARCH PROCESS AND DATA ANALYSIS.

Textbooks

Required:

**Arbuckle, J. L. (2012). IBM® SPSS® Amos™ 21
User's Guide.
This is available as a download from the following site:
ftp://public.dhe.ibm.com/software/analytics/spss/documentation/amos/21.0/en/Manuals/IBM_SPSS_Amos_Users_Guide.pdf**

**Byrne, B.M. (2010). Structural equation modeling with AMOS.
Basic concepts, application, and programming. Routledge/Taylor & Francis, New York. ISBN10: 0805863737; ISBN13: 9780805863734**

**Kline, R. B. (2010). Principles and practice of structural equation
modeling - 2. ed. - New York : Guilford Press, ISBN-10:1606238760;
ISBN-13: 9781606238769**

Required readings (Byrne & Kline) will be on BLACKBOARD.

Tentative Lecture Schedule (Lectures Subject to Change)

Jan 17 **Class assessment and introduction/review of Latent Constructs and Exploratory Factor Analysis**

Jan 24 **Using Composite Scales in Multiple Regression Analysis/ Intro to Path Analysis**

Jan 31 **Multiple Regression Using AMOS**

Feb 7 **Confirmatory Factor Analysis Using AMOS**

Feb 14 **More on Confirmatory Factor Analysis Using AMOS**

Feb 21   **Mediation and Moderation in SEM**

Feb 28 **Combining Structural and Measurement Models Using AMOS**

Mar 7 **Using AMOS with Longitudinal Data - Autoregressive Models**

Mar 14 Spring Break

Mar 21 **Using AMOS with Longitudinal Data - Latent Growth Curve Models**

Mar 28 No Class (Tentatively)

Apr 4 **Exploratory SEM using Specification Search**

Apr 11 **Latent Class Analysis and Mixture Modeling**

Apr 18 **Bayesian Estimation for Continuous Variables and Ordered Categorical Variables.**

Apr 25 (tentatively) **Bootstrapping**

SASS 618: MEASUREMENT ISSUES IN QUANTITATIVE RESEARCH

SPRING 2014

Class: Wednesdays, 9:00AM - 12:00PM
CRN: 5857

Instructor: Aloen Townsend, PhD
Office: MSASS 301
Phone: 216-368-0373
Email: aloen.townsend@case.edu
Office hours: Tuesdays 4:30-5:30 PM
              and by appointment

CWRU/Jack, Joseph and Morton Mandel
School of Applied Social Sciences
10900 Euclid Avenue
Cleveland OH 44106-7164

TA: Susan Yoon
Email: susan.yoon@case.edu
Office hours: By appointment

DESCRIPTION AND OBJECTIVES

This course focuses on measurement issues and application of measurement techniques in quantitative research from a social and behavioral sciences perspective. The course covers basic purposes, concepts, principles, and models of measurement; considerations in designing (or selecting), testing, critiquing, and refining measures; exploratory and confirmatory factor analysis; reliability and validity; measurement error and strategies for handling missing data.

By the end of the course, students should have achieved the following objectives:

- Understand basic purposes, concepts, principles, and models of measurement
- Able to design (or select), pretest, critique, and refine measures
- Understand and apply exploratory factor analysis
- Able to assess the reliability and validity of measures
- Understand implications of measurement error and missing data and strategies for minimizing these problems
- Able to use SPSS to construct scales and analyze the factor structure, reliability, and validity of measures

PREREQUISITES

This course requires knowledge of research design (SASS 613, "Advanced Research Design," or equivalent), univariate and bivariate statistics (SASS 615, "Social Statistics and Data Analysis," or equivalent), and general linear models (SASS 616, "Applied Regression and General Linear Model," or equivalent). It also assumes mastery of SPSS statistical software and the *Publication Manual of the American Psychological Association (6th ed.)*.

Converse, J., & Presser, S. (1986). *Survey questions: Handcrafting the standardized questionnaire* (QASS 07-063). Beverly Hills, CA: Sage.

DeVellis, R. (2012). *Scale development: Theory and applications* (3rd ed., Applied Social Research Methods Series, Vol. 26). Newbury Park, CA: Sage.

Pett, M., Lackey, N., & Sullivan, J. (2003). *Making sense of factor analysis: The use of factor analysis for instrument development in health care research*. Thousand Oaks, CA: Sage.

Warner, R. (2013). *Applied statistics: From bivariate through multivariate techniques* (2nd ed.). Los Angeles: Sage.

 (Additional required readings will be on reserve in the MSASS Harris Library or on Blackboard)

RECOMMENDED TEXTS
(ON RESERVE AT HARRIS LIBRARY AND/OR SELECTED SECTIONS ARE ON BLACKBOARD)

Fowler, Jr., F. (2009). *Survey research methods* (4th ed.). Thousand Oaks, CA: Sage.

Fowler, Jr., F. (2014). *Survey research methods* (5th ed.). Thousand Oaks, CA: Sage.

Shultz, K., Whitney, D., & Zickar, M. (2014). *Measurement theory in action: Case studies and exercises* (2nd ed.). New York: Routledge.

Spector, P. (1992). *Summated rating scale construction: An introduction* (QASS 07-082). Newbury Park, CA: Sage.

ASSIGNMENTS AND GRADING

This course has both lecture/discussion sessions and computer labs. The lab typically follows the introduction of the statistical concept in class. You are expected to attend and actively participate in all class sessions (including the labs) for the entire scheduled time period and to complete all required reading assignments prior to class. If you must be absent for any part of the class or lab time, you are still responsible for completing all assignments and required readings and for mastering the content delivered during the time you missed. Participation in class and lab discussions will count for **10%** of the final grade. Late submission of any assignment will lower the course participation part of your grade.

There will be two required papers and three required homework assignments. The first paper (**due Monday February 10 by 12:00 noon, worth 35%**) will require students to demonstrate mastery of course objectives by critiquing a measure provided by the instructor. The second paper (**due Friday April 25 by 5:00 PM, worth 40%**) will require students to demonstrate mastery of course objectives through SPSS analyses of data provided by the instructor and presentation of the results in APA format (consult the 2010 *Publication Manual of the American Psychological Association*, 6th ed., on reserve in the MSASS Harris Library). Detailed instructions for the two papers will be distributed in class.

A homework assignment will be distributed during each SPSS computer lab session. Only the first homework (on exploratory factor analysis, **due by 12:00 noon Monday February 24, worth 15%**) will be graded; however, students *__must__* complete and submit all 3 homework assignments in order to receive a grade for the course. Homework answers plus relevant SPSS output and syntax are to be submitted through the course BlackBoard site no later than 12:00 noon on the Monday before the homework will be discussed in class. Students are expected to bring their completed homework to the class following the computer lab and be prepared to answer questions about it.

Grades for the two papers, the first homework, and class participation will be assigned according to the following scale:

A   Excellent, exceeds expectations; superior performance

B   Good, meets all normal expectations; consistent grasp of content and competency in meeting course objectives

C   Fair, meets some expectations but misses others; acceptable but barely adequate; uneven grasp of course content

COURSE OUTLINE

January 15   *Overview (Purposes, Concepts, Principles, and Models of Measurement)*

DeVellis, Chap. 1 & 2

Spector, pp. 1-18

Jaccard, J., & Jacoby, J. (2010). *Theory construction and model-building skills: A practical guide for social scientists* (pp. 75-90, Focusing Concepts). New York: Guilford.

Bollen, K. (2004). "Cause" and "effect" indicators. In E. Babbie, *The practice of social research* (10th ed., p. 156 only). Belmont, CA: Thomson.

Schaeffer, N. & Presser, S. (2003). The science of asking questions. *Annual Review of Sociology, 29*, 65-88.

Kazdin, A. (1995). Preparing and evaluating research reports, *Psychological Assessment, 7*, 228-237. (read sections related to measures and assessment)

January 22   *Designing (or Selecting), Pretesting, Critiquing, and Refining Measures*

DeVellis, Chap. 5 & 8

Converse & Presser, Chap. 1, 2, & 3

Spector, pp. 18-28

Radloff, L. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1,* 385-401.
(read pp. 385-390 for Jan. 22; the remaining pages will be relevant for later sessions)

Schwarz, N. (1999). Self-reports: How the questions shape the answers. *American Psychologist, 54*, 93-105.

Netemeyer, R., Bearden, W., & Sharma, S. (2003). *Scaling procedures: Issues and applications* (Chap. 5). Thousand Oaks, CA: Sage.

January 29   *Measures (continued)*

Fowler (2009), Chap. 6 & 7

Pett, Lackey, & Sullivan, Chap. 2

Krosnick, J., & Fabrigar, L. (1997). Designing rating scales for effective measurement in surveys. In L. Lyberg et al. (Eds.), *Survey measurement and process quality* (pp. 141-164). New York: Wiley & Sons.

Bryman, A., & Cramer, D. (2004). Constructing variables. In M. Hardy & A. Bryman (Eds.), *Handbook of data analysis* (read pp. 17-22 only). Thousand Oaks, CA: Sage.

Springer, D., Abell, N., & Hudson, W. (2002). Creating and validating rapid assessment instruments for practice and research: Part 1. *Research on Social Work Practice, 12*, 408-439.

February 5   *Exploratory Factor Analysis I*

Warner, sections 20.1 through 20.11

DeVellis, Chap. 6

Shultz et al., Module 18 (Exploratory factor analysis)

Pett, Lackey, & Sullivan, Chap. 3 & 4

Radloff, pp. 397-398

Ensel, W. (1986). Measuring depression: The CES-D Scale. In N. Lin, A. Dean, & W. Ensel (Eds.), *Social support, life events, and depression* (pp. 51- 70). Orlando, FL: Academic Press.

First paper is due by 12:00 noon on Monday February 10

February 12   *Exploratory Factor Analysis II*

Warner, sections 20.12-20.13 and 20.15-20.19

Pett, Lackey, & Sullivan, Chap. 5, Chap. 6 (pp. 167-174 and pp. 196-201), Chap. 7

Costello, A., & Osborne, J. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment Research & Evaluation, 10*(7). Available online: http://pareonline.net/getvn.asp?v=10&n=7

Spector, P., Van Katwyk, P., Brannick, M., & Chen, P. (1997). When two factors don't reflect two constructs: How item characteristics can produce artifactual factors. *Journal of Management, 23*, 659-677.

February 19   *Exploratory Factor Analysis III*

There will be a **computer lab** on exploratory factor analysis

Pett, Lackey, & Sullivan, Chap. 8

Cabrera-Nguyen, P. (2010). Author guidelines for reporting scale development and validation results in the *Journal of the Society of Social Work and Research. Journal of the Society of Social Work and Research, 1,* 99-103.

Fabrigar, L.R., Wegener, D.T., MacCallum, R. C., & Strahan, E.J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods, 4*, 272-299.

Nicol, A., & Pexman, P. (2010). *Presenting your findings: A practical guide for creating tables* (Chap. 16, Factor analysis). Washington, DC: American Psychological Association.

Bandalos, D., & Finney, S. (2010). Factor analysis: Exploratory and confirmatory. In G. Hancock & R. Mueller (Eds.), *The reviewer's guide to quantitative methods in the social sciences* (read pp. 93-105 only). New York: Routledge.

Homework #1 is due by 12:00 noon on Monday February 24

February 26   *Practice Critiques I: EFA*

Steinhauser, K., Bosworth, H., Clipp, E., McNeilly, M., Christakis, N., Parker, J., & Tulsky, J. (2002). Initial assessment of a new instrument to measure quality of life at the end of life. *Journal of Palliative Medicine, 5*, 829-841.

Siebert, D., & Siebert, C. (2005). The caregiver role identity scale: A validation study. *Research on Social Work Practice, 15*, 204-212.

Cox, E., Green, K., Seo, H., Inaba, M., & Quillen, A. (2006). Coping with late-life challenges: Development and validation of the care-receiver efficacy scale. *The Gerontologist, 46*, 640-649.

March 5   *Reliability*

There will be a **computer lab** on reliability. **Homework #2 will be due by 12:00 noon on Monday March 17.**

Warner, sections 21.1 through 21.7.5.2

Pett, Lackey, & Sullivan, pp. 174-196

DeVellis, Chap. 3

Shultz et al., Modules 5 and 6 (Reliability overview: Classical test theory and Estimating reliability)

Cortina, J. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology, 78*, 98-104.

Nunnally, J., & Bernstein, I. (1994). *Psychometric theory* (3rd ed., pp. 264-265). New York: McGraw-Hill.

March 12   *No Class (Spring Break)*

Homework #2 is due by 12:00 noon on Monday March 17

March 19   *Reliability (continued) and Validity*

Radloff, pp. 391-400

Warner, sections 21.8 through 21.8.3

Devins, G., & Orme, C. (1985). Center for Epidemiologic Studies Depression Scale. In D. Keyser & R. Sweetland (Eds.), *Test critiques* (Vol. II, pp. 144-160). Kansas City, MO: Westport.

DeVellis, Chap. 4

Shultz et al., Modules 8 and 9 (Criterion-related validity and Construct validity)

Morgan, S., Reichert, T., & Harrison, T. (2002). *From numbers to words* (Chap. 4). Boston: Allyn & Bacon.

March 26   *Validity (continued)*

There will be a **computer lab** on validity

Shultz et al., Module 11 (Test bias, unfairness, and equivalence)

Burholt, V., Windle, G., Ferring, D., Balducci, C., Fagerstrom, C., Thissen, F., Weber, G., & Wenger, G. C. (2007). Reliability and validity of the Older Americans Resources and Services (OARS) Social Resources Scale in six European countries. *Journals of Gerontology: Social Sciences; 62B*(6), S371-S379.

Fillenbaum, G. (2007). Commentary: Once validated, always validated? *Journals of Gerontology: Social Sciences, 62B*(6), S380.

Okazaki, S., & Sue, S. (1995). Methodological issues in assessment research with ethnic minorities. *Psychological Assessment, 7*, 367-375.

Rogler, L. (1989). The meaning of culturally sensitive research in mental health. *American Journal of Psychiatry, 146*, 296-303.

Vogt, D., King, D., & King, L. (2004). Focus groups in psychological assessment: Enhancing content validity by consulting members of the target population. *Psychological Assessment, 16*, 231-243.

Krause, N. (2006). The use of qualitative methods to improve quantitative measures of health-related constructs. *Medical Care, 44*(11, Supp. 3), S34-S38.

Homework #3 is due by 12:00 noon on Monday March 31

April 2   *Practice Critiques II*

Cornelius, L., Booker, N., Arthur, T., Reeves, I., & Morgan, O. (2004). The validity and reliability testing of a consumer-based cultural competency inventory. *Research on Social Work Practice, 14*, 201-209.

Coleman, D. (2004). Theoretical Evaluation Self-Test (TEST): A preliminary validation study. *Social Work Research, 28*, 117-128.

Hemmelgarn, A., Glisson, C., & Sharp, S. (2003). The validity of the shortform assessment for children (SAC). *Research on Social Work Practice, 13*, 510-530.

April 9   *Measurement Error*

Viswanathan, M. (2005). What is measurement error? (Chap. 2, read pp. 97-122 only) and What causes measurement error? (Chap. 3). In M. Viswanathan, *Measurement error and research design*. Thousand Oaks, CA: Sage.

Lyberg, L., & Kasprzyk, D. (1991). Data collection methods and measurement error: An overview. In P. Biemer, R. Groves, L. Lyberg, N. Mathiowetz, & S. Sudman (Eds.), *Measurement errors in surveys* (pp. 237-257). New York: Wiley & Sons.

Fowler (2009), Chap. 2

Harris, L., & Brown, G. (2010). Mixing interview and questionnaire methods: Practical problems in aligning data. *Practical Assessment Research & Evaluation, 15*(1). Available online: http://pareonline.net/getvn.asp?v=15&n=1.

Shultz et al., Module 16 (Response biases)

April 16   *Missing Data*

Fowler (2014), Chap. 4

Enders, C. (2010). *Applied missing data analysis* (pp. 1-8 and 37-55). New York: Guilford Press.

Johnson, D., & Young, R. (2011). Toward best practices in analyzing datasets with missing data: Comparisons and recommendations. *Journal of Marriage and Family, 73*, 926-945.

McKnight, P., McKnight, K., Sidani, S., & Figueredo, A. (2007). *Missing data: A gentle introduction* (Chap. 2: Consequences of missing data, pp. 17-39). New York: Guilford.

McKnight, P., McKnight, K., Sidani, S., & Figueredo, A. (2007). *Missing data: A gentle introduction* (Chap. 11, Reporting missing data and results, pp. 213-224). New York: Guilford.

April 23   *Confirmatory Factor Analysis & Wrap up*

Gjesfjeld, C.D., Greeno, C.G., Kim, K.H. (2008). A confirmatory factor analysis of an abbreviated social support instrument: The MOS-SSS. *Research on Social Work Practice, 18*, 231, 237.

Ullman, J. (2006). Structural equation modeling: Reviewing the basics and moving forward. *Journal of Personality Assessment, 87*, 35-50.

Warner, section 20.20

Shultz et al., Module 19 (Confirmatory factor analysis)

Final paper is due by 5:00 PM on Friday April 25

GENERAL INSTRUCTIONS FOR THE TWO REQUIRED PAPERS

Read the instructions that will be distributed in class carefully. If you have any questions, ask the instructor.

Papers are expected to adhere to the format described in the *Publication Manual of the American Psychological Association (6th ed.)*. Use minimum 1-inch margins all around and minimum 11-point font. Use only Times New Roman or Arial typeface. Double space everything, including tables. References (in text and in the reference list) are expected to follow APA *Manual* (6th ed.) format. Support your points and your criteria for statistical decisions using assigned course readings. Do not include any references other than assigned course readings.

Put a coversheet on each paper that has the following: Your chosen ID number, Spring 2014, SASS 618, Title (e.g., Paper 1). Put this same information in a heading at the top of each page, along with the page number. Do not put your name anywhere on the paper.

For the second paper, submit the paper (in WORD) as well as the SPSS output and syntax for all analyses used in your paper (as pdf files). Do not include output or syntax for things that you did not use in the paper.

Before you submit them, proofread both papers carefully for grammar, spelling, clarity, and completeness.

The Design and Analysis of Observational Studies

Instructor Thomas E. Love, Ph. D. [call me Tom, Dr. Love or Professor Love – your choice]
  Professor of Medicine, Epidemiology & Biostatistics, Case School of Medicine
  Director, Biostatistics & Evaluation Unit, Center for Health Care Research & Policy
Office R229A Rammelkamp Research & Education Building,
  MetroHealth Medical Center, 2500 MetroHealth Drive, Cleveland, OH 44109-1998
E-mail Thomas.Love@case.edu [always the best way to reach me]
Phone (216) 778-1265 [voice mail – never the best way to reach me]
Web https://sites.google.com/a/case.edu/love-500/ [refreshed Tuesdays, usually]
Grades 50% project, 20% Observational Studies in Action, 30% Class participation / HW

I am available to meet. Email to set an appointment.
Also, email me in advance to let me know if you will miss class.
All classes are from 9:00 to 11:30 AM in Wolstein Building, Room 1403.

Class	Date	Topics	Readings/Homework
1	Jan 13	Course Overview and Philosophy Randomized and Observational Studies; Some Thoughts on Using R	Visit course web site Skim Benson and Concato Syllabus, Rosenbaum Ch 1
		No Class Jan 20 (University Holiday) **Homework 1 due Sunday January 26 at Noon**	
2	Jan 27	The Fundamentals Why is Randomization Important? Interpreting Causal Effects Sensibly	Abramson, Ch. 2 Skim Rosenbaum Chs 2, 4, 6 (Skim White and Sacco) Read Whitehouse
		Homework 2 due Sunday February 2 at Noon	
3	Feb 3	Discussion of Projects and OSIA Interpreting Causal Effects Propensity Scores, Part 1 Estimating the PS & Matching	Rosenbaum, Ch 1 and Skim Chs. 7 and 13 Skim Gum Read D'Agostino
		No Class Feb 10 (Professor Love is at NIH) **Observational Studies in Action selections due Sunday February 16 at Noon**	
4	Feb 17	Propensity Scores, Part 2 Applying Matching. plus Stratification & Regression Adjustment	Read Matching Handout Rosenbaum, 8.1 - 8.3 and 9 Read Bingenheimer and Holden's summary
		Project Proposal due Sunday February 23 at Noon	
5	Feb 24	Propensity Scores, Part 3 Applications in R	Skim Hirano
6	March 3	Applications in R	Normand article
		No Class March 10 (CWRU Spring Break) **Homework 3 due Sunday March 16 at Noon**	

Class	Date	Topics	Readings/Homework
7	Mar 17	Designing with Propensity Scores **Observational Studies in Action, 1**	Rubin (2001) article Two OSIA articles
Homework 4 due Sunday March 23 at Noon			
8	Mar 24	Sensitivity Analysis Methods **Observational Studies in Action, 2**	Rosenbaum skim 14-17, read Chapter 18 Sensitivity Analysis handout
Project Summary Update by Sunday March 30 at Noon			
9	Mar 31	**Observational Studies in Action, 3** Project Discussions	
10	April 7	Non-Bipartite Matching, Time-varying Covariates	Skim Rosenbaum, Ch 11-12
11	April 14	Instrumental Variables and Comparing Methods	Read Landrum Read Posner
12	April 21	Wrapup, Project Discussions	Individual Meetings
All Project Materials [Slides/Abstract/Discussion] are due Sunday April 27 at Noon			
13	Apr 28	Project Presentations and Evaluation	Class Presentations

Brief Course Description

An observational study is an empirical investigation of treatments, policies or exposures and the effects that they cause, but it differs from an experiment in that the investigator cannot control the assignment of treatments to subjects. This course is designed to introduce design, data collection and analysis methods appropriate for clinical investigators engaged in observational studies, and will prepare students to design and interpret their own studies, as well as those of others in their field. Technical formalities will be minimized, and the presentations will focus on the application of methodologies and strategies in practical settings. Students with a working knowledge of multiple regression, and some familiarity with logistic regression, should be well prepared.

Topics include randomized experiments and how they differ from observational studies, planning and design for observational studies, adjustments for overt bias, sensitivity analysis, and propensity methods for selection bias adjustment, including multivariate matching, stratification, weighting and regression adjustments, along with some comparison of these methods with instrumental variables approaches.

CRSP 500/EPBI 500   Spring 2014 Syllabus

Literature Talks: Observational Studies in Action

In keeping with our general focus on putting design and analysis into practice and the university's focus on discussion and seminar learning, a substantial amount of class time will be explicitly devoted to the discussion and critique of articles from literature which applies methods discussed in class. Most especially, at three sessions in March, members of the class will choose an article, then *present* it to the class, briefly, emphasizing conceptual and practical ideas. We'll spend in total about 20-25 minutes on each article, spending the rest of the session on a more general discussion of design in observational studies.

By **Sunday February 16 at Noon** (but earlier if possible), please submit an email to Thomas.Love@case.edu containing the complete reference information to describe **two** articles you have identified in the literature that are of interest to you which either use propensity score methods to compare the effectiveness of treatments/exposures, or which comment on the use of propensity methods and related concerns in observational studies. Ideal articles will be in or near a medical field of interest, touch on a clinically important concern, and are recent (2009 or later, ideally.) Please [1] indicate which of the two articles you have identified that you would prefer to review in class and why, and please also [2] include PDF copies of each article as attachments in your email. Use words I know.

The class (having read the abstract and skimmed the rest of the paper in advance) will react to the comments presented in the main presentation and by a colleague discussant (you'll serve as lead discussant for one of your colleague's papers) throughout the presentations. Presentations will be assessed by the class, based on (some of) these items…

Score Sheet Outline for Assessment of Presentations and Discussion

1. Write a one-sentence description of what the paper was about.
2. What was the muddiest, least clear section of the paper discussion today?

    How well did the speaker communicate the answers to these questions (Likert scale)…
3. What kind of problem is being solved here?
4. What are the unusual aspects of this application that require special treatment?
5. What does the paper offer that is different from other looks at the problem?
6. Give an example of a study where the techniques used here would be useful.

7. How well did the discussant contribute to your understanding of the paper?

Instructions for Course Projects

As half of your course grade, you will complete a small observational study comparing two (or more) exposures on one (or more) outcome(s) by late April. It is hard to statistics (or anything else) passively; concurrent theory and application are essential[1]. There is more to a statistical application than the analysis of a canned data set, even a good canned data set. George Box noted that "statistics has no reason for existence except as the catalyst for investigation and discovery." Expert clinical researchers repeatedly emphasize how important it is that people be able to write well, present clearly, work on teams to solve problems, and show initiative. This project assignment is designed to help you develop your abilities in these areas, and have a memorable experience in this course.

You will be responsible for writing a proposal, accessing some data (you must have the data no later than April 1), selecting and performing appropriate analyses, doing a one-page progress report in early April, then writing an abstract of the results, meeting with me to discuss ideas, then presenting your results to an audience (including the rest of the class), as discussed below.

The main deliverable for the project is a 20 minute oral **presentation** of your results, along with (1) electronic copies of the slides used in the presentation, and (2) an **abstract** (details to follow).

I care deeply about the writing you do. My best tip: ==**USE WORDS I KNOW**==.

"The process of trying to say something, of working through craft issues and the worldview issues and the ego issues - all of this is character building, and, God forbid, everything we do should have concrete career results. I've seen time and time again the way that the process of trying to say something dignifies and improves a person."

-- George Saunders, quoted in *The New York Times*, 1/6/2013

Deliverable 1: The Project Proposal

By **Sunday February 23 at Noon**, submit via e-mail to Thomas.Love@case.edu a proposal for your study. The e-mail should have a **subject line** like RE: CRSP 500 Proposal for YOUR NAME. Submit a Word attachment entitled **YourNameProposal.docx**. The **first line** of the Word document should be your name and contact information. Then take the time to come up with a good, interesting **title**. You will work hard on this – don't call it "Observational Studies Project." A vast majority of your intended audience will never get past the title and abstract of the final report. Get off to a good start. Avoid deadwood like "The Study Of…" or "An Analysis Of…" Also, avoid one-word titles.

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[1] Though hardly an original idea in general, this particular phrasing is stolen from Harry Roberts, as are several of the bulleted points to follow, originally prepared for the University of Chicago. I am also grateful to Doug Zahn, for several helpful suggestions swiped from his work at Florida State University, and to Dave Hildebrand, at Wharton.

The rest of the proposal should be a (roughly 2 page) summary (moving towards an abstract) of the study, to include:

- ✓ A paragraph of **background** information, meant to help me understand the study's objective. Again, use words I know.
- ✓ An **objective** or list of study objectives, which leads directly to the research question.
- ✓ A careful statement of the **research question(s)**, with indications about anticipated directions for any hypotheses. Be sure you identify the exposure and key outcome(s) here, and please do state research questions as questions.
- ✓ A **classification** of the type of research design (i.e. prospective cohort, etc.)
- ✓ A description of the **setting** in which the data were collected (i.e. MHMC burn unit)
- ✓ A brief description of the **participants**, including key inclusion or exclusion criteria, as well as the size and style of the sample (i.e. 200 consecutive male patients between November and May with burns over more than 15% of their bodies)
- ✓ A brief description of the **intervention** or exposure of interest
- ✓ A description of the exposure's **method of allocation** to participants
- ✓ A listing of **primary outcome measures**, which should be clearly linked to the objectives
- ✓ A paragraph or two describing the available **data set**, and confirming that you either have it or describing why you will certainly be able to get it in time to complete the project by deadline.
- ✓ A paragraph or two describing your **planned statistical methodology** for answering your research questions. Obviously, you won't have developed a complete tool set here, but do the best you can.

You may need to go through multiple iterations of the proposal. Your eventual abstract will also include results and conclusions, but we're not there yet.

Deliverable 2: Project Summary Update

An e-mail to Thomas.Love@case.edu of a project summary update is due at **Noon on Sunday March 30. This summary should respond to these three issues** (a single paragraph for each is sufficient, but more may be necessary, depending on complications you're having.)   This update will not be graded, but will force you and I to touch base on the project in a serious way when there's still time to make changes, as needed. If you feel the need to write more than 3 pages in total here, then we should be talking offline well before the due date.

[1] Describe the data - tell me what you have, and what you are still waiting for.
[2] Has anything changed from your project proposal abstract, and if so, what?
[3] Describe the biggest problem you're currently having with regard to completing the design and analysis of the study. Feel free to describe multiple problems, especially if I can help, and don't be shy about asking for help sooner, rather than later.

Deliverable 3: Project Abstract / Discussion / Presentation

I want you to establish relevant and interesting research questions related to a problem of interest, procure data to help answer the questions and pose others, and communicate your results to an audience of your peers. You will prepare about a 20 minute talk (TBA in March) using PowerPoint or PDF and statistical or graphics packages of your choosing and present it in class in late April.

An e-mail to Thomas.Love@case.edu is due at **Noon on Sunday April 27**, containing the slides for your talk (ready for presentation), as well as your project **abstract** and **discussion**.

Your project **abstract** should be no longer than 3500 characters and will look very similar to much of your approved proposal (deleting some of the background, data set, and methodological details to meet the character limit). To this, you will add (still within the character limit) brief Results and Conclusions sections.

Plan to submit a separate project **discussion** section (not to exceed 6000 characters) at the same time. Here, you can describe your conclusions in a larger context and describe implications of your current work, and potential future work, likely in more detail than you will be able to provide in your presentation. You may incorporate up to 4 figures in your discussion. Figures and labels do not count against the character limits.

- Use Words I Know.
- Focus on well-labeled pictures rather than dull bullet points.
- **Start building slides in February**. If you wait until April 15, you'll never make it.

Broadly, your slides will include an **introduction** which provides a foundation by motivating and clearly stating the research questions you studied, a **main section** which summarizes your pre-data collection beliefs, the key models and analytical results, and the critical findings of the study, and a **conclusion**, which provides insight into how your knowledge of the problem you studied has changed as a result of the project, as well as highlighting what you believe to be the key takeaways (both statistical and study-specific) for your audience. These sections should be keyed to slides, smoothing transitions, and forcing you to "tell us what you're going to tell us, tell us, then tell us what you told us." Plan for at most 25 minutes of total time: allowing 3-4 minutes for asking and answering questions during the talk, and 1-2 minutes after the talk.

Don't use more than 20 slides, including a title slide containing the project title, and your name, email and affiliation(s). Use large, extremely readable fonts. Class slides provide insight into what I think works well.

All students must attend all presentations (you will be providing both oral and written feedback to your colleagues). I will send you a copy of the evaluation sheet in advance.

EPBI 435: Survival Data Analysis
Fall, 2014

INSTRUCTOR:	Pingfu Fu
	Epidemiology and Biostatistics
	Office: W-G82P
WHEN/WHERE	Mon, Wed 10:00-11:15 am / NOA 280
OFFICE HOURS:	By appointment:
	Phone: 368-3911 or Email: pxf16@case.edu
REQUIRED TEXT:	Collet D. (2003). *Modeling Survival Data in Medical Research*, Chapman and Hall. Second edition (3rd edition is coming, Dec. 2014).
WEB SITE	Data files, SAS and S$^+$ programs and some course announcements will be posted on our class specific website:
	http://bfox.cwru.edu/~pxf/teaching/435.html

TEACHING ASSISTANT:

OBJECTIVE:

Time-to-event data are common in biology and medicine, particularly in longitudinal or cohort studies where the onset of certain health outcomes is observed. The timing of event onset, in addition to the outcome event (e.g. development of a symptom, death), provides important information about disease progression or treatment effects. Furthermore, the outcome may not be observed on every study subject because of limitations in the study design. For example, a study may terminate before a subject develops the symptom of interest. This characteristic of incomplete observation is called censoring, must be considered in evaluating the study. The objectives of this course are several folds, including (1) discussion of various methods for analyzing time-to-event data with an emphasis on using computer software for exploratory analysis, model building and model checking; (2) to enhance students' ability to independently conduct data analysis and their skills of statistical computing. Students will be able to

- characterize life time data arising from studies of intermediate level of complexity;
- identify appropriate methods for data analysis;
- understand the strength and limitation of the method;
- appreciate model building/checking process;
- use common computer software such as SAS and/or S$^+$ to conduct data analysis;
- interpret results.

TOPICS:

Characterization of survival data; non-parametric procedures; modeling survival data; distributions frequently used to represent survival data; proportional hazards model; model checking; parametric models; extended Cox models: time dependent variables, piece-wise Cox model, etc; sample size requirements for survival studies; additional topics as time allows; SAS and S$^+$ computer software for survival analysis.

Advanced topics (if time permits): length bias / left-truncation; multi-state model / competing risk; Informative censoring; Interval censoring / current status data; multivariate failure time / recurrence data.

10900 Euclid Avenue
Cleveland, Ohio 44106-4945

Phone: 216.368.3197
Fax: 216.368.3970
http://epbiwww.case.edu

PREREQUISITES:

A background that includes regression and analysis of variance models, as well as maximum likelihood methods of statistical theory will be necessary. You should understand the basic statistical concepts of sampling variation, parameter estimation, confidence limits, and statistical hypothesis testing At least EPBI 431/432 or equivalent is required. EPBI 481, 482 (theoretical statistics) and EPBI 414/415 are encouraged.

REFERENCES:

1. Klein JP and Moeschberger ML (2003). *Survival Analysis: Techniques for Censored and Truncated Data,* Springer-Verlag. Second edition.
2. Kalbfleisch JD and Prentice RL (2002). *The Statistical Analysis of Failure Time Data,* John Wiley & Sons. Second edition.
3. Therneau TM and Grambsch PM (2000). *Modeling Survival Data: Extending the Cox Model*, Springer-Verlag.
4. Zhang H and Singer B (1999). *Recursive Partitioning in the Health Sciences*. Springer, New York.
5. Lee, ET and Wang J. W. (2003). *Statistical Methods for Survival Data Analysis*, John Wiley & Sons. Third edition.
6. Fleming TR and Harrington DP (2005). *Counting Processes and Survival Analysis*, John Wiley & Sons. Second edition.

SOFTWARE:

- SAS User Guide: Basic and Statistics, Version 9, SAS Inc., Cary, NC.
- S^+: *Modern Applied Statistics with S-PLUS* (by Venables and Ripley).Fourth Edition.

COURSE EVALUATION:

I.	Midterm examinations	25%
II.	Classroom participation	10%
III	Computer projects and homework	30%
IV	Final Examination or project	35%

Multilevel Modeling
Sociology 525

Instructor: Jessica Kelley-Moore
Associate Professor
Department of Sociology

230 Mather Memorial Hall
jak119@case.edu
216-368-8879

Objectives of this Course:
This course is designed to provide an introduction to multilevel, or hierarchical, regression models, and to explore its two primary applications in the social sciences: (1) studies of individuals nested within groups; (2) studies of repeated observations nested within individuals. After taking this course, students should be able to discuss the components of the multilevel model, including random intercepts & slopes, variances at levels 1 & 2, within- and between-group regressions. Students should also be able to conduct independent statistical analysis using Stata from initial tests of assumptions and hypothesis testing, and to assessing model fit. This course will additionally provide instruction on time-based and age-based latent growth curves within the multilevel modeling framework.

Prerequisites:
This is an advanced statistics course that presumes students have a strong background in the fundamentals of multivariate linear regression and analysis of variance. One should have a working knowledge of the following concepts: probability, probability distribution, null & alternative hypotheses, variance, covariance, correlation, standard deviation, and standard error. *Any student from a department other than Sociology should consult with the instructor to determine if she/he is prepared for this course.*

Although the general modeling can be applied to any software package, please note that this course is taught using Stata. All computer labs and homework assignments will be completed in Stata. It is not required that students know how to use this program upon entering the class, but those unfamiliar with this software package may want to consult a primer such as: Rabe-Hesketh, Sophia and Brian S. Everitt. 2007. *A Handbook of Statistical Analyses Using Stata.* Chapman and Hall.

Required Materials:
Primary text: Snijders, Tom A B and Roel J Bosker. 2012. *A Introduction to Basic and Advanced Multilevel Modeling.* Los Angeles: Sage Press.

Other readings posted to Blackboard.

Statistical software: Stata version 14. Student pricing allows for a 6 month license for $60 via the ITS Software Page.

Secondary text: Rabe-Hesketh, Sophia and Anders Skrondal. *Multilevel and Longitudinal Modeling Using Stata, 3rd. Ed. Volumes 1 and 2.* Stata Press. [This book is not required for the course specifically, but anyone seeking to work with multilevel models on independent projects will find it essential.]

Grade Distribution

Item	Points	Due
Exam1	100	Week 7
Exam2	100	Finals Week
Application Exercise 1	50	Week 4
Application Exercise 2	50	Week 6
Application Exercise 3	50	Week 11
Independent Project	100	TBA

Exams
Exam 1 will cover the basic structure and math of the multilevel models. It will be an in-class short answer exam. Exam 2 will cover the application of the multilevel models for hierarchical and panel data. Students will be supplied with statistical output and will prepare a written, final report, with the Analytic Plan, Results, and Discussion (including substantive interpretation of the findings and limitations).

Application Exercises
These exercises focus on the mechanics of the statistical modeling. In each case, students will be provided the data and instructions for the problem under study. Students will use Stata to estimate the best-fitting models and provide written interpretations. Graded performance will be based on: (1) the analytic decisions made in the statistical modeling procedures and coding; and (2) the presentation/interpretation of those findings. For all exercises, students will prepare a report and append their annotated output.

Independent Project
During the semester, students will be expected to use ICPSR or another source to identify multilevel data in their substantive area of interest. Students will prepare the data for analysis, code the variables, design an analysis, and present the findings. Although this could be a simple exercise for more practice, students

are encouraged strongly to select data that may lead to an independent project or dissertation.

Schedule

Unit 1: Introduction to Multilevel Modeling

Week 1 – Our Starting Point: Violating the Independence of Observations Assumption

S&B, Chapter 2.

> Types of Data Structures with Dependent Observations
> -- Multistage Random Samples
> -- Hierarchical Data
> -- Panel Data
>
> Handling Dependence without Multilevel Models
> -- Statistical Treatment of Clustered Data
> -- Robust Standard Errors

Week 2 - Within- and Between-Group Variance

S&B, Chapter 3

Skrondal, Anders and Sophia Rabe-Hesketh. 2004. "The Omni-Presence of Latent Variables." Pages 1-18 in *Generalized Latent Variable Modeling*. Chapman and Hall.

> Intraclass Correlations
> Introduction to Latent Variables

Lab 1 – Stacking Your Data

Week 3 – Two-Level Model

S&B, Chapter 4

> Random Intercept Only Model
> -- Fixed versus Random Effects
> -- Intercept and Intercept Variance [RI Empty Model]
> -- RI model with 1 Explanatory Variable
>
> Within- and Between Group Regressions

Week 4 – Random Intercepts and Random Slopes

S&B, Chapter 5

      Random Slopes
             -- Handling Heterogeneity
             -- Random Slopes and Slope Variance
             -- Covariance between Intercept and Slope

      Cross-Level Effects

Applied Exercise 1 Due: Interpreting the Components of the Multilevel Model

Week 5 – Model Specification

S&B, Chapter 6

      Hypothesis Testing
             -- Null Hypotheses of the Model

      Mechanics of the Model
             -- Degrees of Freedom
             -- Fixed and Random Components
             -- Latent Variables and Associated Indicators

Week 6 – Model Specification, cont.

S&B, Chapter 7

      What is a Good-Fitting Model?
             -- Log Likelihoods and Likelihood Ratio Tests
             -- Empty versus Specified Models; Nested Specified Models
             -- Explained Variance
             -- Decomposing the Model to Assess Fit

      Tests of Random Intercepts
      Tests of Random Slopes

Applied Exercise 2 Due: Model Specification

Week 7 – Steps for Analysis

      Selecting and Testing Parameters
      Interpretation
      Principles of Model Building

EXAM 1

Unit 2: Multilevel Models for Panel Data

Week 8 – Panel Structures and Questions of Change

Singer, Judith D. and John B. Willett. 2003. Chapters from: *Applied Longitudinal Data Analysis*. Oxford Press.
    Chapter 1: "A Framework for Investigating Change over Time."
    Chapter 2: "Introducing the Multilevel Model for Change."

    Observations Nested Within Individuals
        -- Number of observations
        -- Fixed versus Time-Varying Covariates

    Fixed versus Variable Occasions Designs
        -- Balanced versus Unbalanced Data

Week 9 – Uses of "Time" in the Model

S&B, Chapter 15

    Introduction to Latent Growth Curves

    Latent versus Observed Change
        -- Linear and Nonlinear Change (Time, Time-Squared)
        -- Time-Varying Covariates

    Utilization of Random Intercepts and Random Slopes to Assess Change
    Intra- and Inter-Individual Variability

Week 10 – Uses of "Time" in the Model

Singer, Judith D. and John B. Willett. 2003. Chapter from: *Applied Longitudinal Data Analysis*. Oxford Press.
    Chapter 5: "Treating TIME More Flexibly."

    Models for Trajectories, Turning Points, and Transitions
        -- Latent Growth Curves
        -- Spline Trajectories
        -- State-Change Models

Week 11 – Missing Data

Elias, Merrill F. and Michael A. Robbins. 1991. "Where Have All the Subjects Gone? Longitudinal Studies of Disease and Cognitive Function." Page 264 – 275

in *Best Methods for the Analysis of Change*, edited by Linda Collins and John L. Horn. Washington, DC: American Psychological Association.

McArdle, J. J. and Fumiaki Hamagami. 1991. "Modeling Incomplete Longitudinal and Cross-Sectional Data Using Latent Growth Structural Models." Pages 276 – 304 in *Best Methods for the Analysis of Change*, edited by Linda Collins and John L. Horn. Washington, DC: American Psychological Association.

> Planned Missing Data Designs
> Synthetic Trajectories Based on Available Information

Applied Exercise 3 Due: Time-Based Latent Growth Curves

Week 12 – Age-Graded Trajectory Models

> Synthetic Cohort Designs
> Swapping Time and Age in the X Axis

Week 13 – Principles and Practice of Age-Graded Trajectory Models

Introduction to Stata code: gllamm
Rabe-Hesketh, Sophia and Anders Skrondal. *Multilevel and Longitudinal Modeling Using Stata, 3rd. Ed. Volumes 1 and 2*. Stata Press. Chapter 8.

Week 14 – A Taste of Other Models for Repeated Measurements

S&B, Chapter 8

Curran, Patrick J. and Kenneth A. Bollen. 2001. "The Best of Both Worlds: Combining Autoregressive and Latent Curve Models." Pages 105 – 136 in *New Methods for the Analysis of Change*, edited by Linda M. Collins and Aline G. Sayer. Washington, DC: American Psychological Association.

> Autoregression and Latent Growth Curves
> Using Tests of Heteroskedasticity for Hypothesis Testing
> Multilevel Models for Survival Analysis

Week 15 – Final Projects Completed

Exam 2 Due During Finals Week