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| **Doctoral Programme** **Course unit outline 2020/21** |
| **Unit code:**  | **BMAN88152** |
| **Title:** | **Exploratory Factor Analysis** |
| **Credit value:** | **5** |
| **Semester:** | **2** |
| **Course Coordinator** **contact details:** | Prof. Paul Irwing, Room 7.005, Tel. 0161-8323872/63419, Email: paul.irwing@manchester.ac.uk |
| **Other staff involved contact details:** | N/A |
| **Pre-requisites****Dependent course units** | Students on this course must also have completed the prior course on introduction to quantitative methods or the equivalent.Multiple Regression, Structural Equation Modelling, Introduction to Hierarchical Linear Modelling with HLM |
| **Course unit overview** |
| Any empirical study is no stronger than the measures it uses. The science of developing valid measures, often denoted psychometrics, is heavily dependent on factor analysis. This course will teach both the theory and application of factor analysis to real life data sets. |
| **Aims** |
| Quantitative studies in business are never better than the quality of measures used to gather data. Commonly, many such studies involve the use of scales composed of multiple components, very often in the form of questionnaire items. Exploratory factor analysis is a key technique used in the development of valid scales. This course is intended to provide students with a grounding in the statistical techniques used in c=scale development. The emphasis is on the development of the practical skills required to carry out such analyses using SPSS software.  |
| **Objectives (Learning outcomes)** |
| *On completion of this unit successful students will be able to:** conduct factor analyses;
* understand the principles of estimation
* apply these analytic methods to publishable data sets
* know how to report quantitative analyses in journal style
* interpret arguments based on factor models
* think critically, analytically and synthetically about research data
* analyze, interpret and extrapolate from data
* Know how to write up these analyses in journal form
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| **Syllabus content** |
| * Exploratory factor analysis
* Estimation methods including principal components and maximum likelihood,
* Rotation: orthogonal and oblique methods,
* Determining the number of factors: Kaiser criterion, Scree test and parallel analysis
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| **Methods of delivery** |
| **Lectures** | **6 hours.** The course will be delivered over two consecutive days |
| **Seminar/Tutorial/Workshop/Lab Hours** | **6 hours**  |
| **Independent Study** | **38 hours** |
| **Total Study Hours** | **50 hours** |
| **Reading List** |
| **Pre Reading**: Tokarev, A., Phillips, A.R., Hughes, D.J., & Irwing, P. (2017). Leader dark traits, workplace bullying, and employee depression: Exploring mediation and the role of the dark core. Journal of Abnormal Psychology, 126, 911-920. http://psycnet.apa.org/doiLanding?doi=10.1037%2Fabn0000299 **Core Texts:** Hair, J. F., Jr., Anderson, R. E., Tatham, R. L. & Black, W. C. (2006). Multivariate Data Analysis. Upper Saddle River, NJ: Prentice-Hall.**Supplementary Texts:*****SPSS*** Field, Andy (2013) Discovering Statistics using IBM SPSS for Windows, Sage Publications.**Factor Analysis In Test Development**Irwing, P., & Hughes, D. J. (2017). Test development. In P. Irwing, T. Booth & D. Hughes (Eds.), *The Wiley Handbook of PsychometricTesting A Multidisciplinary Reference on Survey, Scale and Test Development.:.* London: John Wiley & Sons. Although this chapter’s focus is not factor analysis per se, you will probably find this the most useful read of all to understand the course material as a whole. **Introduction** Mulaik, S. (2018). Fudamentals of common factor analysis. In P. Irwing, T. Booth & D. Hughes (Eds.), *The Wiley Handbook of PsychometricTesting A Multidisciplinary Reference on Survey, Scale and Test Development.:.* London: John Wiley & Sons. **General Review Articles**(\*) 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.**   Russell, D.W. (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.**   Osbourne, J.W. & Costello, A.B. (2005). "Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis." Practical Assessment, Research & Evaluation**, 10, 1-9.** **Specific Factor Analysis Books**Kline, P. (1994). *An Easy Guide to Factor Analysis.* Routledge: London.(\*) Comrey, A.L. & Lee, H.B. (1992). *A First Course in Factor Analysis.* Laurence Erlbaum Associates **Specific Issues in EFA****Rotation**Jennrich, R. I. (2018). Rotation. In P. Irwing, T. Booth & D. Hughes (Eds.), *The Wiley Handbook of PsychometricTesting A Multidisciplinary Reference on Survey, Scale and Test Development.:.* London: John Wiley & Sons.**Number of Factors Problem** Timmerman, M. E., Lorenzo-Seva, U., & Ceulemans, E. (2018). The number of factors problem. In P. Irwing, T. Booth & D. Hughes (Eds.), *The Wiley Handbook of PsychometricTesting A Multidisciplinary Reference on Survey, Scale and Test Development.:.* London: John Wiley & Sons. ***PCA vs Common Factor Model***(\*) Bentler, P.M. & Kano, Y. (1990). “On the Equivalence of Factors and Components.” *Multivariate Behavioral Research,* 25, 67-74.(\*)Velicer, W.F. & Jackson, D.N. (1990). “Component Analysis versus Common Factor Analysis: Some Further Observations.” *Multivariate Behavioral Research,* 25, 97-114.(\*) Widaman, K.F. (1993). “Common Factor Analysis Versus Principal Components Analysis: Differential Bias in Representing Model Parameters?” *Multivariate Behavioral Research,* 28, 263-311.***Sample Size***(\*) MacCallum, R.C., Widaman, K.F., Zhang, S. & Hong, S. (1999). “Sample Size in Factor Analysis.” *Psychological Methods,* 4, 84-99.***Computing Factor Scores***(\*) Grice, J.W. (2001). “Computing and Evaluating Factor Scores.” *Psychological Methods,* 6, 430.450.**Theoretical Application Article**Kline, P. (1987). "Factor analysis and personality theory." European Journal of Personality**, 1, 21-36.** |
| **Assessment** |

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| **Mode of Assessment** | **Length required** | **Weighting within unit** |
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| This will comprise a write up of the class exercises in the form of a journal article. | 3,500 words | 100% |

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| **Assessment is for those requiring unit credits (please make this clear to the tutor at the start of the elective)****Coursework**PGRs may take this elective as a stand-alone assessed 5 credit module. In which case they will complete a 1500 word assignment based on EFA. If this elective is taken alongside multiple regression then please see that outline for guidance on the 10 credit assessment. If the three electives are taken together then PGRs should see the SEM outline for the 15 credit guidance.  | 1,500 words | 100% |

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| **Feedback methods** |
| PGRs are encouraged to express any constructive comments or to seek help and advice from the individual lecturers involved. At the end of the semester there will be the opportunity to give feedback on the course by means of a feedback questionnaire. In addition there will be a group presentation in which both PGRs and staff will provide constructive feedback. For the coursework, there is a standard template which specifies the exact criteria used to assess the coursework. At the end of the course an exemplary piece of coursework will be posted on Blackboard.  |