MEASURING WHAT MATTERS:
HR ANALYTICS TO LIFT RESULTS

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- Teaches postgraduate courses in Analytics for HRM and Business and Research Methods at King's College London
- Researches multifaceted assessments in HRM (e.g., performance ratings, assessment centres, situational judgement tests, gamified assessments)
- Consulted to a range of different organisations, including the Cabinet Office, Propel International, ETS, Samsung, Auckland City, Farmers TCL, The Warehouse

WHAT IS ANALYTICS?

ANALYTICS: A DEFINITION

- Analytics is:
  - "**the process of developing actionable decisions or recommendations for actions based on insights generated from historical data**" (Sharda et al., 2021, p. 67)
- Analytics is about using data to guide decisions
  - It is a broad term that is put into action in different ways, depending on the focal industry
  - It has replaced some earlier, more specific terms in some sectors (e.g., business intelligence)

A FAMILIAR APPLICATION

AND SUDDENLY… WEIRDNESS

- I look in my Facebook feed (old skool, I know, but stay with me)
- And suddenly I see a bunch of adverts appearing for augers

WHAT HAPPENED?

- Well, what happened is that data relating to my online shopping behaviour was shared across websites
- What I searched for in eBay or Amazon was registered by an algorithm in Facebook
  - In this case, the targeted advertising didn't work because the horse had long since bolted

ANALYTICS: USING DATA TO GUIDE DECISIONS

- Here, data collected from an online shopping website is used to guide decisions about how to target advertising to me
  - The basis of this process is an algorithm – a set of rules used to arrive at some outcome

ALGORITHMS

- We use algorithms all the time in our everyday life
- Take crossing a road, for example

ALGORITHMS

- Of course, the algorithms used in analytics tend to be more complex than this and are almost always handled by computers
- But the principle is the same

ANALYTICS IN HRM

ANALYTICS IN HRM

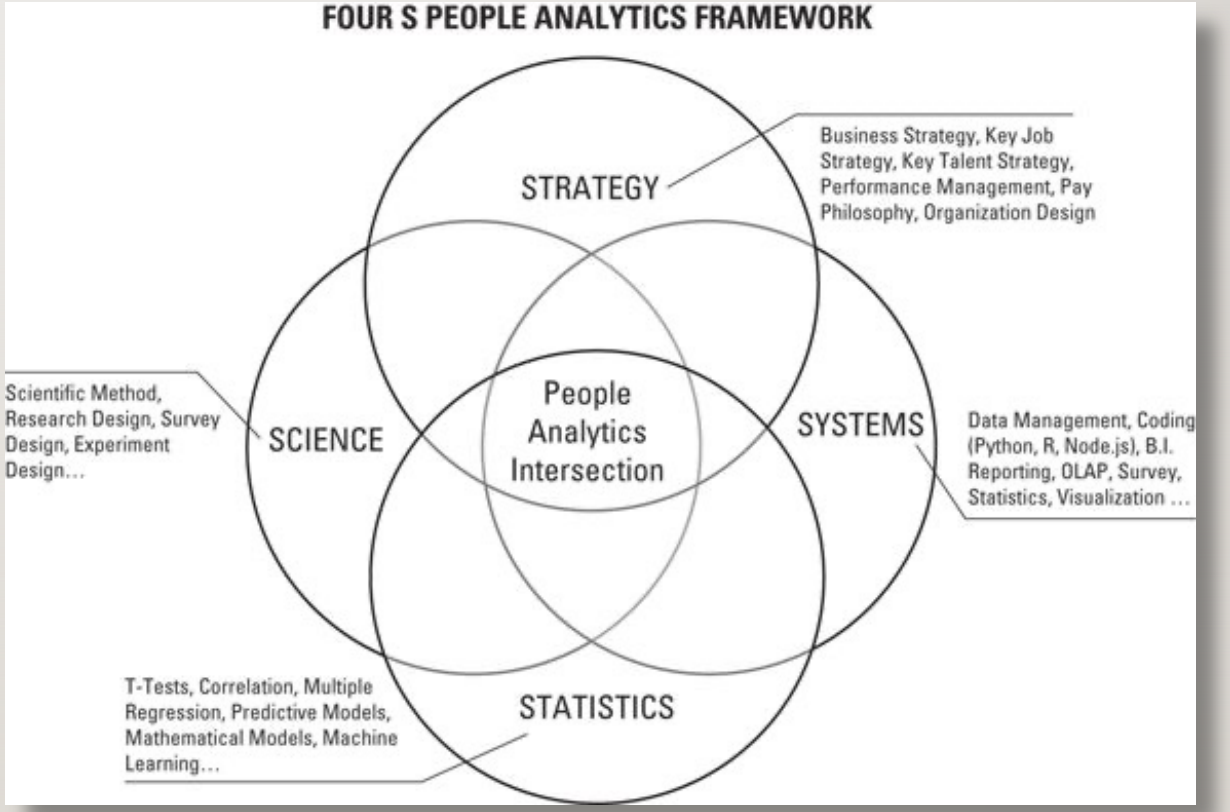
- How or which data are used to guide decisions depends on the context
- In the HRM context, analytics is sometimes referred to as:
  - HR analytics
  - People analytics
  - Evidence-based HR (in some cases)
- Still an emerging area, with new articles and books on the topic only coming out in the last few years

TWO KEY, RELATED THEMES FOR HR ANALYTICS

1. Methodological design and statistical modeling
2. Artificial intelligence

METHODOLOGICAL DESIGN AND STATISTICAL MODELING

THE BIGGER PICTURE



Graphic from West (2019, p. 13)

EXAMPLE FROM RESEARCH AND PRACTICE: DIVERSITY

STRATEGY

- Organisation: large public sector
- Strategy: to create a more diverse workforce
  - Assists the development of society
  - Promotes an ethical approach
  - Develops a more relevant, responsive organisation

METHODOLOGICAL DESIGN

- Perusal of the research literature suggests that human resource selection is a point of focus
  - Research has consistently shown that cognitive ability testing can show group differences that disfavour minority groups by up to 1 SD (a large to very large difference, see Hunter & Hunter 1984)
  - But this is not limited to cognitive ability testing – group differences, albeit smaller, have been found on assessment centres (*d* = .52, see Dean et al. 2008) and situational judgment tests (up to *d* = .67, see Roth et al. 2013), among others

METHODOLOGICAL DESIGN

- To what extent is adverse impact a problem in the selection tests used by the present organisation?
- Take existing data sets, analyse them, and locate where any group differences arise that are large enough to warrant further attention

SYSTEMS

- Data management: requires storage and retrieval of relevant data
- Data preparation and manipulation
- How reporting, analysis, and visualization will be processed
  - Achieved with the assistance of software

STATISTICAL MODELING

- Requires use of software and the application of expertise
- With the current problem, the organisation wants to know about whether the group differences in the HR selection systems warrant further attention
  - Are the differences statistically significant?
    - E.g., *t*-test-based significance testing
  - What is the margin of error around the difference?
    - E.g., 95% confidence intervals for mean differences
  - Is the difference large or small?
    - E.g., *t* converted to *r* square, Cohen's *d*, Hedge's *g*

WHAT THEY FOUND

- Cognitive ability tests: large, significant differences with a narrow margin of error
  - Decision: abandon use of cognitive ability tests
- Other assessment types: small-to-medium, significant differences with a narrow margin of error
  - Decision: revise to reduce adverse impact, but retain validity
    - This latter decision will require further analysis to ensure validity is sustained

OTHER APPLICATIONS RELEVANT TO HRM

APPLICATIONS OF ANALYTICS TO HRM

- There really is no limit to how analytics can be applied to HRM
  - If there's a decision that could benefit from guidance and there's a data set available, then there's an analytics application
  - But here are some common examples

DOES MY HR SELECTION TEST HELP ME TO CHOOSE TOP PERFORMERS?

- Strategy: optimising organisational performance
- Methodological design: involving data from assessment centre and job performance ratings
- Systems: data storage, retrieval, and preparation
- Statistical modeling: correlations with corrections for attenuation, multiple regression, structural equation modeling

HOW DO I UNDERSTAND THE CLIMATE OF THE ORGANISATION?

- Strategy: develop an effective, positive organisational climate
- Methodological design: involving data collected at different time points following organisational initiatives
- Systems: data storage, retrieval, and preparation
- Statistical modeling: repeated-measures ANOVA, latent curve modeling

WHICH VARIABLES PREDICT SALES OF MY PRODUCTS?

- Strategy: increase sales
- Methodological design: collection of data on variables that might increase likelihood of purchase (e.g., perceptions of utility, availability of alternatives, perceptions of price) and likelihood of purchase (likely versus unlikely to purchase)
- Systems: data collection (e.g., via marketing company), storage, retrieval, and preparation
- Statistical modeling: e.g., logistic regression

WHAT PREDICTS EMPLOYEE TURNOVER IN MY ORGANISATION?

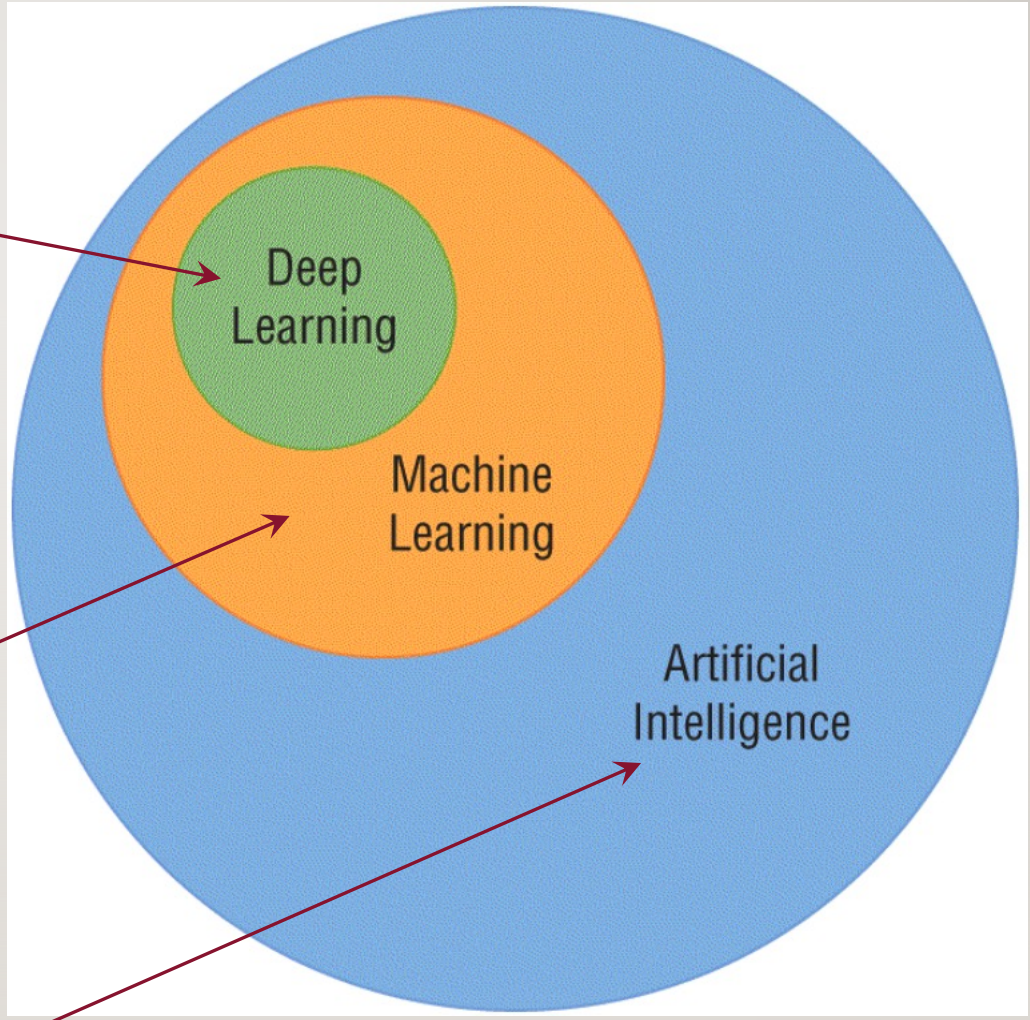
- Strategy: to reduce employee turnover
- Methodological design: decide whether it is turnover intentions or actual turnover that you wish to (or can) predict, collection of data that might theoretically predict turnover (e.g., perceptions of manager, availability of other options, job satisfaction, organisational commitment)
- Systems: data collection (e.g., via online survey), storage, retrieval, and preparation
- Statistical modeling: e.g., multiple regression, structural equation modeling

ARTIFICIAL INTELLIGENCE

Specialised ML that uses complex neural networks to discover new knowledge (usually for image, video, sound analysis)

AI that uses existing data to discover new knowledge

Any attempt to have a computer system mimic human behaviour



Graphic from Nwanganga and Chapple (2020, p. 7)

HOW DOES IT WORK?

- There are a number of different statistical techniques that AI systems use to function, depending on the aim
- Three common aims for organisations revolve around classification and prediction
  1. Clustering into unknown groups (e.g., for market segmentation, preference for workplace format, e.g., group or individual interactions): clustering techniques
  2. Predicting classification into known groups (e.g., hired versus not hired): logistic regression-based techniques
  3. Predicting numerical outcomes (e.g., job performance ratings): multiple regression-based techniques

HOW DOES IT WORK?

- Basic approach involves:
  - Developing a predictive model with training data
  - Testing whether that model works with novel data, refine model
    - Aim is to create a model that generalizes to novel situations
  - Use model with novel data

APPLICATIONS TO HRM: SELECTION

- LinkedIn Recruiter and Zip Recruiter are two examples (of many) of companies that use machine learning (ML) to rank job candidates
- This approach is based on data that applicants have shared, including listed skills, experience, location, and previous interactions online with prospective employers and similar candidates
  - So that's info candidates have previously shared on social media being used to predict person-job fit

HOW ABOUT SCREENING RESUMES?

- ML has a place here too
- *Ideal* is a company that specializes in ML-based resume screening
- It achieves this by comparing candidate experience across resumes and then ranking candidates according to how closely they match the requirements of the job opening
- Saves a lot of time, particularly for companies hiring at a large scale
  - Gains in efficiency and profitability

AN OPPORTUNITY FOR HRM

- Oswald et al. (2020) provided an excellent review of the opportunities available to HRM via AI-related technologies

  Oswald, F. L., Behrend, T. S., Putka, D. J., & Sinar, E. (2020). Big data in industrial-organizational psychology and human resource management: Forward progress for organizational research and practice. *Annual Review of Organizational Psychology and Organizational Behavior, 7, 505-533. doi:10.1146/annurev-orgpsych-032117-104553*

- They suggest that many other disciplines have already benefitted from this approach for over 20 years and so modelling tools are available for us to pick up and use

TOOLS FOR ANALYTICS

SOFTWARE PACKAGES

- There are many, often expensive packages available to assist with data management and statistical analysis
  - E.g., SPSS, SAS, Mplus, Stata, etc
- But there's one package that does everything, that rapidly grows in response to advances in the discipline, and that is completely free
- Furthermore, it was originally developed in New Zealand

WHY R?

- R is really the only data software that can lay claim to the following:
  - Data management? ☑
  - Data manipulation? ☑
  - Any statistical model imaginable? ☑
  - Artificial intelligence, machine learning, and deep learning? ☑
  - Big data? ☑
  - Constantly being updated? ☑
  - Open source and therefore completely free? ☑
  - Lots of books, online groups, and other support available? ☑
  - Widely used by leading tech companies? ☑

READINGS

Dean, M. A., Roth, P. L., & Bobko, P. (2008). Ethnic and gender subgroup differences in assessment center ratings: A meta-analysis [Health & Mental Health Services 3370]. *Journal of Applied Psychology, 93*(3), 685-691. https://doi.org/10.1037/0021-9010.93.3.685

Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). Sage.

Field, A., Miles, J., & Field, Z. (2012). *Discovering statistics using R*. Sage.

Hunter, J. E., & Hunter, R. F. (1984). Validity and utility of alternative predictors of job performance. *Psychological Bulletin, 96*, 72-98. https://doi.org/10.1037/0033-2909.96.1.72

Nwanganga, F., & Chapple, M. (2020). *Practical machine learning in R*. Wiley.

Oswald, F. L., Behrend, T. S., Putka, D. J., & Sinar, E. (2020). Big data in industrial-organizational psychology and human resource management: Forward progress for organizational research and practice. *Annual Review of Organizational Psychology and Organizational Behavior, 7*, 505-533. https://doi.org/10.1146/annurev-orgpsych-032117-104553

Roth, P. L., Bobko, P., & Buster, M. A. (2013). Situational judgment tests: The influence and importance of applicant status and targeted constructs on estimates of Black–White subgroup differences. *Journal of Occupational and Organizational Psychology, 86*, 394-409.

West, M. (2019). *People analytics for dummies*. Wiley.