



Best Practices in Linking Data to Organizational Outcomes

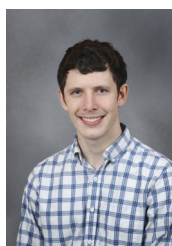
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In today's organizational landscape, it's becoming increasingly clear that companies can gain a competitive advantage by leveraging insights uncovered through effective data analytics. In the field of human resources (HR), there is a growing demand for people with analytical skillsets (Lytle, 2016), as they can effectively identify trends in HR data that enable accurate predictions about an organization and its employees. Specifically, the use of analytics can help organizations better understand their current state and strategically act upon areas necessary to organizational success, such as employee satisfaction, engagement, turnover, productivity, and talent management. Many large, well-known companies like Google, Procter & Gamble, and Sysco have turned to predictive analytics to answer questions about staffing, turnover, and climate (Davenport, Harris, & Shapiro, 2010). However, the predictive capabilities of data analytics are not restricted to those in the *Fortune* 500. They can be leveraged by any company willing to dedicate the appropriate time, personnel, and financial resources. The goal of this white paper is to

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outline some of the basic steps required to make valid, informative inferences based on organizational data.

Many terms, including HR analytics, talent analytics, and predictive analytics are often used interchangeably to describe these practices. Van Vulpen (2016) outlined subtle differences in each of these terms. For example, he explained that "HR analytics" is often used to describe most uses of HR data, whereas "people analytics" refers more broadly to any data related to employees—whether it is managed by HR or not. In this paper, we aim to describe practices aligned with a similar definition of people an-

alytics as "the use of people-related data to improve and inform all types of management, business, and HR decisions throughout the company" (Bersin, Collins, Mallon, Moir, & Straub, 2016, p. 87). Thus, the term "people analytics" will be used throughout this paper and pertains to data that is descriptive as well as predictive in nature.

Background

The use of people analytics has gained traction in recent years due to advances in technology, simplification of statistical tools, prominence in popular media, and recognition of the value that it adds to organizations. As evident to many, the world of work has become more global, fast-paced, flexible, and boundaryless (Schippmann et al., 2000). In order to remain competitive, decisions must be made faster with less room for error. As part of the 2017 Global Human Capital Trends report from Deloitte, it was noted that 71% of companies endorse people analytics as a high priority to their organization, with areas of focus including performance, workforce planning, compensation, and retention of talent. However, despite this overwhelming interest in people analytics, only 8% of organizations report having usable, ready-to-analyze data (Collins, Fineman, & Tsuchida, 2017). This is concerning, as the use of an effective, well-developed people analytics strategy has been shown to reduce attrition rates by 50% and raise business productivity by 26% according to the consulting group McKinsey & Company ("People Analytics," n.d.).

What the effective use of people analytics can do is improve organizational decision making. It is

often the case that, in the absence of data-based decisions, organizational leaders make judgments based on intuitive, emotional factors (Dane & Pratt, 2007). Although there are instances where this may be appropriate (e.g., when decisions need to be made very quickly), decisions based on empirical data typically lead to more desirable results. As an example, like many companies, AT&T and Google believed that high performers would be those who were academically successful from prestigious universities. What they found, however, was that performance on the job was better predicted by one's ability to take initiative (Davenport et al., 2010). These conclusions were reached thanks to the analysis of large quantities of organizational and people-oriented data. These examples are quickly becoming the norm rather than the exception in today's organizations.

Additionally, people analytics can identify patterns in data which may be nearly impossible for human decision makers to identify. For example, Harrah's Entertainment used analytics to calculate the number of staff they needed at different positions, identify costs saved through employee health and wellness programs, and identify opportunities for high-profit clients (Davenport et al., 2010). Nielsen used analytics to identify factors leading to attrition and develop solutions to reduce it (Green, 2016). Sysco used people analytics to identify which employee characteristics were associated with higher revenues and lower turnover, enabling them to increase profitability (Davenport et al., 2010). These conclusions were reached thanks to the analysis of large quantities of organizational and people-oriented data. These examples are quickly becoming the norm rather than the exception in today's organizations.

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To date, much work has been done both in academia and within organizations to determine best practices for the collection of data, management of data, recommended analyses, and data visualization. The effective use of people analytics empowers organizational leaders to make better decisions, plan strategically for the ever-changing world of work, and strive toward continuous improvement. The next section aims to outline these best practices and provide actionable strategies toward a successful people analytics function.

Implications for Practice

The following paragraphs will describe several practical implications derived from industrial-organizational (I-O) psychology research, the broader social sciences literature, and the authors' conversations with experts in the field. A summary of these recommendations can be found in Table 1. Some additional resources pertaining to each recommendation can be found in Table 2.

Table 1 <i>Broad Recommendations for Linking Data to Organizational Outcomes</i>	
Identify the outcomes of interest and their likely predictors	
Create a theoretical model explaining how variables relate	
Identify existing sources of data and areas where further data collection is needed	
Use existing, validated measures in surveys when possible	
Use appropriate methodology for collecting data	
Store data in a central place and use identifiers to link individual-level data where possible	
Use appropriate statistical techniques and software	
Present findings in a way that is informative and meaningful to the intended audience	

Table 2 <i>Additional Resources for Each Recommendation</i>	
Broad recommendation	Resources
1	SIOP Top 10 Workplace Trends HR Magazine (https://www.shrm.org/hr-today/news/hr-magazine)
2	SIOP White Paper series <i>Harvard Business Review</i> Searching for research on Google Scholar
3	<i>On the Distribution of Job Performance: The Role of Measurement Characteristics in Observed Departures from Normality</i> (Beck, Beatty, and Sackett, 2014)
4	Paul Spector's website (http://shell.cas.usf.edu/~pspector/) Academy of Management Measure Chest
5	<i>Research Methods in Industrial and Organizational Psychology: Data Collection and Data Analysis with Special Consideration to International Issues</i> (Spector, 2001) <i>Principles and Methods of Social Research</i> (Crano, Brewer, & Lac, 2015) Coursera (e.g., Methods and Statistics in Social Sciences)
6	Alteryx Statistics Solutions blog – Confidentiality vs. Anonymity (http://www.statisticssolutions.com/confidentiality-vs-anonymity/)
7	Crash Course in I-O Technology (SIOP TIP series by Richard Landers) Richard Landers's blog (neoacademic.com) Coursera (e.g., Business Statistics and Analysis)
8	SIOP "Show Me the Data" Workshop website <i>Visualizations That Really Work</i> (Berinato, 2006) <i>The Wall Street Journal Guide to Information Graphics: The Dos and Don'ts of Presenting Data, Facts, and Figures</i> (Wong, 2013)

An important step in people analytics occurs prior to any data collection or statistical testing. Best practices suggest that organizational stakeholders should first identify which outcomes (e.g., turnover, engagement, absenteeism, performance) they are interested in predicting. These can be outcomes for which the organization already has data or ones for which data will need to be collected. A substantial issue within organizations is the development of appropriate metrics, which entails defining the measurable aspects to be quantified. As an example, performance is an outcome of common interest to organizations as it is directly related to financial proficiency. However, the measurement of performance is complex because it is made up of many different pieces. Recommendations for the accurate measurement of performance can be found in paper by Beck, Beatty, and Sackett (2014).

Next, organizations should identify the predictors they wish to evaluate in relation to the outcome(s) of interest. Many theoretical models and scientific findings in I-O can inform this stage of the process. For example, there is ample evidence that job attitudes such as satisfaction are highly predictive of turnover (Judge & Kammeyer-Mueller, 2012). Years of I-O research have supported the validity of the job characteristics model (Fried & Ferris, 1987), which identifies job features such as feedback from others as important predictors of performance, absenteeism, and satisfaction. Overall, there is no shortage of useful theories organizations can leverage to identify predictors of critical outcomes. Of course, organizations may also use data they have already collected (for example, from an employee attitude survey) when relevant to the outcome of interest. As potential predictors are identified, organizations should work toward the construction of a model which describes predictors' expected relationships to outcomes. This will enable the organization to identify testable research questions. The benefit of this step is that, when a model is outlined in relation to human behavior, the insights stemming from the findings are more actionable. Let's say that via an annual survey you find that employee age predicts engagement. Although this information may be valuable, it is difficult to explain why this relationship exists and to further strategize upon these findings. Recommendations for the development and evaluation of a testable research question can be found in Table 3.

Sometimes, organizations may eschew the creation of a theoretical model in favor of examining data first and creating a model afterward based on the data. This is often used in conjunction with large volumes of information, typically referred to as big data. Although big data analytics can provide very useful insights for organizations, it can and should be used in conjunction with theory. As McAbee, Landis, and Burke (2017) point out, data mining and other inductive, data-based approaches can direct researchers toward interesting relationships and questions but can be problematic when used to create models without any theoretical grounding. The authors outline several flaws in using a purely atheoretical, data-based approach. First, theory is needed to hypothesize and



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explain causal relationships among variables. Simply examining the statistical relationships among large numbers of variables does not explain why those relationships may exist and what organizations should do to take advantage of them. Second, many variables studied within big data may be deficient measures of the concept an organization wishes to study. For example, the number of emails sent by employees, mouse clicks, and other behavioral measures that organizations can easily collect may not be accurate indicators of variables such as employee productivity. Last, models based purely on statistical relationships are unlikely to generalize to other situations, samples, environments, and periods of time. In contrast, models grounded in organizational theory are likely more applicable to a wide variety of contexts. Overall, organizations should absolutely use inductive, statistical approaches such as big data analytics if available—however, they would be best served by using it to complement rather than supplant the creation of theory-based models. Interested readers are referred to the article by McAbee et al. (2017) for further discussion on this topic.

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Once a theoretical model has been created, organizations should identify how they will measure the constructs of interest. This could be with data that is already available such as employee demographics or data that must be collected via survey or experiment. It is important to note that even if data is available, such as performance ratings, it may be valuable to collect additional data that is more representative of the construct and offers substantial variability between individuals. Variability is important because if all employees endorse the same value, it is impossible to predict differences between them. This is a common issue with self-

reported performance as employees are unlikely to report that they perform poorly. Additionally, information drawn from statistics is only as valuable as the appropriateness of their construct measurement. In other words, for statistical techniques to be informative and provide real organizational utility, constructs of interest should be well-defined and well measured. To the extent possible, organizations should use or adapt existing measures from I-O literature rather than attempting to develop measures from scratch. Some sources for validated measures include Paul Spector’s website (Spector, 2014) and the Academy of Management Measure Chest (“Measure Chest,” n.d.).

Table 3 <i>Recommendations for Developing a Testable Research Question</i>	
Questions to ask	Example
1. What outcome am I interested in?	I wish to understand engagement within my employees.
2. What science or theory exists around this topic?	Research shows that substantial predictors of engagement include autonomy, social support, and feedback.
3. What is our current state?	Our open-response questions regarding the company have shown that a lot of employees are frustrated about bureaucracy.
4. How does our current state relate to the science or theory out there?	Research shows that bureaucracy is related to lower autonomy which is a supported predictor of engagement.
5. What is my research question?	Do perceptions regarding bureaucracy impact employee engagement?

Organizations should also ensure that they are using the appropriate data collection methods to answer their questions. For example, organizations interested in examining the effects of a new health intervention may be better suited by an experimental design rather than a survey. Although surveys are the easiest to design and administer, they may provide little utility in terms of prediction if administered once, so it is imperative that organizations consider their goals when selecting a specific method. Surveys administered repeatedly (e.g., annually, quarterly, etc.) will allow for tests of one's theoretical model over time. Additionally, in initial phases, organizations may be unsure which predictor constructs they should be interested in. If this is the case, open-ended, qualitative data may be beneficial to identify initial ideas for a more quantitative-focused data collection later on. Interviews, focus groups, and observations can be very useful tools for organizations attempting to identify employee-centered predictors influencing their outcomes of interest. Although space limitations preclude a summary of best practices in qualitative research, interested readers are referred to *Principles and Methods of Social Research* by Crano, Brewer, and Lac (2015) for more information. Regardless of the methodology used, it is also important for organizations to obtain a representative sample of their workforce. If the entire workforce cannot feasibly be assessed, sampling randomly from the employee population will likely lead to representativeness. Organizations should be mindful that employee non-response may bias results in surveys. For example, employees who are low on job satisfaction may be less likely to fill out a survey on job attitudes. It is recommended that, in an effort to increase employee participation, surveys be brief, clearly outline their utility, engage leaders as well as employees, be well-marketed, and ensure confidentiality when possible.

Additionally, using best practices in people analytics entails proper use and handling of the data once it has been collected. To the extent possible, organizations should try to store data in the same central locations within the company. This makes it easier for stakeholders to locate the data they need and determine what data they have available. The confidentiality or anonymity associated with data collection depends on the specific research question being asked. When possible, it is best to allow employees to respond anonymously so that they feel free to answer honestly and without fear of punishment for negative feedback. However, instances where trends in data need to be evaluated or where individual performance is an outcome, the use of identified data is necessary. In this case, data collected at the individual level should be linked using a unique, anonymous or confidential identifier for each employee. To protect privacy, personal identifying or sensitive data should not be collected and employees should never be mandated to respond to a given question. Employees should always be informed about the level of anonymity or confidentiality with which the data is being held. Last, a given individual employee's data should not be reported alone; data should only be reported in the aggregate. As an example, if managers receive reports regarding the job satisfaction of their subor-

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ordinates, they should likely receive the average across subordinates rather than individual data points by person. This can reduce issues with anonymity and allow employees to feel safe responding honestly without fear of reprisal.

Proper people analytics requires both an understanding of human behavior as well as the statistical knowledge needed to determine whether an organization's proposed hypotheses are supported.



Proper people analytics requires both an understanding of human behavior as well as the statistical knowledge needed to determine whether an organization's proposed hypotheses are supported. Table 4 contains a summary of some statistical techniques that can be employed in people analytics, along with an explanation of their use. This is not a comprehensive list, but the techniques listed here can answer many research questions an organization may have. For more information on these methods and their appropriate uses, see Spector (2001). In addition to having the right skill set, organizations must provide analysts with the proper software. Microsoft Excel can perform many useful analyses, such as descriptive statistics, correlation, and regression. Social sciences researchers often use programs such as SPSS (IBM Corp., 2013) to perform several types of analyses with a user-friendly interface. R is a free program (R Core Team, 2013) that is becoming increasingly popular and

Table 4

Useful Statistical Techniques for People Analytics

Statistical technique	Useful for...	Example
Descriptive statistics	Examining demographic characteristics, benchmarking, examining a single variable	Comparing an organization's average engagement level to industry norms
Correlation	Examining the relationship between two variables	Determining whether employee satisfaction is linked to employee performance
Regression	Predicting the value of one variable using several predictor variables	Predicting employee turnover with employee performance, satisfaction, and engagement
Analysis of variance (ANOVA)	Examining group differences on variables	Determining whether there are differences in job satisfaction between salaried and hourly workers
Factor analysis	Examining the underlying structure of scales to aid in their development and refinement	Determining which items should be removed if an engagement survey needs to be shortened
Hierarchical linear modeling	Examining variables at more than one level of analysis (e.g., person, team, organization)	Determining whether the amount of communication within a team predicts individual performance
Structural equation modeling	Testing complex models involving several predictor and outcome variables	Determining the extent to which job satisfaction, engagement, and perceived fairness predict job performance and intentions to quit

is flexible enough to conduct almost any type of statistical analysis required for HR. It can also be used to create unique and appealing data visualizations.

Last, the presentation of data is an important step in people analytics. It is important to tailor the presentation to the audience in question. Specifically, focusing on outcomes and predictors which are meaningful and important to the audience will help to tell a story all can understand, regardless of statistical background. The level of statistical complexity presented should not greatly exceed the audience's level of statistical knowledge. Even with a statistically fluent audience, it is better to err on the side of focusing on the results of analyses rather than focusing on the statistical methods used. In addition, visualization of data should quickly convey a story to the audience—more graphs, lines, or colors do not necessarily make a visualization more informative. Simpler visuals are often more effective in telling a story with the data. Although this paper will not go into detail on data visualization and design, several useful resources for visualization examples and techniques can be found online; a good place to start is the website developed for a SIOP workshop on data visualization (Sinar, Doversberger, & Charles, 2016), which can be found at <https://sites.google.com/site/showmethedatasessionnotes/>.

Next Steps

As noted, the appropriate use of people analytics can greatly enhance an organization's understanding of a variety of constructs important to organizational proficiency such as turnover, employee engagement, or performance. However, not all analytic practices are equal and it is important that, in order to glean an appropriate understanding of employee behavior, organizations understand what they are measuring, effectively utilize theory, and use appropriate methodology. For those organizations looking to employ an effective people analytics strategy, it is recommended that they consider the following:

Utilize theory and ensure proper construct measurement. The use of theory at the early stages will not only aid in the development of a data collection strategy, but will also help in determining appropriate constructs to link to people-relevant outcomes. In addition, the proper measurement of selected predictor/outcome constructs is imperative as analytical interpretations are only as valuable as the degree to which constructs were measured appropriately. As noted, there are a variety of empirically tested academic measures available for use for most constructs of interest to organizations. It is recommended, especially in cases where internal personnel lack the technical expertise to create well-designed surveys, that these academic measures be utilized.

Select the appropriate methodology for your research question. In many cases, survey data collections at the same time point are easiest and least burdensome on employees. However, sim-



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ple survey data collection can hinder data scientists' ability to make predictive insights. Additionally, the efficacy of various organizational interventions can be difficult to assess when employees self-select into study participation. Despite the limitations organizations commonly face when attempting to design data collection strategies, it is recommended that methods are selected that are appropriate for the questions being evaluated.

Ensure adequate employee participation. In order to make accurate statistical models relevant to the population of an organization, it is imperative that a good representation of employees participates in data collection. Best practices regarding employee participation suggest that surveys should be visually appealing, brief, and fun when possible. Change management initiatives can also be utilized to communicate the use of surveys and the benefit to employees. For example, organizations can explain how the results of surveys will be used to identify ways of improving employee satisfaction, reducing stress, or reducing turnover. Organizations can emphasize the importance of employee participation in making these positive changes.

Integrate data earlier rather than later. When able, store data from across departments together and use a common data template (e.g., variables always have the same name). Data that are compiled in a similar format can be easily merged and more quickly analyzed. Many, if not all, statistical programs require data to be in a specific format before analysis can occur. When various formats exist between datasets, programs such as Alteryx exist to aid in the merging of variables across datasets. However, even this program has many limitations and requires work on the front end. It is better to set the data up from the beginning to ensure easy merging and analysis.

Use benchmarking resources to better understand your organizational strengths and deficits. Certain constructs, such as employee engagement (Mann & Harter, 2016), have a low rate of positive endorsement despite proper measurement. For constructs of this nature, it may be more fruitful to understand where your employees stand in relation to other organizations of a similar size within your industry rather than just as a descriptive value. There are many ways to access benchmarking data and normed percentiles for various constructs. One example is the Mayflower Group, which allows large organizations to view and use thousands of survey items as well as compare scores. However, the use of this program is costly, and to be eligible, your organization is required to employ more than 7,500 people and actively employ a survey strategy. Other, less restrictive benchmarking systems are also available through programs such as SurveyMonkey.

People analytics is becoming increasingly valuable as more and more companies use it to improve decision making and gain a competitive advantage. Although most organizations will not have the resources of Google or Procter & Gamble, every company can leverage people analytics to improve their human capital management. The steps and resources we have provided here can help any organization connect people-related data to the outcomes they care about. In this way, we hope this paper will serve as a roadmap for organizations interested in getting involved in the exciting and promising field of people analytics.



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