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Liz Wanless
Ohio University, Wanless@ohio.edu

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Progressive Analytics Diffusions: Rewiring our Software

Liz Wanless

Ohio University

Please send correspondence to: Liz Wanless, Wanless@ohio.edu

The sport industry is no stranger to the pursuit of innovation (Slack & Thurston, 2021). One such innovation, the use of numerical data to drive business processes spans the sport industry in various capacities (Troilo et al., 2016). Sport business leaders attribute increased revenue generation from ticket pricing strategies, improvements throughout the customer lifecycle, and successful marketing campaigns to incorporating data-driven decision making (Harrison & Bukstein, 2017). The adoption of numerical data analysis to support the business-side of sport in the professional sport industry did not happen for all organizations at once, but instead followed a theoretically described progression (Wanless & Naraine, accepted, 2022). Diffusion of innovations theory was developed to explain how and why innovations are adopted within a social system (Rogers, 1963; 2003). Part of the theoretical expression involved classifying organizations from a social system according to their innovation adoption timing. Regarding the diffusion of numerical data to drive business practice in the professional sport industry, the innovators began this practice in the early 2000s. The laggards or latest adopters comprise organizations that have yet to adopt up to this point.

While sport analytics adoption has origins in the early 2000s, it seems only lately we are noticing the initiation of sport analytics programs and classes. Professional sport seems to be closing their adoption curve in this area and sport management education in the early adoption phase. But what seems conclusive, especially in professional sport (everyone's analyzing data), is just a beginning in the ongoing cyclical nature of the progressive evolution of the field (Wanless & Naraine, accepted, 2022). Diffusion curves are ever initiating in sport even throughout analytics application. While we may be at the back end of the business analytics diffusion curve (in the traditional numerical sense), the analytics realm has been and will be an ever-evolving set of diffusion curves, where different technical capabilities and data availabilities will spread and mainstream throughout the sport industry. These progressive analytic diffusions will impact sport management research and education. We have an opportunity to keep and generate pace.

Sport Business Unpacks Text Data

In a study of 89 teams in the Big Four professional sport industry, 88 adopted business analytics, traditionally considered as the analysis of structured numerical data, by May 2020 (Wanless & Naraine, accepted, 2022). It is rare to learn of a professional sport organization that has not yet harnessed quantitative

analysis to support business practice. While the analysis of structured numerical data diffused through the Big Four professional sport industry beginning in 2002, a new development began in 2010 (Wanless & Naraine, accepted, 2022). Natural language processing (NLP) embodies the computer capability to recognize and reproduce the human language (Albalawi et al., 2020; Joseph et al., 2016). While text data analytics has continually progressed in the history of analytics field, we are now seeing evidence of rampant NLP use in the sport industry (Wanless et al., 2022). Sport organizations realized the merit of harnessing analyses to interpret the large volume of text data not just in the public narrative (although this is the prevailing use case; Wanless et al., 2022), but also for internal document analysis and classification as well as language translation. From sentiment analysis to derive consumer emotive attitudes in the public narrative (Ponce, 2014) to implementing chat bots (Long & Connelly, 2017), sport organizations integrate NLP in various ways.

A study of 91 professional teams in the MLB, NBA, NFL, and NHL found that more than half (48/52.7%) used NLP to advance their sport business efforts by May 2020 (Wanless et al., 2022). Sport organizations disclosed the tasks by which they utilized NLP. The use cases are broad. Sport organizations reported utilizing NLP to gain insight from text data in six wide areas: 1) customer relationships, 2) the organization, 3) partnerships, 4) competitors, 5) the sport industry, and 6) the sport experience. Notably, within these areas, the 48 teams declared 334 uses spanning automated customer interactions, automated journalism, and partnership risk assessment associated with scanning the digital public narrative for potentially negative information regarding potential partners. NLP began to diffuse faster and broader than many anticipated. While NLP is in its thirteenth year in the professional sport industry, where is the navigation and training regarding this capability in sport management undergraduate, graduate, and doctoral programs? Beyond this, another branch or analytics development may be in the early takeoff phase of diffusion in professional sport at this moment.

Knowing that analytics are important to sport business advancement, knowing the analytics realm is steadily evolving and knowing executive leadership is critical to the adoption of analytical tools, what does this mean for sport management research and education?

Research

As analytics evolves so too do the types of analyses that can be harnessed to derive insight from data and theoretical application in sport literature. As sport organizations learn the power of NLP and machine learning at large (Wanless et al., 2021), sport researchers and doctoral programs are beginning to ask themselves: what does it mean to apply machine learning methods to advance the answers to sport management questions? With sentiment analysis, topic modeling, and other NLP algorithms impacting sport so broadly across functional areas, researchers are beginning to note the potential for sport research (Chang, 2019). Largely, though, researchers and doctoral programs should be asking themselves what it means to keep and generate pace as applied analytics for sport continues and will continue to develop.

Analytics is broad beyond and will evolve past quantitative training within doctoral programs. Current quantitative training focuses attention toward how to use certain analyses (e.g., a course in statistics or structural equation modeling). This is important as sport management doctoral programs produce future

scholars and reviewers that should have some working knowledge of foundational analyses in the field. We certainly have vehicles to develop contemporary skill sets for researchers looking to embody the applied analytics researcher of the moment. Core courses in doctoral programs for analytics and data science (depending on the program a potential mix of predictive/prescriptive analytics, statistics, and computer science courses) provides a great window into the types of courses that might be formidable for an analytics track within sport management doctoral programs. Modifications to existing sport management doctoral structures have the potential to bolster student qualifications. In just one example, replacing the typical one-semester social sciences statistics course covering hypothesis testing, ANOVA, and regression analyses with a year-long statistics progression covering those topics and others important to analytics such as probability and probability distributions, could be considered a preparation upgrade (seemingly evident as an elective option within Temple's PhD in Business Administration/Tourism and Sport). This year-long approach for foundational statistics theory and application is typical of mathematics, engineering, and other STEM degree programs that create a more conducive foundation to evolve along with the analytics field. This approach from such programs often accompanies faculty with teaching rigor and experiences that better reflect the analytics field. To add, many doctoral programs in data science and analytics allow flexibility in elective choice for students to chart their own path, an important vantage point to consider for sport management doctoral students to continue to develop technical skills. And of course, recruiting students with significant quantitative backgrounds, such as engineering or analytics bachelors or masters will be better positioned to embrace the previously described analytics track. Keep an eye out for quantitative preparation in other areas, however, as women typically major in alternative quantitative disciplines such as marketing or psychology – Jessica Gelman of KAGR being a prime example with her Harvard major in Psychology.

But as previously stated, the analytics realm keeps moving. Analytics diffusion curves are ever-presenting. What about the emergence of NLP and the emergence of additional analytic capabilities? Missing from doctoral programs globally in quantitative training is addressing systematic and intentional processes to take on and learn new analyses in a rigorous way. Doctoral programs including independent study work can quickly route in the flexibility needed to take on machine learning methods, such as NLP in the academic environment. A doctoral analytics track that also includes an analytics independent study option, where students apply analyses early in their diffusion in professional sport or those not yet diffusing may be a platform to not only keep but generate pace in sport analytics application in research. Accountability and a focus on a specific method across a semester can create a solid context for understanding. How often are we teaching the current state of the art, rather than teaching systematic ways for taking on new analyses in a rigorous way? Teaching structural equation modeling is one important concept, while teaching students how to assemble and synthesize resources, such as textbooks and integrative literature reviews as a background from which to deliver new analysis application is another and necessary partner. The increased analytic focus within sport management doctoral programs has a tradeoff with the exclusion of other courses, a tradeoff worth considering given the demand for professionals who can carry teaching and research in the area in the job market especially for students wanting to develop that skill set.

Education

As analytics evolves so too do the potential value-add insights to support sport business. The analysis of numerical data generates insights for sport organization functional areas from marketing to operations both on and off the field (Fried & Mumcu, 2017). It is clear the analysis of text data operates comparatively with a wide range and wide-reaching impact for the sport industry. Professional sport organizations attest to advancing customer relationships, partnerships, and the event experience through harnessing NLP (Wanless et al., 2022). Given that sport management professionals across the functional areas (not just those comprising the analytics teams) are such a critical piece to how these analytic initiatives take shape (McKinsey, 2016), sport management programs have a question to answer: what does it mean to facilitate analytics education for students who will pursue sport analytics and also for those who will not? The answer to this question becomes more complicated as diffusion curves of analytic advances continually emerge.

The technical training for those students wishing to pursue sport analytics as a career can be successful in different forms. Significant analytics exposure exists in sport analytics programs or as a sport track within analytics programs at large or in other disciplines, such as engineering. While finance and economics typically comprise the quantitative coursework in sport administration curricula, partnerships with programs tackling NLP- and machine learning-related problems, coding, and execution will create platforms to keep pace with the diffusion of other types of analyses as these disciplines will likely be facing emerging analytic diffusion curves in the business sector at large. The technical path for sport analytics professionals has flexibility, but what about training leaders outside of the technical realm?

Sport analytics education is essential for non-technical personnel (Wanless & Naraine, 2020). Students planning to pursue careers in marketing, operations, sales, and beyond cannot expect to place their data-driven solutions solely in the hands of the individuals with technical training. Given the analytics process (e.g., the Cross-Industry Standard Process for Data Mining), individuals with contextual knowledge are critically important to the business understanding and solution deployment phases. Sport executives external to the analytics team will also be instrumental in data warehousing and analysis system acquisition, a critical component to analytics process success. From frontline sales professionals to the executive level, Braden Moore of the Philadelphia 76ers claimed analytics execution was a full organization process (Moore, 2018). In fact, many of the reasons why analytics programs fail is because of the executives, the nontechnical personnel surrounding the analytics team (McKinsey, 2016). Executives failing to embrace the technicalities also fail to implement the results. Data-driven culture, data integration strategies, analytics project management, strategic uses, all represent topics that are underexplored and underestimated in sport management education. Sport data strategy, entrepreneurship or sport management capstone classes can zig and zag around these topics as they emerge. In the master of business administration program at Ohio University, the class that covers such topics for business at large is termed analytics for executives. I will teach the class for the third time this summer. Given the influence that business analytics has and will continue to have, executives with data-driven training will gain an edge over their peers to advance to the c-suite. A student knowing the full capabilities of NLP, for example, may drive competitive advantage for themselves and their careers. Top sport management graduate programs such as Ohio University and

University of Massachusetts-Amherst have implemented dual graduate degrees in business administration as well as sports administration to help business professionals gain that competitive edge through business acumen. The new dual degree for next generation sport leaders is the master's in business analytics coupled with the master's in sports administration.

Conclusion

The sport industry is ripe with innovation. The sport analytics realm represents the continual emergence of innovation diffusion curves. Sport gave birth to and celebrates leaders that change the game; *Moneyball* is one prime example. In sport management research and education, however, do our general attitudes look more like Billy Beane's or some of the reticent and preventative individuals surrounding the push against something new? Through innovating both research and education in response to diffusion curves in sport analytics, we can create the space to not only keep but also generate pace.

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