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A Systematic Review of the US Graduate Programs in Business Analytics

Emergent Research Forum (ERF)

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Abstract

This research responds to a growing interest among higher education institutes in creating programs to train data-savvy managers. The paper explores the current landscape of business analytics education in the United States. The aim is to understand how higher education institutes respond to the growing demand for analysts and professionals with quantitative skills. By conducting a systematic review of more than 190 graduate programs, this paper provides a detailed snapshot of the current status of the programs related to training data-savvy managers. Benchmarks are provided for higher education decision-makers to guide the design of graduate programs for training managers, who will need to rely heavily on data analysis in their decision-making.

Keywords

Business Analytics Education, Higher Education, Graduate Programs, Data-Savvy Managers, Systematic Review.

Introduction

One of the consequences of the digital age is that data is all around us, increasing at an explosive rate. The effect is being felt everywhere, from governments to the arts, from business to science (“Data, Data Everywhere” 2010). The challenge is making sense of this overwhelming resource and getting meaningful, usable information out of it. One of the main barriers in extracting value from data and analytics is attracting and retaining the right talent (Henke et al. 2016). Professionals with deep quantitative skills and analytical reasoning are in extremely high demand internationally and regionally. In the United States, the projected job market for analytics-related occupations remains stronger than average well into the future (“Bureau of Labor Statistics” 2022). Statisticians and analytics-based occupations (with a median income of 91k in 2019) are expected to be in the top ten of fastest-growing jobs through 2030 (“Bureau of Labor Statistics” 2022). In nearly every industry, data is increasingly used to inform decision-making. Data-driven decision-making applies to a diverse set of fields - ranging from finance, pharmaceuticals, natural sciences, public policy, insurance, entertainment, sport management, healthcare, and political science. The diversity of employers drives the market shortage in domain experts and managers who can benefit from the data in their decision-making.

Higher education institutes are responding to the rising demand for analytical skills by offering various business analytics and data science programs. The issue posed for colleges and universities interested in providing these programs is the status of existing programs and the next steps to take. This research responds to this growing interest among higher education institutes in creating analytics-related programs. The focus is on the programs with the aim of preparing domain experts for analytics-related roles in their field of interest. These programs are designed to add analytical skills to the existing domain

experts and managers to enable them to rely on data analysis in their decision-making. This paper explores the current landscape of business analytics (BA) education and provides evidence from thematic and statistical investigation of the current BA graduate programs in the United States in terms of their structure, credits, and content.

Conceptual framework

To set the boundaries around this investigation and as an analytical foundation for the study, a conceptual framework was used based on IS2020 Competency Model (Leidig and Salmela 2020). A conceptual framework allows the researchers to capture the complexity of a phenomenon without formalizing specific interactions among variables. It serves as a lens to explore or examine a phenomenon by defining the scope of the investigation and can be used to guide data collection and analysis. This approach matches Sarker et al.'s guidelines for qualitative studies in information systems (Sarker et al. 2013).

The IS2020 Competency Model (Leidig and Salmela 2020) by the Association for Computing Machinery (ACM) and the Association for Information Systems (AIS) intends to facilitate the development of graduates who are well prepared for jobs that require the design and management of technical solutions for users' organizational, societal, and disciplinary needs of computing. The model aims to balance information system competencies, domain-specific competencies, and individual foundational competencies. Overall, the IS2020 report identifies nineteen competency areas and groups them into six broad competency realms: foundations, data, technology, development, organizational, and integration competencies. It should be noted that although the model is initially aimed at undergraduate IS programs, the core competencies are relevant to analytics-related education at any level. Thus, the above-mentioned broad competencies were used as the initial codebook to inform the data analysis. Figure 1 shows a high-level representation of the conceptual framework for this study.



Figure 1- High-level conceptual framework based on the IS2020 Competency Model

Methodology

To obtain a representative sample of specialized BA master's programs in business schools, this study utilizes the official website of the Graduate Management Admission Council (GMAC) ("Graduate Management Admission Council" 2022). GMAC provides a program finder function to help prospective students find the right programs. The GMAC program finder tool was used as a starting point to find business analytics graduate programs. With goal of investigating all Master's programs with Business Analytics focus in the USA, the initial criteria to find the programs included:

1. Degree: Master's, excluding MBA
2. Type: Full Time or Part-Time
3. Focus: Business Analytics/Decision Science (a GMAC-defined category)
4. Class Style: On Campus, Online, or Hybrid
5. Location: US

The search in January 2022 returned 193 programs. The results included a few duplicates since some universities have similar online and on-campus programs but present them separately. The website of each program was investigated, and the list was refined to delete duplicate programs and programs beyond the scope of this study. The focus of the investigation was graduate programs in business schools targeting the training of data-savvy managers and analysts. Therefore, any program that only focused on one specific area of analytics (e.g., marketing analytics, healthcare analytics, supply chain analytics, etc.) was excluded from the investigation. Moreover, since the scope of the study was training data-savvy managers, programs with a pure focus on data science or data analytics without a connection to the business application were also excluded from the dataset. Furthermore, the programs with limited data

available on their public website were also eliminated since the required information could not be obtained.

Overall, 82 graduate programs in the US with a focus on business analytics were investigated in detail. At each program website, a researcher recorded the number of prerequisites, required, elective, and total credits, along with class style and delivery mode. Required and elective courses, tools, and techniques covered in each program were also recorded when available publicly.

An inductive data analysis approach was used to generate themes from the data collected. The focus of the analysis was on elaboration and interpretive methods to construct theory-informed narratives (Walsham 1995) with the attempt to create an accurate representation of reality. Content data analysis techniques advocated by Strauss & Corbin (Corbin and Strauss 2014; Myers 2013) were followed to identify categories and relationships between those categories using DeDoose text analysis software (based on researches discussion and consensus). The study’s conceptual framework informed the analysis of the data.

Findings

At the time of writing this manuscript in February 2022, data collection is complete, data analysis has been conducted, and preliminary results have been produced.

The analysis of the number of credits in investigated programs (Figure 2) shows that a total of 30-34 credits is typical, although the total credits may vary between 30 to 52 credits. However, further analysis of the required and elective credits shows a wider variation. As depicted in Figure 3, the number of required courses varied from six to 46 credits (25-30 required credits were the most common categories). The total elective credits ranged between 2-25, with ten electives as the most frequent category.

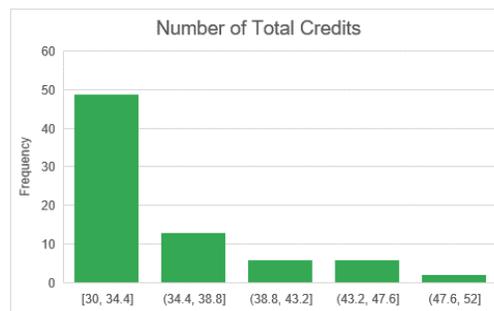


Figure 2- The analysis of the total number of credits in BA Graduate Programs

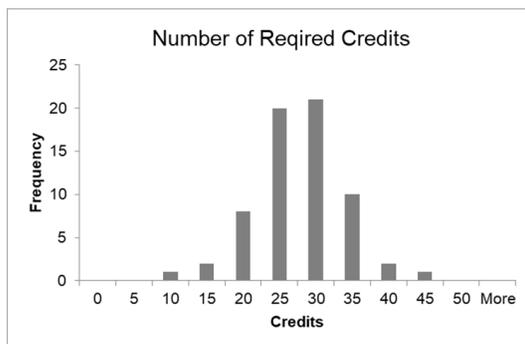


Figure 3-a

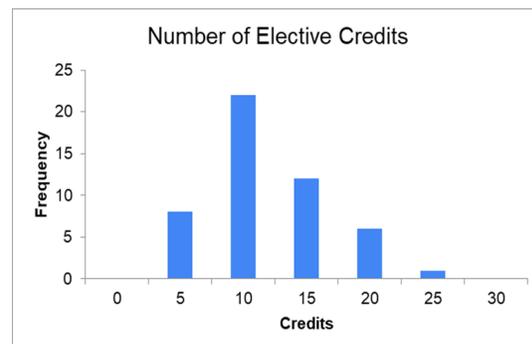


Figure 3-b

Figure 3- The number of required (Figure 3-a) and elective (Figure 3-b) credits in BA Graduate Programs

Regarding the topics covered in the BA Graduate Programs, the course titles and descriptions were examined and categorized by thematic analysis within the overall structure of the IS 2020 Competency

Model. Figure 4 shows the percentage of the programs covering various areas of the broad competency realms. As expected, all programs cover *data*. Also, *Integration* and *Foundation* areas were covered by the majority of the programs. The least frequently covered competencies were *Technology* and *Organizational domains*.

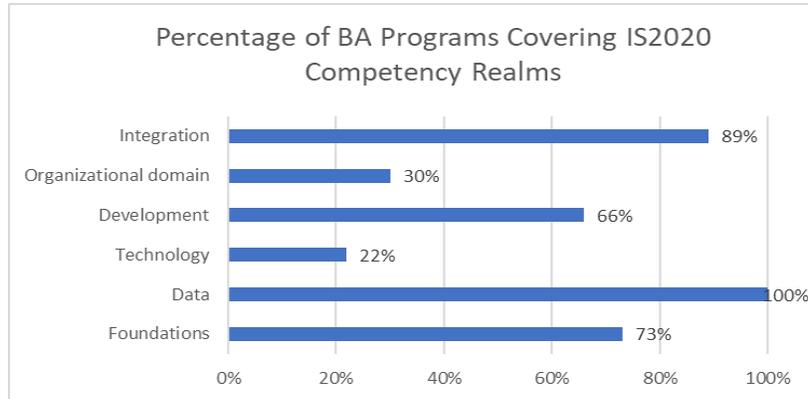


Figure 3- The percentage of BA Graduate Programs covering IS2020 competency realms

Within the overall structure of the IS2020 competency model, the required and elective courses offered in the investigated BA programs were analyzed, and the most common topics were extracted by thematic analysis. Figure 5 demonstrates the themes that emerged from data analysis of the course topics.

Foundations	Data	Technology	Development
<ul style="list-style-type: none"> IS intro/managing the digital organization Statistical analysis 	<ul style="list-style-type: none"> Business analytics/ data science intro database/ data management Data mining/ machine learning Artificial intelligence Visualization and storytelling with data Big data/ big data analytics Business intelligence/decision support systems Specific DM/ML algorithms Specific analytics techniques Specific analytics applications 	<ul style="list-style-type: none"> Infrastructure/ network Cloud computing Secure computing Emerging technologies (e.g., IOT, Blockchain, etc.) 	<ul style="list-style-type: none"> System analysis & design Application development Programming
Organizational domain	Integration	Others	
<ul style="list-style-type: none"> Ethics, use & implications for society Management & strategy Digital innovation Business process management 	<ul style="list-style-type: none"> Project management Capstone/ Practicum/ Project 	<ul style="list-style-type: none"> Business Essentials/ Fundamentals Special Topics Data-driven organizations Data and Information Quality Research Methods ... 	

Figure 4- Thematic analysis results of the topics covered in BA Graduate Programs

The most common prerequisite course is statistical analysis. The top five required courses are respectively capstone project/practicum, database/ data management, specific analytics techniques, business analytics/data science introduction, and data mining/machine learning. A capstone project was required for most BA graduate programs (83%). Most programs (73%) included one or more specific courses on analytics techniques, including exploratory data analytics, predictive analytics, prescriptive analytics, probability and data modeling, forecasting, optimization, risk management and simulation, spreadsheet modeling, time series modeling, decision modeling, multivariate data analytics, and data streams analytics.

The elective courses were more diverse and repeated less frequently than required courses. The most frequent electives are courses on a specific analytics application, courses on a particular data mining/machine learning algorithm, and visualization & storytelling with data. Although the specific applications of analytics were the most frequent elective course, programs offered a wide variety of analytics applications based on their program focus and faculty specialties. Examples include supply chain analytics, marketing analytics, accounting analytics, financial analytics, healthcare analytics, data analysis for security, government data & analysis, transportation informatics, climate & ecosystem monitoring, sports analytics, management analytics, data-driven quality management, HR & people analytics, game data analytics, fraud analytics, entertainment analytics, internet customer analytics, customer relationship management analytics, and competitive analytics.

Regarding the program format, only 60% of the investigated programs mentioned their format. The most frequent design was online (41%), and the least frequent was the on-campus format (21%). Only half of the investigated programs (56%) mentioned the tools and platforms they cover in their programs. Python and R were the most common tools/platforms; however, programs used a variety of tools such as SQL, Tableau, SAS, SPSS, and Excel.

Concluding Remarks

This research responds to a growing interest among higher education institutes in creating programs to train data-savvy managers. By conducting a systematic review of more than 190 graduate programs, this paper provides a detailed snapshot of the current status of the programs related to training data-savvy managers.

Findings indicate that there is a high degree of variability across the programs. The variability can be demonstrated in several ways, such as the content of the courses offered, the structure of the programs, the number of required credits in the programs, and the tools and techniques being used. Benchmarks are provided for higher education decision-makers to guide the design of graduate programs for training managers, who will need to rely heavily on data analysis in their decision-making.

This study serves as a foundation for future works that include a comparative study of the industry needs with typical BA curriculum to measure how well these BA programs are preparing students for careers in the workforce and find the potential gaps between the programs and market demand. By integrating the potential gaps in the thematic analysis of the topics currently covered in BA programs, an extended competency framework will be developed for higher education decision-makers to guide the design of analytical graduate programs.

REFERENCES

- “Bureau of Labor Statistics.” 2022. <https://www.bls.gov/emp>.
- Corbin, J., and Strauss, A. 2014. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, Sage publications.
- “Data, Data Everywhere.” 2010. (<https://www.economist.com/special-report/2010/02/27/data-data-everywhere>).
- “Graduate Management Admission Council.” 2022. (<https://www.gmac.com/>).
- Henke, N., Bughin, J., Chui, M., Manyika, J., Saleh, T., Wiseman, B., and Sethupathy, G. 2016. “The Age of Analytics: Competing in a Data-Driven World.” (<https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/the-age-of-analytics-competing-in-a-data-driven-world>).
- Leidig, P., and Salmela, H. 2020. “IS2020 Competency Model.” (<https://doi.org/10.1145/3460863>).
- Myers, M. 2013. *Qualitative Research in Business and Management*, London: Sage.
- Sarker, S., Xiao, X., and Beaulieu, T. 2013. “Qualitative Studies in Information Systems : A Critical Review and Some Guiding Principles,” *MIS Quarterly* (37:4), iii–xviii.
- Walsham, G. 1995. “Interpretive Case Studies in IS Research: Nature and Method,” *European Journal of Information Systems* (4:2), pp. 74–81.