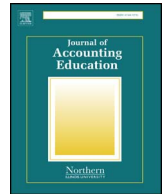




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Educational Case

Power from the ground up: Using data analytics in capital budgeting

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ABSTRACT

In this case, you will perform quantitative and qualitative analyses to determine if a university should repair its existing coal powered boilers or replace the aging system with a geothermal plant. Politicians and local coal workers are pressuring the university to repair the existing coal furnace because this strategy requires a lower initial investment and supports the local coal industry. Faculty and students are pressuring the university to make an investment in green energy by constructing a geothermal plant, despite the higher initial cost. In conducting your analysis, you must balance the desires of these stakeholders against financial realities. You will: (1) apply statistical skills to evaluate cost behavior and consumption trends using historical data, (2) develop skills in predictive data analysis to forecast future possible outcomes, (3) analyze the impact qualitative factors may have in making appropriate recommendations from data from the perspective of various stakeholders, and (4) strengthen applied spreadsheet skills and proficiency.

1. The case

Elizabeth Robertson looked through her office window onto the campus mall at the protesting students and audibly sighed. Since taking the Chancellor's post at Holt State University, Elizabeth had developed a reputation for getting her way. A frequently divided Board of Trustees often made the job difficult. Though no one knew for sure, rumors flew when she was first appointed that she was a contentious choice and only squeaked by in the final vote. Still, Robertson was a hard woman not to like, with a reputation of being approachable to students, inspiring to alumni, and effective with donors. Generally respected by the faculty as an accomplished academic, she could deftly navigate political waters and get things done. The problem was, this time, she wasn't sure what she wanted to accomplish.

This was her fourth year as Chancellor. It had been three years since she first learned about Holt State's aging coal-fired boilers that were used to heat the entire campus. The plant was first constructed in the early 1960s for a campus of 10,000 students. Now the boilers were nearing the end of their useful lives and needed to be refurbished. However, it was hard to argue with the protesting students who insisted there was no environmental future for coal. Robertson's personal convictions told her to go grab a sign and protest with the students. Spending millions of dollars to continue burning coal just *felt* wrong.

Despite that, the price of investing in green power was impossible to ignore. "More than twice the cost" was appearing everywhere in news headlines questioning the proposed geothermal system, and that was going to be a hard sell to the taxpayers of Ohio. Politicians from the coal producing counties of southeastern Ohio were delivering veiled threats to defund the university. Coal miners were worried that this change to geothermal heating would hurt the Ohio coal mining industry, possibly costing them their jobs.

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Sq ft starting 2021	3,200,000
Sq ft starting 2026	3,500,000
Sq ft starting 2031	3,600,000
Sq ft starting 2041	3,700,000
Sq ft starting 2051	3,800,000
Sq ft starting 2061	3,900,000

Exhibit 1. Holt State facility growth projections.

The recent legislative push-back on the geothermal plan had been unexpected. Ball State University, located only one state west, made a similar investment in geothermal, but its success was no longer going to be sufficient to convince the trustees. A so-called “compromise” plan of cleaner-burning, more efficient coal-fired boilers was still on the table as well. The three choices were certain to be the hottest debate among the trustees that Robertson had witnessed so far at Holt State. With only a few weeks until the next trustees’ meeting, she needed a thorough analysis of the three choices—and fast. Robertson wanted to be able to walk into that meeting with a rock-solid case supporting one of the three choices to minimize the debate. At this point, she was willing to make any of the alternatives “her way” if she had the analysis to back it up.

1.1. Holt State University

Holt State University was founded in southwestern Ohio in 1924 and traditionally pulls its population of nearly 10,000 on-campus students from Ohio and adjacent counties in Indiana and Kentucky. Holt State is a balanced university, meaning that it equally values both excellence in teaching and excellence in research. Many students choose Holt State University because the smaller class sizes create a “homey” atmosphere compared to other public universities. Holt State’s investment in faculty is proportionally larger than many of its peers and competitors, while its physical plant (buildings, etc.) is more restrained. As a state-supported university, Ohio taxpayers are a key stakeholder. In recent years, the local community has become increasingly vocal. Local citizens expect the university to give priority to the people of Ohio, and in particular, the people of southwestern Ohio. Also, the Ohio state legislature has placed increasing pressure on Holt State and other Ohio public colleges and universities to demonstrate their actions are in the best interest of Ohio taxpayers.

Changes in the higher education landscape are challenging the status quo at Holt State. The university has been slow to move into online education, fearing a threat to the university’s reputation of deep student-faculty relationships made possible through small on-campus class sizes. Other institutions, both regionally and nationally, have taken some of the university’s enrollment, especially from core classes causing a slight decline in some key program enrollments. Growth in other departments with high placement rates, such as business and nursing, has offset the enrollment losses enough to show overall university net enrollment growth of 1% per year for the past several years. It is unclear whether growth in some programs can continue to exceed losses in others.

Despite the uncertainty created by changing enrollments, Holt State’s current projections assume continued expansion in both on-campus enrollment and physical plant due to its evolving programs and needs. Holt State has 3,000,000 square feet of building space as of the beginning of 2016. [Exhibit 1](#) details the additional square footage the university wants to add over the coming years (these are available at the beginning of each respective year). As the university projects further into the future, estimates become less reliable. The estimates for beyond 2030 are the university’s best guess, and reflect an expected overall reduction in the growth rate of the university after 2025.

Holt State’s existing coal-fired boilers were first placed in service in 1962 with an estimated useful life of 50 years. In the early 2000s, federally-mandated pollution controls necessitated repairs that extended the boilers’ useful lives approximately five years. Overall, the current plant has been sufficient for the university’s needs. Prior to 2015, it was assumed that the plant would simply be refurbished and would continue in operation for decades to come.

The university’s cooling needs are met by a central plant which was built in 1964. The chill plant operates on purchased electricity. The boilers and “chill plant” are collectively referred to as the power plant at Holt State. [Exhibit 2](#) details the total cost of operating the power plant for each of the past five years.¹ The following sections describe the costs.

1.1.1. Labor and benefits

Labor and benefits includes all costs associated with labor in the department. Since staff are either salaried or have guaranteed work hours, this is considered a fixed cost. Fluctuations are small and generally attributable to turnover, a small incentive program, average seniority, and similar factors. Over the past five years the department experienced 2.5% wage growth. Human resources expects this cost to grow at the long term expected inflation rate of 2.3%, assuming no changes are made to the plant.

¹ Five years of data are considered, as this is a common range of historical data used to develop forecasts for the future ([Hitchner, 2011](#)). While data older than five years in age can be added to the analysis, the overarching risk is that such data is potentially “stale,” no longer reflective of operating realities, and could lead to false inferences if proper care is not exercised. However, when applying statistical analyses such as those considered in this case, larger datasets and sample sizes generally have more statistical power to identify relations in data. As a result, the choice of the dataset involved involves tradeoffs and must be carefully considered when conducting a professional analysis, especially one that involves an impactful decision.

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