MIS 2100 Homework Major  
**Data Analysis and Business Case**

# Purpose

Learn to build a basic business case by using data analysis techniques and interpreting and presenting their results. Techniques include weighted values, NPV calculation and comparison, sensitivity analysis, and balanced scorecard analysis.

# Submission Requirements

Respond to the items specified in the Assignment section of this document.

1. Include your responses in a **new document** — do not use this document to respond. Including the text of this document in your submission will result in a **five-point deduction** on your grade.
2. Your submitted document must include your name at the top. Failure to include your name at the top of your document will result in a **five-point deduction** on your grade.
3. Number your responses according to the question numbering given in the Assignment section below.
4. Complete this assignment **on your own**; doing otherwise represents a breach of academic integrity**.** What you submit must represent your own thinking and your own work. Do not look at answers from other students, and do not share your answers with others. Students submitting something other than their own work will **receive a 0 on this assignment** and be reported to the university for the academic integrity violation.
5. Submit your completed response via Canvas as a Word document or PDF.
6. After submitting your document, **check on Canvas that you submitted the correct document** — if you submit an incorrect document, we’ll assume that the homework assignment was not actually completed.

# Background

DBVac is considering adding an additional product to their lineup. The company’s Research and Development (R&D) team has come up with three different concepts for new vacuum cleaners and assigned them the codenames Fin, Snorkel, and Facemask. Each of the three proposed products has a number of different characteristics (described below) that distinguish them from one another. However, the company only has the means to bring one of these three products to market in the near future. As such, they would like you to evaluate the three products using a few different analyses, then write up a business case recommending which of the three new products to bring to market and detailing the reasons behind your recommendation and detailing expectations the company should have for the new product (e.g., how much they should expect to profit from its release). Further, they would appreciate your help in providing a recommendation as to which of the company’s four available product managers would be best equipped to lead the project.

In assessing DBVac’s situation, **please carefully read the content in this background section** as your response is **very dependent** on the content herein. You’ll need to come back to this background section to find data required to perform the analyses required in the assignment.

## Candidate Products

DBVac is considering developing and bringing to market one of three possible products, code-named Fin, Snorkel, and Facemask. Fin would be a very low-cost model, Snorkel would be a mid-range model with some innovative features, and Facemask would be a top-of-the-line model built on a drone platform.

In trying to understand what the initial (pre-launch) development cost would be for these potential new products, the company thinks it would be worthwhile to consider the pre-launch development cost for its four most recent new product development projects: the FarmBunny, RapidBunny, BunnyKing, and the disastrous CozyCony. The company has analyzed facets of each of the three potential new projects to get a sense for how similar each of the three is to the four previous new project development projects. This was done under the assumption that, if the development process for the new product is exactly like, for instance, the FarmBunny development process, then the initial cost of development should be the same.

The initial cost of development for these previous new product development projects were as follows:

* FarmBunny: $2.7 million
* RapidBunny: $4.2 million
* BunnyKing: $4.6 million
* CozyCony: $13.7 million

### Fin

Fin would be DBVac’s lowest cost entry into the vacuum cleaner market, providing no advanced features but still being a vacuum cleaner, technically speaking. R&D would consist of aggressive down-costing measures to ensure the affordability of product manufacturing.

In considering Fin’s initial R&D cost, DBVac has provided the following estimates of the project’s similarity to past new product development projects.

* 30% probability of being similar to the FarmBunny initial R&D cost.
* 38% probability of being similar to the RapidBunny initial R&D cost.
* 5% probability of being similar to the BunnyKing initial R&D cost.
* 27% probability of being similar to the CozyCony initial R&D cost.

No additional revenue or cost is expected to be accrued during the initial year (i.e., the R&D year) beyond the initial R&D cost. After this initial R&D year, sales net of unit cost are expected to total $2.5 million in the first year, then increase by 19% each year thereafter.

The company expects to incur a cost of $800,000 to train service, support, and repair personnel in handling the product during the first year after introduction, then $250,000 per year each year thereafter. Additionally, because this is a high-volume product, DBVac expects to need to spend $1.2 million the third year after the initial R&D year to expand their current service and repair facilities to accommodate service claims.

Because the product is significantly down-costed, the company expects a high failure rate. As such, the company foresees warranty and repair costs that total 27% of sales net of unit cost annually starting the first year after development.

On the other hand, because the product is made primarily of recycled materials, DBVac expects to be able to recoup 4% of the total annual warranty cost each year by selling the recyclable materials to recycling companies.

### Snorkel

Snorkel is foreseen as a vacuum cleaner that would fit in the middle of the DBVac lineup in terms of price, settling in somewhere between the company’s current MadHare and JackRabbit models. Using many of the same technologies already available in other models, such as the patented turbo button found on both the MadHare and JackRabbit models, Snorkel would also include two new key technologies: (a) reverse-thrust, which would allow the user to jettison collected debris through the hose directly into a waste receptacle (e.g., a garbage can), and (b) the carpet de-tangler, which would sense when a long carpet strand is getting lodged within the vacuum’s roller, warn the user, then eject the strand.

In considering Snorkel’s initial R&D cost, DBVac provides the following estimates of the project’s similarity to past new product development projects.

* 9% probability of being similar to the FarmBunny initial R&D Cost.
* 48% probability of being similar to the RapidBunny initial R&D cost.
* 29% probability of being similar to the BunnyKing initial R&D cost.
* 14% probability of being similar to the CozyCony initial R&D cost.

No additional revenue or cost is expected to be accrued during the initial year (i.e., the R&D year) beyond the initial R&D cost. After this initial R&D year, sales net of unit cost are expected to total $3.0 million in the first year, then increase by 12% each year thereafter.

Further, based on the level of innovation involved in the development of the product, the company is 33% confident that it will qualify for an $800,000 research innovation grant from the federal government, which would be paid out the second year after development.

The company expects to incur a cost of $950,000 to train service, support, and repair personnel in handling the product during the first year after introduction, then $450,000 per year for each year thereafter. Further, to service what is expected to be an unusual technology, the company will need to spend $750,000 to improve its current service and repair facilities the first year after the R&D year. Additionally, DBVac expects to need to spend $400,000 the fourth year after the initial R&D year to expand their service and repair facilities.

Given the unique nature of the product, the company expects warranty and repair costs that total 20% of sales net of unit cost annually starting the first year after development.

### Facemask

Facemask would be the company’s most technically advanced product — it would be the company’s “flagship” the kind of awe-inspiring product that would be valuable not only in terms of its own sales, but in its ability to bring new customers to consider the entire DBVac family of vacuum cleaners. In addition to the always-on, dirt-anticipating TruSentience® capabilities already found in the company’s BunnyKing model, Facemask would work in three dimensions. Incorporating military-grade drone technology, Facemask would be able to fly through the household, cleaning window coverings and crown moldings as needed and could even capture dust and dirt mid-air before it has a chance to land on things.

In considering Facemask’s initial R&D cost, DBVac provides the following estimates of the project’s similarity to past new product development projects.

* 2% probability of being similar to the FarmBunny initial R&D Cost.
* 39% probability of being similar to the RapidBunny initial R&D cost.
* 45% probability of being similar to the BunnyKing initial R&D cost.
* 14% probability of being similar to the CozyCony initial R&D cost.

No additional revenue or cost is expected to be accrued during the initial year (i.e., the R&D year) beyond the initial R&D cost. After this initial R&D year, sales net of unit cost are expected to total $1.9 million in the first year, then increase by 20% each year thereafter.

Further, based on the level of innovation involved in the development of the product, the company is 100% confident that it will qualify for an $800,000 research innovation grant from the federal government, which would be paid out the second year after development.

The company expects to incur a cost of $500,000 to train service, support, and repair personnel in handling the product during the first year after introduction, then $240,000 per year for each year thereafter. Finally, the company expects warranty and repair costs that total 16% of sales net of unit cost annually starting the first year after development.

## Candidate Product Managers

In addition to identifying which of the three products should be taken forward and developed, DBVac wants to know which of four product managers is best suited to guide the product through development and into the marketplace. The company is considering four candidates:

* Eunice Stark, current product manager for the MadHare and the CEO’s sister.
* Torsten McDuck, current product manager for warranty products and the CEO’s son by a previous marriage.
* Veronica Abernathy, current product manager for the FarmBunny and the CEO’s cousin.
* Serge, current product manager for both the BunnyKing and the RapidBunny and the CEO’s third-cousin who grew up in Brazil.

In selecting a product manager, the company has compiled a set of wishes that come from the company’s top executives regarding the kind of person they’d like to see managing the development of this new product. The quotes below are attributed to those executives; these quotes are listed in order based on the importance to the company of the individual being quoted.

* Chief Executive Officer (CEO): “I really like people I can trust, and, let me tell you, in this industry, blood is thicker than water. Family is really where it’s at, that’s very important. I call that the ‘dust factor’ — it’s what makes DustBunny Vacuums great. But definitely not the most important thing — we also desperately need this product development process to succeed. It’s incredibly important that the product manager in charge of this new product knows how to bring a product from its very infancy up until it hits the market and dominates its competitors. Also, we want someone in this role for whom crushing the competition is incredibly important; I’ve grown tired of our competition not being obliterated. We need someone who can do that, maybe even someone who has demonstrated it at a recent sporting event.”
* Chief Marketing Officer (CMO): “We need this project to be led by someone that everyone knows and trusts, someone that everyone in the company would bend over backward for in order to ensure the project succeeds. Obviously, it’s important that they understand the type of product it is and are intimately familiar with any new technology that might be going into it. I also think, and I’m sure the CEO agrees with me, that we need someone we can trust — a product manager whose promises mean something. That’s crucial for the success of a product like this, particularly when the product manager has to work with factory managers and other vendors to ensure a successful launch.”
* Chief Financial Officer (CFO): “It’s crucial that this product succeeds and that the person leading it is someone who knows how to ensure that it succeeds — past success, in my mind, is a must! That said, I’d rather not have to pay out much on the bonus, since we need to be frugal with our expenses. I was pretty leery of offering a bonus at all, but maybe we can help ensure that it’s not a big bonus through our choice of the project lead (the product manager). Also, just given the culture of the company, I think the product manager should be someone that everyone loves. We all want to help our friends, particularly if they’re very good at softball. This is a very softball-driven company, believe it or not. In fact, the entire vacuum cleaner industry is *very* softball-driven.”
* Chief Technical Officer (CTO): “I don’t care. Wait, I really do care. I need this job. Make sure it’s someone who’s got good experience in developing new products — preferably ones that actually succeeded. And they should know the technology of the product like the backs of their hands, otherwise the people down in R&D will run amok and we’ll have another CozyCony situation on our hands. We don’t want that. Also, it’s good to remember how much this company wants to completely crush all our competitors — it’s maybe not the most important thing, but it really is something that’s valued at DBVac. Crushing. Well, that and being well-liked.”
* Corporate Attorney (Lead Counsel): “I’m hoping we don’t get sued as a result of this product, so, from that standpoint, we need to have a product manager who really understands the technology going into it, otherwise they might develop something that causes damage and lawsuits. Would also be good if they had some real, positive experience with new product development. I think we have people like that. We also like winners here, particularly if they destroy the competition when playing softball. Over the last 12 years of working here, one thing that’s become clear to me is that the people who succeed at softball are the ones who succeed at vacuum cleaners — every time.”
* Chief Operating Officer (COO): “Well, obviously, if it makes sense, you want to pick someone who’s a close relative of the CEO — you know, the ‘dust factor’. It’s only natural. Beyond that, though, this is a place that responds well to people we can trust and people with good, relevant experience. So — look for someone with good, relevant experience, particularly if they know their way around a softball field. I mean, experience is more important than softball, but they both have their place in this decision, I think. Also, since we might be entering a recession, it’d be good if we didn’t have to pay out a whole lot for the product manager’s bonus. Further, it’d be great if it were someone I really liked. I think whatever product goes forward, it’s going to succeed, and everyone wants to see someone they like be successful. It’d be great for the morale of the company as a whole.”

Note also that, if the product breaks even during the first year of sales, the product manager is guaranteed a bonus equal to 8% of their annual gross salary.

### Eunice Stark

Eunice has worked at DBVac for over 20 years (her entire career) and was recently voted the most popular employee at the entire company, receiving votes from 82 of her fellow employees. That said, she was only recently promoted to the position of product manager, and has only managed the MadHare line for six months — she has never taken part in the development of a new product at the company. Her current annual gross salary is $94,000.

Before becoming product manager, Eunice spent most of her career in the HR and legal departments, where she was well-liked for her impersonations of famous tennis players. During this time, her job consisted primarily of dealing with employee discipline (i.e., deciding whether to place employees on probation or to fire them), legal disputes that occurred following employee discipline decisions, and coaching one of the two teams during the summer softball game (Eunice’s record as manager is 18 wins, 1 loss).

While working in HR, she instituted the company’s trustworthiness training regime, which included the establishment of an annual trustworthiness test taken by all employees. Most recently, she scored a 73 on this exam.

**Torsten McDuck**

Mr. Torsten, as he insists other employees refer to him, is relatively new to the company, having arrived only two years ago after a long career in aerospace designing and developing medical emergency drones and other small flyable devices for a local aerospace company. With a degree in electrical engineering, he claims to have personally shepherded over nine different drone platforms through the R&D process and into production during that stage of his career.

Now the product manager for warranty products, Mr. Torsten’s salary is $115,000 annually. While not very well known in the company, most employees who meet Mr. Torsten like him (in fact, 23 named him the most popular employee in a recent survey), although they get kind of sick of calling him “Mr. Torsten” like he’s some sort of camp counselor. Interestingly, Mr. Torsten was once a camp counselor at a major east coast softball camp. He plays competitively on a traveling team, but doesn’t really care about winning or losing — he just likes hitting the ball really far. He usually ends up on the team not being coached by Eunice Stark.

While Mr. Torsten was initially put off by having to take the trustworthiness test, he scored a 62 on it, which was above the company’s minimal threshold of 50 to be able to work there.

**Veronica Abernathy**

Veronica has worked at DBVac for seven years, ever since graduating summa cum laude from Clementine College, a small liberal arts school located in West Mifflin, Pa. where she majored in modern dance with a minor in interpersonal aggressiveness. While generally inexperienced at softball, her inner competitor has lifted her to the status of above-average at the annual softball game, with the other team’s pitcher often electing to given her an intentional walk just out of respect and/or fear.

Four the last two years, Veronica has been the project manager for the FarmBunny project, the development of which she participated in. Previous to that, she was heavily involved with the CozyCony, a product that was wildly unsuccessful in the marketplace. She also worked as assistant product manager on the highly technical BunnyKing product, though she was not part of its introduction. That said, she considers herself very technically savvy, and recently researched and published a peer-reviewed scientific paper detailing how the behavior of certain freshwater tank fish that like to clean various filth in all corners of their tanks could be adapted into a semi-autonomous, artificial intelligence-driven, free-hovering cleaning system.

While more feared than popular within the company, Veronica has a small but close circle of friends with whom she likes to go to lunch sometimes — three employees in the company have named her the most popular employee. With an annual gross salary of $103,000, she makes more than most of these friends, but never offers to pay for lunch. Her friends say they don’t care, but some at the company believe they secretly do care. But, while some may view her as a little cheap, few see her as dishonest, as witnessed by her score of 88 on her most recent company trustworthiness test.

### Serge

Originally from Brazil, Serge has been at DBVac for the last six years, and is currently the product manager for both the BunnyKing and RapidBunny products. Having spent time working for a company that manufactures wind tunnels, Serge is very well versed at how to make wind go both forward and backward using blades and turbines. While at the wind tunnel company, he was part of a very large team that saw out the development of a new kind of fan blade fastening device, which cost 3% less than the previous fastening device used by the company.

Serge is well-liked by almost everyone inside the company — 60 of them named him the most popular employee — and is considered by the HR department to be very trustworthy, having scored a 77 on the trustworthiness test. His love of beaches and small dogs endears him to pretty much everyone, not including those who really just adamantly dislike small dogs. Of course, it also helps his popularity that he makes only a relatively modest salary of $70,000, despite the fact that he manages twice as many products as any other product manager.

While Serge doesn’t mind crushing the competition, he isn’t well versed in American sports, and thus typically (and controversially) opts out of the annual company softball game.

# Assignment

In this assignment, you’ll be writing a business case in which you will recommend to DBVac which of the three vacuums to bring to market, give them a sense for what to expect from its release in terms of sales and profit, and recommend which of four available product managers is best suited for leading the new product’s development. Your submission should be formatted as a business document (e.g., *label* your responses, don’t number them; don’t include content from this assignment document in your submission). **Include your name at the top of the document.**

Your submission should include the following:

1. Executive Summary (**write this last!**) — 5 points
   1. Write a half-page summary providing highlights of your business case such that the company’s CEO can, at a glance, understand what the recommendation is, why it’s a valid recommendation, and what to expect if the company goes forward with the recommendation.
   2. As part of your summary, summarize the company’s opportunity (in a sentence, what is it that the company hopes to accomplish?), your recommendation (which product should they bring to market and at what price?), how you came to make this recommendation (i.e., why is that what you’re recommending? What did you do to evaluate the options and make this recommendation?), and what the company should expect from releasing the recommended product (in terms of sales and profit).
   3. Use relevant data points to support the points made in the executive summary.
   4. If your summary is less than a half page of **meaningful content**, it doesn’t have enough detail. If it’s more than a half page of content, it has too much detail.
2. Background — 5 points
   1. Describe the problem and opportunity that the company is facing. You should be re-stating the problem **in your own words** so that the company knows that you understand their situation.
   2. In doing so, indicate what the choice to be made is (i.e., what are you advising the company on?) as well as the basis to be used in making the choice (i.e., what will the recommendation be based on?).
3. Analysis
   1. Calculate the expected *initial* cost of development for all three options using weighted values. (15 points)
      1. Include your calculations (i.e., a screenshot of the part of the Excel spreadsheet that shows your work) in your submission.
      2. Explain (for DBVac) what these values are and how they should be useful to the company in terms of evaluating the three options.
   2. Calculate the NPV for all three options using the data provided in the background section and using the expected initial cost of development (as calculated in 3a) for each of the three options. (15 points). Use a discount rate of 10% and calculate the NPV inclusive of the investment year (Year 0) and the five years that follow — a five-year time-horizon.
      1. Include the calculations (i.e., a screenshot of the part of the Excel spreadsheet showing your work) in your submission.
      2. Explain for DBVac what these values tell us and how they might be useful in comparing the three possible choices.
   3. Conduct a sensitivity analysis showing what the NPV for each of the three products would be. In the sensitivity analysis, provide four different calculations of NPV: (1) based on the expectations noted in 3b above (i.e., reiterate the calculation from 3b), (2) based on sales growth that is half as great as that predicted by the company and used in 3b above, (3) based on sales growth that is 75% less than that predicted by the company and used in 3b above, and (4) based on -5% annual sales growth after the first year.
      1. Include the calculations (e.g., from Excel) in your submission.
      2. Explain for DBVac what the difference is between (1), (2), (3), and (4) and why it’s useful to consider all four possible outcomes.
4. Determine which of the company’s four product managers should lead the project. (30 points)
   1. The scorecard should compare the four possible options across six criteria: the “Dust Factor”, (positive) experience with new product development, dollar amount of bonus to be paid should the project exceed sales expectations in year 1, how well liked the candidate is within the company, and familiarity with the product’s sub-niche (i.e., how familiar they are with the specific kind of product you’re recommending the company pursue). Additionally, include a sixth meaningful, reasonable criterion of your choice.
   2. Explain what the sixth criterion is and why it makes sense to include that as one of the criteria.
   3. For **each of the six** **criteria**, assign a weight from 1-10 based on the relative importance of that factor to the company as determined from content provided in the background section. **No two criteria should have the same weight.** Explain how you decided to weight each criterion relative to the other criteria (you should have a good, well thought-out explanation; your explanation should be 10-25 words for each criterion).
   4. For each of the four product manager candidates, for each criterion, enter a raw score (don’t worry, you’ll get to normalize it soon). Where available, this raw score should be given in measurable units (e.g., cost in $).
   5. Create a second version of your table in which you instead use the **normalized** score for each value entered in 4d. Use *z*-transformation normalization to calculate the normalized value.
   6. Calculate the total balanced scorecard score for each product management candidate using the normalized values and your assigned weights.
   7. Include (screenshots of) the spreadsheets you used as part of this balanced scorecard analysis in your document. Make sure it’s clear to the reader what each of the screenshots represents.
5. Recommendation (10 points)
   1. Use an appropriate visual to communicate to the executives the possible NPV outcomes for the recommended new product based on the different assumptions you used in the sensitivity analysis.
   2. Discuss which of the three product options should be pursued by the company (based on the NPV analysis).
   3. Make clear what the value to the company is expected to be from pursuing this option. Express this in terms of NPV and profit over the next five years.
   4. Explain (to the DBVac executives to whom you’re writing the report) the results of the balanced scorecard and what these results indicate about which of the four options should be preferred. In doing so, make a clear recommendation regarding which candidate should lead the product’s development.