Teaching Case
Using Excel to Make Strategic Managerial Decisions

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ABSTRACT

This case involves actual data from a student managed café that serves as a learning laboratory for a college of business. The student team that manages the café has never had access to precise data from a point of sale system until this semester. However, once they downloaded the raw data from the cash register they were unable to make sense of the data. This was in part due to the data entry errors in recording transactions as well as operational issues such as multiple managers entering new items into the register when there is already an existing code for the item in the Point of Sale (POS) database. To clean up the data and develop actionable spreadsheet based results, the managers decide to call in a team of information systems consultants to help them clean the dataset while not losing important data. To address the operating concerns of the managers, the consultants analyze the sales data for a number of questions whose answers can be used to improve how the café operates. By using Excel to analyze the data, consultants will be able to address the managerial decisions faced by the café team.

Keywords: Spreadsheets, Excel, Data cleansing, Descriptive statistics

1. CASE SUMMARY

Success or failure in a retail business depends on managers making informed decisions on a timely basis. Managers rely on data from point of sale systems (POS) to help them understand their business and their customers. In this case, a café faces a number of significant management decisions. The managers running the café need help using the collected transactional data to make good decisions. Your role is that of an information systems consultant hired to transform the raw data from the point of sale system into a useable format. Additionally, you will create an analysis of the data to the managers for making several key managerial decisions.

2. INTRODUCTION FOR INSTRUCTORS

The café has a dual mission: to serve food and drinks to students, faculty, and staff in the college of business, and to serve as a learning laboratory for students in the college of business as part of the senior capstone management class. Through running the café, students are able to actively learn by changing how the café operates and observing the effects of the change. To manage the café, the students organize into a series of teams, each dedicated to a function of the café: marketing, operations, accounting, human resources, new technology, and new products. Additionally, teams from other courses can also observe and experiment with the café. A sub-team of students acts as boundary spanners to coordinate work between other courses and the café operations.

The café uses a point of sale system at the cash register (just introduced in January of 2015) to track its sales by item through the use of a bar code reader. Those data form the basis for the data used in this case. The database contains raw transaction data pulled from the point of sale system. Students incorporate the data into their operational decision-making using Excel spreadsheet software. The management team from the café has posed a number of questions that are awaiting analysis and consequent implementation of changes in future semesters. The section below has a brief description of the café and its operations, followed by the introduction of the relevant data and related operating and strategic issues currently facing the café team.

3. THE EXECUTIVE EXPRESS CAFÉ CASE FOR STUDENTS

The Executive Express Café is a student-led café housed in a college of business. The café provides a venue for business students to operate and experiment with strategies and operational changes during their senior capstone class. The following sections will set the context by providing some background on the café along with its operations, menu, and introduction of the data.

3.1 Background & History
A student team in the college of business founded the café in 2009 as part of a consulting project in their senior capstone strategy class. The café replaced a failed sandwich shop that was closed by the campus foodservice vendor after a relocation of a neighboring college led to a precipitous decline in sales.

When the college of business relocated to a new facility in a restored federal courthouse in 2012, sales grew significantly due to a much improved facility as well as large increases in foot traffic in the building. Now, the café generates between $15,000 and $21,000 in sales per semester. Students make all relevant decisions in the café; a faculty member serves as café director and also the learning 'coach' of the capstone class.

3.2 Café Operations
The café is open five days per week from 8am to 3pm. Students staff the retail operation of the café generally in teams of three for two shifts per week, each about three hours. The café buys food from local restaurants and other vendors. The students prepare and serve coffee as well as expresso-based drinks as do many well-known cafes. However, they do not prepare any food in the café itself. A guiding principle is that pricing should be student-friendly, with items priced under $3.00 or $4.00 wherever possible.

3.3 Café Menu
The café sells a variety of items, including main menu items, snacks and desserts, sides, and drinks. An abbreviated list of menu items is listed in Figure 1 below.

The café has featured items from local restaurants and also offers combinations with special pricing for main menu items such as a sandwich, chips, and drink combo.

Main menu items	Snacks/Desserts
Bagels	Candy
Pizza	Chips
Salads	Cinnamon Rolls
Sandwiches	Cookies
Wraps	Granola/Nutrigrain Bars
	Pudding
Drinks	Yogurt
Coffee	
Espresso Items	**Sides**
Fruit Juices	Cheese & Fruit Cup
Gatorade	Crudites Tray
Hot Chocolate	Fruit Tray
Milk	Pepperoni & Cheese
Sodas	Veggie Tray
Tea	
Water/Flavored Water	

Figure 1: Cafe Menu Items

3.4 Café Data
The café data were directly downloaded from the POS and entered into an Excel spreadsheet. This "Raw Data" file includes several columns including those labeled: Date, Qty Sold, Total, and Payment Type. Table 1 below contains an excerpt from the raw data. We note that these data are shown exactly as they appear in the POS and that the dataset contains several blank columns. Also, note that the data entries are not always consistent within a column. The complete data file contains 21,651 lines.

A	B	C	D	E	F	G	H
1	Date		Qty Sold		Total		PaymentType
2	1/22/2015		1		3		Cash
3			PJN 2 Slice & Md Drink		1		
4	1/22/2015		1		3		Cash
5			PJN 2 Slice & Md Drink		1		
6	1/22/2015		1		1.5		Cash
7			Gatorade Orange		1		
8	1/22/2015		2		4.82		Cash
9			Baesler's Ham and Cheese Sandwic		1		
10			Baesler's Ham and Cheese Sandwic		1		
11	1/22/2015		1		1.61		Credit Card
12			Welch's Grape		1		
13	1/22/2015		1		2.14		Credit Card
14			PPJN 1 Slice & Md Drink		1		
15	1/22/2015		2		1.34		Credit Card
16			Nutrigrain Blueberry		1		

Table 1: Excerpt from Raw Data File

The café managers need help interpreting the data in the spreadsheet and have called in a team of IS consultants to help them interpret it. The date and payment type only appear in some lines (for example, lines 2, 4, 6, 8, 11, etc.) and the Qty Sold represents quantity sold on some lines but includes an item description on others (e.g. lines 3, 5, 7, 9, 10, etc.). Furthermore, while the total column has an entry in each row, it is inconsistent in meaning. In the rows where dates appear, Total actually represents the dollar total of the transaction, while in the rows where item descriptions appear, the Total represents the count of items. In addition, there are several blank columns and voided sales are included in the rows. Thus, before any analysis can be done, a fair amount of preprocessing or cleansing of the data needs to be performed.

4. OPERATIONAL PROBLEMS AND QUESTIONS

As the IS consultants, you have investigated the café operations and interviewed the café managers to fully understand the problems and concerns facing the café. Your investigation suggests that the concerns are with daily sales, payment methods and patterns, and cost-benefit analyses, which are summarized in the following sections.

4.1 Managing Data
Good data management facilitates analysis and aids decision-making. Students should recognize that the real-world, as in our case, does not have clean data sets and that they will need to perform some data cleansing as a first step before any analysis can take place. Clean data enables accurate analyses. Despite the fact that the collected café data are internal data (where controls can be put in place for clean and consistent data collection), the retrieved data are not in a useable format.

The first managerial question (MQ) the team faces is:

MQ1: How can data be cleaned or preprocessed into a format that facilitates analysis and decision-making?

4.2 Understanding Payment Methods and Patterns
Credit and Debit card sales (referred to hereafter as credit sales) are problematic for the café. Due to security concerns, the university controller will not permit a cash register that includes integrated card swiping. Instead, the transaction is rung up on the cash register (or scanned using the bar code reader) and then if paid by credit, the cashier swipes the card into a reader, connected via a hardwire to the telephone system, which then reports the transaction to the credit card processing company. Once the credit card reader indicates the card is accepted, the cashier completes the transaction and generates a receipt for the customer.

Cashiers believe they have observed the number of credit transactions is increasing while cash payments are becoming less common. You need to determine if this is really true for several reasons. First, if credit transactions are the future of this company then the café must determine a feasible way to increase the capability of processing credit card transactions in order to minimize customer delays in the café. The latest credit card machine cost the café over $700 due to the new chip reading technology required by the credit card companies. Second, the cafe team is considering adding another credit card terminal to be able to move people through checkout faster in order to ease congestion in the café during the times between classes and around the lunch hour. To begin your analysis you identify two major questions that would help in deciding what to do, if anything.

4.2.1 Cash versus Credit transactions: The café managers have noticed that long queues form at certain times of the day and would like to alleviate this as best they can without additional staff. The café currently offers cash or debit/credit options for payment through one register. One of the suggested solutions is to add an additional cash register to handle only cash transactions whereas the competing suggestion is to add a credit-debit 'card only' capable tablet that could accept transactions but not handle cash. For this reason, it would be helpful to understand the overall breakdown of cash versus credit transactions. In addition, because some days of the week are typically much busier than others, it is also helpful to know if the number and percentage of transactions made by cash or card differ depending on the day of the week. Lastly, because some items are very popular, knowing if cash or credit is used more often with those frequently purchased items may also be useful to management.

4.2.2 Cost of low dollar, non-cash transactions: The café pays a per-transaction fee of approximately $0.17 plus 1.8% of the transaction amount. To simplify, the café assumes a cost to the café on average of about $0.25 for each transaction. Up to this point, the café absorbs that charge. Given the low prices of some items, $0.25 per transaction is a significant loss of profit. Some of the management team advocate charging a fee of $0.25 per transaction for credit card purchases under $1.25. How can you determine what the gain from fees might be? Assume a profit margin of 40% of total sales for transactions under $1.25, and an estimated 30% in lost sales (of transactions priced under $1.25) due to customer dissatisfaction with the new fee. Would it be worth enduring the anger over the fee to help offset the losses from those paying with credit on small transactions? If the profit margin was 30% on average, would it make sense to lose sales but collect the fees?

The managerial questions (MQs) regarding payment methods can be summarized as follows:

MQ2: Do you recommend that an additional register (handling both cash and credit/debit cards) be purchased? What about a card-only tablet for processing card transactions?

MQ3: Should the café charge a fee of $0.25 per transaction for credit card purchases under $1.25, considering the gain from fees, assuming a profit margin of 40% of total sales and an estimated 30% in lost sales (of items $1.25 or less). Is any potential gain worth the possible loss of customer goodwill?

4.3 Cost-Benefit Analyses to Aid Decision-Making
The café managers are undecided if they should continue to hire past students to help with training, and whether to continue offering espresso-based drinks. A cost benefit analysis will help them determine if the benefits of these business endeavors outweigh the costs.

4.3.1 Hiring past students to help the café open a week earlier: Starting the café at the beginning of a semester is always a challenge because a new group enrolls in the capstone class each semester, resulting in 100% turnover in all positions. In the past, several volunteers from the previous semester's classes would come in and train the new classes in order to be able to begin operations. But the result was a three-week period where the café was not open, causing customer dissatisfaction. In a recent semester, three former students were hired back as consultants to manage the café startup. The café was able to open a full week earlier due to this innovation. The café team and director would like

to know if opening one week early is worth the expense of hiring the consultants.

The managerial question (MQ) regarding the cost-benefit analysis of using past students to help the café start every semester are summarized as follows:

> **MQ4:** Considering only the $855 startup costs, the first week sales (obtainable from the data), and assuming a 30% profit margin on sales, did the café "break even" when it decided to hire previous employees in order to open one week earlier (five business days) in the semester? Show your calculations and assumptions.

4.3.2 Espresso machine: The espresso machine used by the café is a sophisticated piece of equipment. The machine automatically measures and grinds the correct amount of coffee, then brews the requested number of shots to perfection. The barista prepares steamed milk or adds flavorings to prepare lattes and other drinks. The automation helps the café hold quality standards high while using many students with little practice or training. It is essential given the way the café is staffed that the espresso maker be very simple and foolproof. However, there is concern that such an expensive piece of equipment is not pulling its weight. If not, something must be done to increase the utilization rate of the machine (making and selling more drinks).

The managerial questions (MQ) regarding the cost-benefit analyses of the espresso-based drinks operation are summarized as follows:

> **MQ5:** How much revenue did espresso-based drinks generate during the semester? Assuming direct costs of 30% of sales price, plus an average cost of $125 per semester for machine service and $600 in leasing costs per semester, did the café earn a profit on its espresso drinks this semester? If so, how much? What would its profit be if the café sold 10 more espresso-based drinks per week over a 13-week semester?

5. EXCEL: FILTERS, PIVOT TABLES & FUNCTIONS

As the consultants for the café, you need to organize and cleanse the data for them to be useful in addressing the key managerial questions. The sections below describe the steps for you to follow.

5.1 Data Cleansing: MQ1

The first task is to cleanse the data (**MQ1**) before any data analysis can take place.

As part of this process, a good understanding of the data is necessary, so a summary of the data might be helpful. When first looking at the data, ask the following questions. Can you recognize what variables are represented in the data set? Can you classify each of the fields as qualitative (categorical or grouped into categories) or quantitative (numerical or measurable)? Do you notice why the data set is unusable for in-depth data analysis? Do you notice the blank columns and the missing values for dates and Payment type?

After you clearly understand the data set, you can begin to cleanse the data. Luckily, as developing Excel experts, you can use filtering techniques to separate the data sets

quite quickly after populating the missing values. The transactions from Payment Type "None" should be removed as they are training transactions and do not reflect real café sales. Your final output will be two distinct data sets saved on different worksheets: **Itemized Data** (Date, ItemDescription, ItemCount, and PaymentType) and **Summary Sales** (Date, QtySold, Total, and PaymentType).

These data sets can now be used to help you perform the rest of your analysis using other Excel features. It is important to remember that you want to develop your spreadsheets for future use, so always make sure to use relative, mixed or absolute cell referencing as appropriate. For example, it is never advisable to enter a static value such as 0.3 (current profit margin) directly into a formula in Excel. Instead, if you enter the value into a separate cell and use an absolute cell reference in your formula, your values become dynamic and will automatically update your calculations should that value change in the future.

5.2 Credit versus Cash: MQ2

The café managers would like to decide if it would be more beneficial to add an additional cash register or tablet (**MQ2**). They have summarized some additional questions that they feel will figure into the final decision as:

> *What is the overall breakdown of cash versus credit purchases? Does the number or percentage of transactions made by cash or card differ depending on the day of the week? Do customers who use cards buy more or less per transaction? Are there items that are almost always bought with one either cash or credit-debit card? How are the most popular items purchased, with cash or with credit-debit cards?*

As the IS consultants, you quickly realize that pivot tables will help the managers understand the different aspects of payment methods and patterns prior to making a decision. You also notice that the day of week is not included in the original data set, so you will first need to use an Excel function to populate these data.

Your final output will be four pivot tables. Three of the pivot tables will be created using the **Summary Sales** data file. These will include tables displaying counts and then percentages of Payment Methods by Day of Week (**MQ2a**) and Average Amount Purchased (number of items and dollar amount) with Credit versus Cash (**MQ2b**).

The fourth pivot table uses the **Itemized Data** file to produce a table showing the number of times each product was purchased, and then for the most popular items, identifying the percent of time these items are paid for with cash (**MQ2c**). This pivot table can be used to filter out items that were purchased only a few times, as they hold little value for analysis. Conditional formatting and a custom sort will help highlight the most and least selling items. The pivot tables should be made to look professional by adding currency formatting and descriptive labels to make them visually appealing.

5.3 Transactions Fee Analysis: MQ3

The analysis for **MQ3** will help managers decide whether to charge a fee of $0.25 per transaction for credit card purchases under $1.25, assuming a profit margin of 40% of total sales and an estimated 30% in lost sales. You will need to create a table with the relevant information, similar to the one shown in Table 2. The **Summary Sales Data** file can be used to help populate the table. It might be wise to start with a copy of the summary sales data set and then use **Database** functions with criteria set for Total and Payment, along with simple Excel formulas to complete the table.

	Current	Estimated if
	No Customer Fee	$0.25 Customer Fee
Number of Transactions		
Sales totals		
Transaction fees to café		
Profit from sales		
Income from customer fees	N/A	
Total Profit		
Difference		

Table 2: Estimated Sales/Profit with Fee

The final output will be the completed table on a separate worksheet called **MQ3**. Add a title to the table of **Analysis of Transactions Under $ 1.25** and any necessary formatting to make the table professionally presentable.

5.4 Startup Consultants Breakeven Analysis: MQ4

The café managers would like to know if it was worthwhile to hire previous employees as consultants to facilitate startup and open one week (five business days) earlier than normal **(MQ4),** assuming a 30% profit margin on sales and $855 startup costs). Use the **Summary Sales** data to assess the first week of sales (five days) as well as the overall profit from hiring these consultants. It might be helpful to show the overall profits/losses for Week 1 as a percentage of overall profits for the semester. Your final output will be the filtered data set and the completed table on a worksheet called **MQ4** formatted to make the table professionally presentable.

Follow up question (**MQ4b**): Your first answer is based only on dollar amounts, but now also take into account intangibles, including helping the students (1) overcome fears of startup and making mistakes, (2) committing fewer mistakes in ordering supplies, (3) helping them better transition with suppliers, and (4) achieving higher customer satisfaction. With these additional considerations, would you recommend that the café continue this practice in future semesters? Why or why not?

5.5 Espresso Items Analysis: MQ5

The café managers would like to determine if they should continue to offer espresso items **(MQ5)** and if the café earned a profit on espresso drinks this semester (**MQ5a**). Also, they would like to understand how the situation would change if they were able to increase sales of espresso drinks by 10 items per week (**MQ5b**).

As the consultants, you can use the **Itemized Data** file to create a pivot table featuring only the espresso items (lattes, flavored lattes, mochas and extra espresso shots). You would also like to calculate the direct costs of drinks, service costs, leasing costs and profit. The following questions will help lead you to the final question:

1. How many of each type of espresso drink were sold during the semester? Remember to include both large/grande and medium/tall sizes.

2. What is the total revenue from espresso-based drinks over the course of the semester? Prices for flavored lattes and mochas are $3.99 for large/grande and $2.99 for medium/tall sizes. For lattes, prices are $3.50 for a large and $2.50 for a medium. Extra espresso shots are $0.50 each.

3. What are the total costs for espresso drinks for a semester? Include direct costs of the espresso products (30% of sale price) and the service and leasing costs of maintaining the espresso machine (average cost of $125 per semester for service and $600 in leasing costs).

4. Is the espresso machine profitable? Explain.

5. MQ5b asks how profits would change if the café could increase sales of espresso-based drinks. To analyze this, assume that costs are the same (30% of sales price, no change in the maintenance and leasing costs, and that the café sells an additional 10 medium lattes (at $2.50 each) per week for 13 weeks.

Espresso Item	Number Sold	Sale Price
Extra Shot Espresso		$0.50
Flavored Latte (Large 16oz)		$3.99
Flavored Latte (Medium 12oz)		$2.99
Latte (Large 16oz)		$3.50
Latte (Medium 12oz)		$2.50
Mocha (Large/Grande)		$3.99
Mocha (Medium/Tall)		$2.99
Total Sales		
Direct Costs of drinks/ingredients		
Service Costs		
Leasing Costs		
Profit		
Profit if increased sales by 10 items per week		

Table 3: Espresso Items Analysis

The first step will be to create a pivot table using Item Description for rows and Num_Items as the value before filtering on espresso items. There are a few ways to populate the pricing, so use your best judgment using features of Excel. The table below (Table 3) can serve as a template and includes the sale prices for the espresso items.

Your final output will be the completed table on a worksheet named **MQ5** with the necessary formatting to make the table professionally presentable.

6. MANAGEMENT RECOMMENDATIONS

As the consultants, you would now like to provide your recommendations from the data analysis. You have professionally prepared all of your data in an Excel workbook with worksheets labeled for each MQ (MQ2-MQ5) along with two datasets on separate worksheets. You would also like to provide a written report addressing each of the managerial questions. This report should be professionally written using Word and include your analysis and recommendations for each managerial question.

7. CONCLUSIONS

Managers in all types of organizations struggle when making decisions with limited information. This case offers a variety of scenarios that require students to use complex formulas and functions to identify trends in the data and apply problem-solving skills using Excel. In this case, the student-managers, through the assistance of consultants, learn to make choices about which data are needed to address their decision problems, what must be done to make the data useable, and how to use the data to inform their decision options and assess the possible consequences of their decisions.

Rather than use a large multinational company, this case uses a student-run organization making it realistic and approachable as many students may already have food service experience. The café context is quite rich and along with the accessibility of the data and clear business context, this may make the case come alive for students. Students will see the importance of properly coding the point of sale information and how accurate data entry is key to serving clients quickly, accurately driving the inventory system, and ultimately providing the accounting data on which financial performance and operational decisions rest. What appear to be simple decisions take on more nuanced elements when students must consider both the quality of the information derived from the point of sale system, as well as the ramifications of the decisions recommended by the students as if they were the managers using these data. By challenging students to find practical answers using real data, students see how they could use their new skills to contribute to organizations which often are in need of systematic analyses like those presented in this case.

This case study delivers the material for very flexible applications in the classroom. The managerial questions may be approached differently because the raw data have been provided allowing instructors to extend the learning beyond basic Excel functionality. For example, learning Excel can be enriched when instructors demonstrate or require the use of different Excel features such as database functions, pivot tables, advanced filtering, and formatting capabilities as approaches to managerial decision-making.

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