Research Essentials

Workbook

Unit 3: Analyzing Information

TOWES

How to use this eWorkbook:

This workbook is meant to guide learners in a step by step method to attaining the stated learning outcome listed on the first page. Print this workbook out and write notes in the margins. Fill in the learning activities using a pencil to allow for mistakes and brainstorming during your learning process.

You may choose to complete this workbook on your own, but it may be helpful to locate a mentor or trusted friend or advisor to give you feedback on your completed learning activities.

Make sure to explain or summarize the main concept of the unit and the purpose of each learning activity to your mentor before you ask for feedback. The purpose of this collaboration is NOT for your mentor to tell you that something is right or wrong, but rather just to give you some constructive and objective feedback that may allow you to look at things in a new way or from a different perspective. Chances are that if you can clearly explain the concepts of the unit and your mentor understands what you have completed in your learning activities - you are on the right track.

Essentially, you have the final say on how you complete your learning activities, and how you use the templates provided in this course, but generally a good rule of thumb is that two heads are always better than one! If you are having difficulties working on your own, ask someone for help or feedback.

Step 1: Read the entire workbook.

Step 2: Complete the learning activities.

Step 3: Ask for feedback on learning activities from a mentor or trusted advisor.

Step 4: Use the templates for school, home, or work situations.

The Story:
David's Test Kitchen

Welcome to Unit 3 of the Research Essentials Learning Series. Meet David. This is his continued story about how he is in the process of researching various types and cooking methods of the best Gluten-Free Pasta. As previously mentioned, David is a chef at a small café that specializes in gluten free menu options. He wants to offer his customers the best tasting pasta available and hopes that they would not be able to taste the difference between the regular pasta dishes and the gluten free options.

Once David learned a little bit about primary and secondary information sources covered in the last unit, he decided that his approach (or methodology) was going to be based on gathering primary information and would involve testing 10 different brands of pasta (in five different shapes including spaghetti, elbows, penne, fusilli, and fettuccine). The Gluten-free pasta brands included: Jovial, Ancient Harvest, DeBoles, Lundberg, Riso Bello, Rizopia, Rustichella D'Abruzzo,

Over a period of 3 days, David cooked all the pastas according to the package instructions - adding equal amounts of olive oil and salt to each one. During lunch hours at his restaurant David offered approximately 50 free bowls (per day) of pasta to his customers. In return for a free lunch, the customers helped him to blind taste test each of the five categories that included: spaghetti, elbows, penne, fusilli, and fettuccine. The same tomato sauce was used for each dish. Customers were asked to fill out a simple 5-question survey and David also conducted informal interviews with customers about the flavors and textures of each type of pasta. His results included approximately 150 written surveys, and 20 informal interviews accumulated over the 3-day test kitchen experiment.

Unit 3: Analyzing Information

Q: *Why is it important for me to learn this material?*

Analyzing information is the key activity that will help you to form your conclusion.

Q: *How long will it take me to complete this workbook?*

It should take learners about 2 hours to complete this unit.

Learning Outcome

When you complete this unit you will be able to...

Outline various approaches used to analyze information and to correlate and compare data types that may provide clues to the researcher to help them form observations and potential conclusions.

Learning Objectives

Unit 3 focuses on the following Objectives:

1. Describe some basic starting points for assessing information including context, culture, and micro, meso, and macro levels of analysis
2. Differentiate between descriptive and exploratory analysis and how the term 'correlation' is used within an analytical context.
3. Characterize the most common types of charts, graphs and diagrams that can be used to visually communicate data relationships quickly and easily.

Learning Activities

Please complete the following learning activities:

- Learning Activity 1: Context Analysis
- Learning Activity 2: Descriptive & Exploratory Analysis
- Learning Activity 3: Visual Correlations

OBJECTIVE ONE

When you complete this objective you will be able to…

Describe some basic starting points for assessing information including context, culture, and micro, meso, and macro levels of analysis

Learning Material

Context, Culture, and Levels of Analysis

Context is an important starting point in analyzing information. It refers to the background, environment, framework, setting, or situation surrounding an event, occurrence or personality (Webster's New World Dictionary, 1994).

When conducting any type of analysis it is important to consider the various types of context including:

- **Personal Context:** meaning an individual's 'internal environment' resulting from a person's age, gender, values, beliefs, previous experience, and state of mind. For example consider your own belief system and emotional state of mind when looking at or analyzing information and have an awareness for what biases you might bring with you when analyzing information or conducting your own research.

- **Social or Cultural Context of the research topic:** how does the research topic or information topic fit into the culture and "norms" of a particular audience or group of people? For example, 20 or 30 years ago people didn't really know what gluten-free was. If David (our restaurant owner featured in this unit's case study) was conducting research on that topic 20 or 30 years ago he might have got a different response from the customers in his restaurant. Think about how at one time smoking cigarettes on an airplane was considered normal! Social norms change and adapt to social trends and popular culture.

- **Environmental Context:** where and when was the research conducted? Do you think David would have different results or participation levels in his experiment if he conducted surveys or interviews in his own restaurant serving his customers food, versus a public place such as a mall? What about an online or virtual space on the Internet?

The various contexts of the researcher including the background, framework, setting and situation in which the research was done should be the first consideration when analyzing any primary or secondary sources of information.

When you hear the term "norms" as mentioned above, it refers to the preferences of what a certain group of people or culture would consider "normal" behavior and beliefs versus "strange" or "odd" behaviors and beliefs. Considering 'culture' is another important factor when analyzing any situation or piece of information. Let's revisit the term culture and what it means. Culture can be defined as: "the norms, values, and behavior patterns that serve as guidelines for people's interactions with others and their environments" (Randomski, 2015).

Make sure to keep it in mind that understanding the context of any situation or piece of information is just a starting point during the analysis process. Do not get hung up on trying to invent "context" if you don't know the whole big picture of things, rather just have an awareness for hidden factors that might not be clearly visible to you at a specific point of time during your analysis. Zooming in and out from the larger broader context of the world around you to the smaller more specific context of your own personal experiences, knowledge and thoughts can be a useful exercise for obtaining a well-rounded perspective. It is important to realize that "social structures and society do not preexist the individual, nor do they exist independently or separate from his or her actions" (Francisco, 2007).

Levels of Analysis

Social reality exists on several levels. The varied levels can be used as a basis for analyzing information and can be described as follows:

Micro-Level: Usually experienced at an individual level as short-term analysis or a face-to-face interaction involving few individuals in a small-scale setting. At the micro-level, people engage in direct personal contact, usually in a close, physical setting. For instance as described in this unit's case study David's interactions with serving his customers 'sample dishes of pasta' and conducting surveys and interviews during lunch hours at his restaurant would be an example of a micro level analysis.

Meso-Level: This is the intermediate or middle level of interaction that focuses on an individual organization, a specific social movement or community. For example if David decided to reach out to an organization such as the Gluten-Free Certification Organization (GFCO) http://www.gfco.org/ or the Canadian Celiac Association http://www.celiac.ca to obtain information or arrange research activities, then that would be considered a meso-level of interaction or analysis.

Macro-Level: This type of analysis looks more at larger scale societal events, processes, patterns, structures that might operate among larger scale social units, usually over large geographical areas and long periods of time. An example of this would involve David looking at statistics and facts about Celiac disease in general rather then exploring topics at a micro or meso level. Examples might include facts at a global or national level (http://www.cdhf.ca/en/statistics) E.g.:

- Each year, families affected by celiac disease spend $150 million to obtain gluten-free foodstuffs; the primary therapeutic option for the disease.

- Gluten-free products are 2.5 times more expensive than regular items making the overall cost of the disease for individuals and their families enormous.
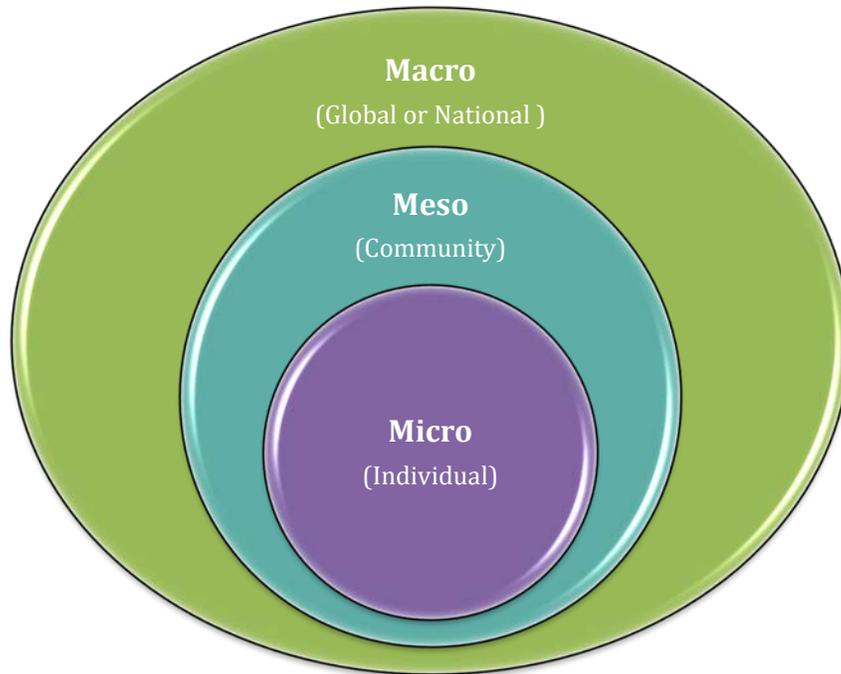

Fig 2: Micro, Meso, and Macro Levels of Analysis

First steps when conducting an analysis may involve:

✓	Considering personal context and biases
✓	Considering the social or cultural context of the research topic
✓	Considering environmental context as to where and when the research was conducted
✓	Considering the relevance of micro, meso and macro analysis

Professor E says:

It's important to think about how…

"Without context, words and actions have no meaning at all. This is true not only of human communication in words but also of all communication whatsoever, of all mental process, of all mind, including that which tells the sea anemone how to grow and the amoeba what he should do next."

~ **Gregory Bateson**, *Mind and Nature*, Bantam Books, 1988, p. 15:

Learning Activity 1: Context Analysis

Complete the Learning Activity listed below…

Answer the following questions relative to your specific research question that you outlined in the previous units or just think about how you look at an analyze information in general.

Consider your own **personal context** and biases. How do you think your age, gender, values, beliefs and previous experience might influence how you look at or analyze information relative to your research topic? List your topic here:	
Do you think your age has any influence? Why or why not?	
Do you think your gender has any influence? Why or why not?	
Do you think your values or beliefs have any influence? Why or why not?	
How might your state of mind impact how you analyze information?	
Does your previous experience with the topic impact how you look at or analyze	

information? Why or why not?	

Consider the **social, cultural and environmental contexts**. How does the information topic that you are looking at fit into the culture and "norms" of a particular audience or group of people? Are there any environmental considerations that may influence how the topic or research is perceived or experienced?

Who is the intended audience of the information?	
Does the topic of the information fit the cultural norms of the typical reader looking at the information? Why or why not? E.g.: It is an accepted and common practice or way of thinking?	
Can you think of any cultural influences that may change the way you or other people may look at or percieve the information?	
Can you think of any environmental impacts that may influence how the information is perceived or experienced by you or others?	

|	
Give an example of a **micro, meso, and macro level** of information analysis for your research topic: List your topic here:	
Micro (Small-scale interactions with individuals or exploring very specific topics with limited perspectives)	
Meso (Intermediate level of information analysis or interaction with an organization, larger community or group)	
Macro (Larger scale societal events, processes, patterns, structures that might operate among larger scale social units, usually over large geographical areas and long periods of time)	

OBJECTIVE TWO

When you complete this objective you will be able to…

Differentiate between descriptive and exploratory analysis and how the term 'correlation' is used within an analytical context.

Learning Material

Different Types of Analysis

Different types of analysis range in complexity from the simple (which require the least amount of time and effort) to the most complex (which require lots of expertise, lots of time, energy and effort). For academic and formal research scenarios it may require more complex forms of inferential, predictive, causal and mechanistic analysis. For most of us involved in day-to-day research projects of a non-academic nature we will mostly conduct ***descriptive*** and ***exploratory*** analysis. We won't really cover each type of analysis in too much detail here but rather just for the purpose of having a basic understanding of the broad range and context of analysis types. Analysis types range from simple to complex, just as research questions range from simple to complex.

Types of Analyses

1. Descriptive
2. Exploratory
3. Inferential
4. Predictive
5. Causal
6. Mechanistic
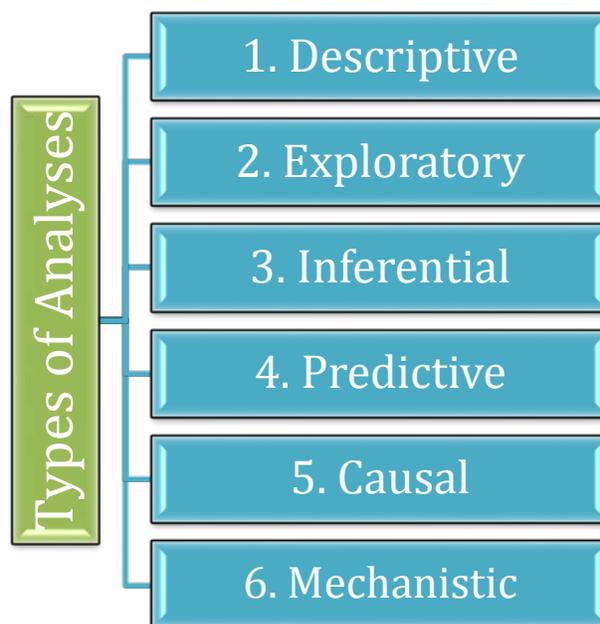
Figure 1: The 6 Key Types of Data Analysis - as identified by Dr. Jeffrey Leek, who is a well-known researcher and professor in the area of data analysis at John Hopkins University.

A key word or concept that may come up frequently when conducting an analysis is "correlation". Correlation is actually a big part of all types of analysis and can

be described as a mutual relationship or connection between two or more things (Oxford, 2015). An example of correlation related to our case study example discussed in this unit would be: the connection (or correlation) between the cooking time of pasta and its firmness or consistency. So it can be said that the cooking time and the firmness of the pasta is directly correlated.

Here are some basic descriptions of the various types of analysis, keeping in mind that the ones most relevant to this level of learning are numbers one and two.

1. Descriptive Analysis	**Easiest type of Analysis:** May take hours or days to complete.
	Involves describing the main features and qualities (qualitative characteristics) of a collection or set of data or information. Examples may include:
	• Statistical Data • Known Facts & Relationships • Census Data
	See the following interactive census map as a simple example: http://www12.statcan.ca/census-recensement/2011/geo/ref/geosearch-georesearche-eng.cfm

Geographic code	01
2011 Census	
Population and dwelling counts	
Population	33,476,688
Total private dwellings	14,569,633
Private dwellings occupied by usual residents	13,320,614
Age and sex [1]	
Total - Age and sex	33,476,685
Age	
0 to 14 years	5,607,345
15 to 64 years	22,924,285
65 years and over	4,945,060
Sex	
Male	16,414,225
Female	17,062,460
Census family structure	
Total number of census families	9,389,700
Number of married-couple families	6,293,950
Number of common-law couple families	1,567,905
Number of lone-parent families	1,527,840
Number of female lone-parent families	1,200,295
Number of male lone-parent families	327,550
Private household type	
Total number of private households	13,320,615
Households containing a couple (married or common-law) with children aged 24 and under at home	3,524,915
Households containing a couple (married or common-law) without children aged 24 and under at home [2]	3,935,540
Lone-parent family households	1,375,450
One-person households	3,673,305
Other household types [3]	811,405
Average number of persons in private households	2.5
Marital status	
Total population 15 years and over by marital status	27,869,340
Married or living with a common-law partner	16,084,490
Married (and not separated)	12,941,960

2. Exploratory Analysis	**Moderate type of Analysis:** May take weeks to complete with knowledge and background in the topic or subject matter area. It involves exploring and analysing existing data to determine previously unknown relationships or correlations of data and is about trying to define future ideas for studies rather than trying to come up with a final answer. • Examples may include exploring new connections, correlations or patterns of data • Research studies that try to correlate new relationships or connections. E.g. Correlation of moderate alcohol consumption to length of life.
3. Inferential Analysis	**Moderately Complex type of Analysis:** May take weeks or months to complete with expertise in the subject area. It tests theories about the nature of the world in general. Uses a small sample of data to say something about a bigger population. • Examples may include an inference that if a small sampling of people in Canada brush their teeth incorrectly that it's a reflection on the larger population. E.g. "Based on our study, on average 4/10 people brush their teeth incorrectly, so that may indicate that only 40% of the population brush their teeth correctly."
4. Predictive Analysis	**Complex type of Analysis:** May take months or years to complete and expertise in the subject area. Analyzes current and historical facts to make predictions about future events. • Examples may include predictions about global warming and its correlation to greenhouse gasses.
5. Causal Analysis	**Very Complex type of Analysis:** May take years to complete and lots of expertise in the subject area. Explores cause and effect relationships to find out what happens to one variable when you change another. • Example: the removal of fluoride from drinking water may cause an increase in population of people with cavities
6. Mechanistic Analysis	**Most difficult type of Analysis:** May take many years and a major amount of expertise to complete. Trying to understand 'exact' changes in variables that lead to changes in other variables for individual objects. • Examples may include complex theories in math, physics and engineering. E.g. Einstein's Theory of Relativity

Learning Activity 2: Descriptive and Exploratory Analysis

Complete the Learning Activity listed below…

1. Identify some 5-10 known facts, statistics, qualities or features related to your research topic or project.

    - Fact 1:

    - Fact 2:

    - Fact 3:

    - Fact 4:

    - Fact 5:

    - Fact 6:

    - Fact 7:

    - Interesting qualities or features? (Is there anything unique, mysterious or intriguing about your topic? Are there any interesting phenomenon associated with your topic?)

2. Can you identify any potential ideas for connections / correlations of any two facts, qualities and features listed above that may make for an interesting research topic in the future?

OBJECTIVE THREE

*When you complete this objective you will be able to…*

Characterize the most common types of charts, graphs and diagrams that can be used to visually communicate data relationships quickly and easily.

Learning Material

When conducting a comparative analysis with any type of information, you might need to visually show relationships or data using different types of charts, graphs or diagrams that can communicate results or concepts quickly and easily. There are a few commonly used formats and below we have described the basic functions and features of the most common ones, which are: Bar Graphs, Line Graphs, Pie Charts and Venn Diagrams.

1. Bar Graphs

A **bar graph** is a useful visual diagram for comparing facts and seeing relationships quickly and easily. The bars on the graph provide a visual display for comparing the quantities of different types of categories. The two factors usually being represented are numerical data (quantitative information) and different qualities or characteristics - such as the 'pasta types' shown below (qualitative information). Each bar has a numerical representation. The taller bars have a greater numerical value than the shorter bars. Each bar will reach a specific numerical value as listed on the side.
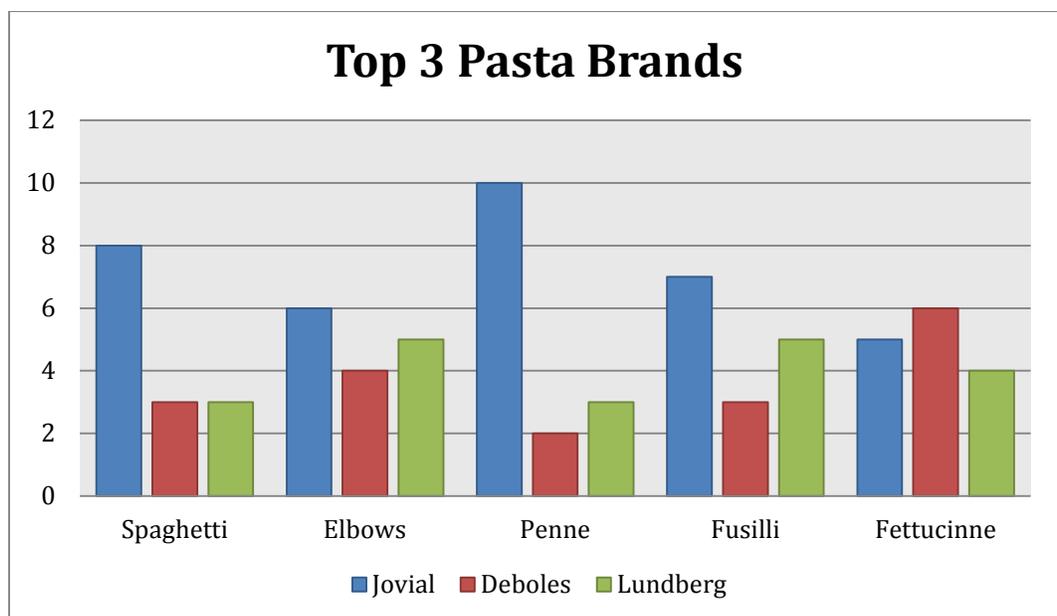
Figure 1: Bar Chart Vertical Example

Bar charts come in both vertical and horizontal formats. The vertical format (up and down) is shown in the chart above, and the horizontal format where the bars run from side to side are shown in the example below.
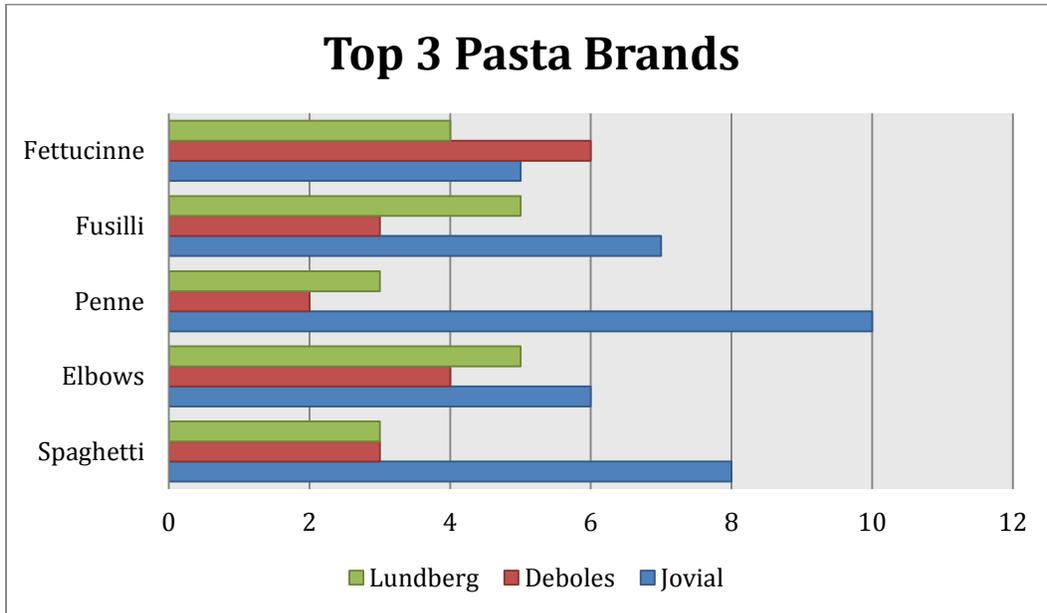
**Figure 2:** Bar Chart Horizontal Example

2. Line Graphs

Another type of chart that is similar to a bar chart is called a Line Graph. Line graphs are slightly different from bar charts because instead of using the height of a bar to represent a numerical value, it is plotted or represented by a single point.

The chart below shows the data from David's test kitchen surveys. We can see all of the customer's preferred pasta types from the survey results over the 3 days. Typically the results would be shown in table like this and then the information would be represented translated into a bar graph or a line graph.

	Spaghetti	Elbows	Penne	Fusilli	Fettuccini
Day 1	6	3	8	4	3
Day 2	4	4	9	3	6
Day 3	3	5	7	5	4

Line graphs differ from bar graphs in that they are more useful for showing trends over a certain period of time or depicting the numerical data during the same time period for more than one category. For instance in the line graph below we can see that the 'Penne' pasta noodles is the clear customer favorite over the 3 day test kitchen survey at David's restaurant.

Favorite Pastas: 3 Day Results
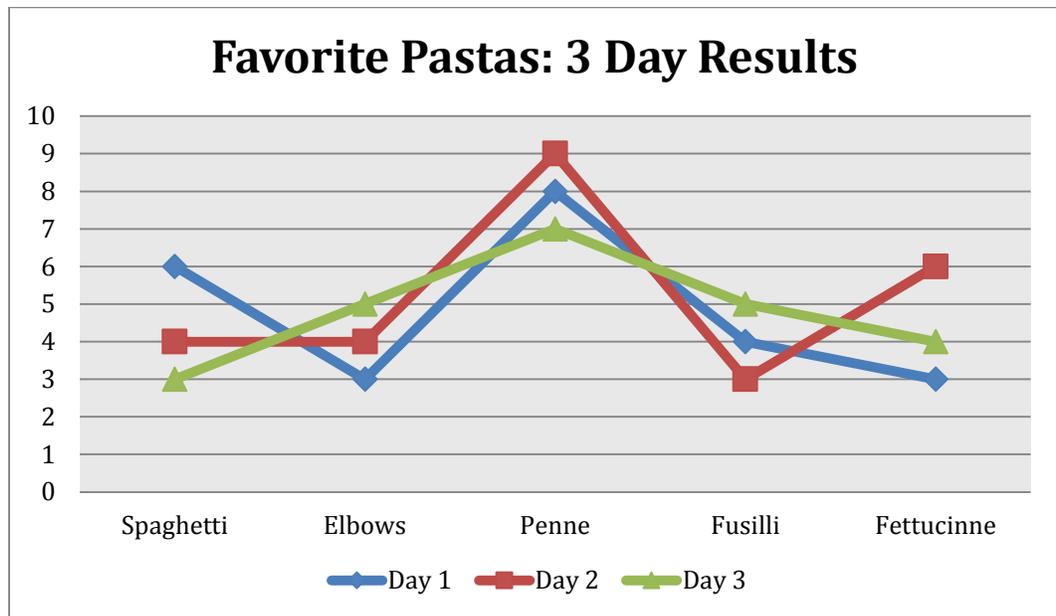
Figure 3: Line Diagrams are useful for showing *Trends*

3. Pie Charts

Have you ever had to be the one to cut up an apple pie and serve it to family or friends? Well that is where pie charts get their name. Think of the circle as the pie. Because there is a whole pie there, all the various slices need to add up to a 100% numerical value. Pie charts are meant to show how data fits in **relation to** a **larger whole**. Keep in mind that pie charts will work best when the numerical data doesn't divide the pie up into such tiny pieces that they will be difficult to see. The slices have to be big enough to compare. If some of the data is too small to represent as a pie slice it may be the wrong type of chart to use to show your specific type of data. Use color or texture differences to create visual contrast.

Jovial Brand of Pasta:
Customer Preference
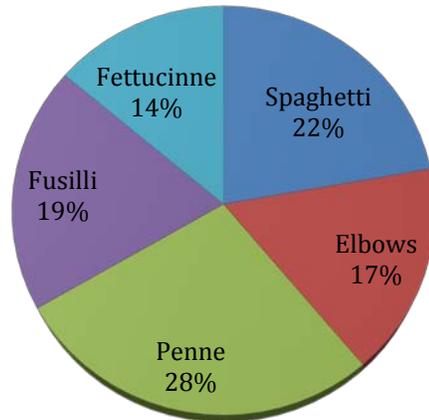
## 4. Venn Diagrams

Venn diagrams illustrate relationships between two or more factors. Each factor or concept can stand on its own, but **Venn Diagrams** show how an individual factor intersects with another individual factor. The overlap areas show a relationship or connection between the concepts. You can build Venn Diagrams with 2 or more circles but in the example below we are showing the relationship between 3 factors or concepts.
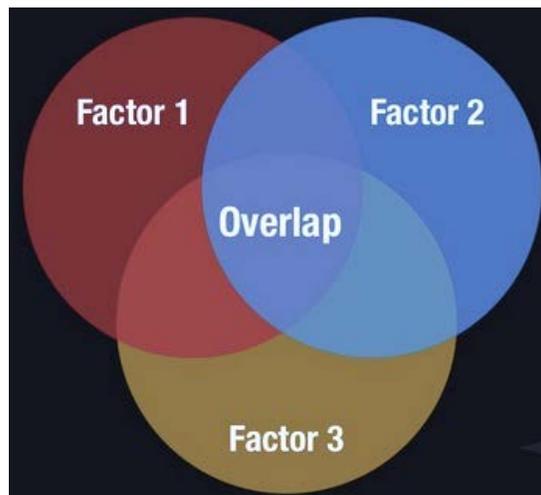
Figure 4: The 'overlap' area shows the relationship between all three factors

The overlap area right in the center is where factors 1, 2 and 3 meet and depicts a sweet spot where all three factors intersect. It is also important to note that *Factor 1 & 3* also have a separate relationship or intersection independent of *Factor 2.* Just as factors 2 & 3 have an independent overlap from factor 1.
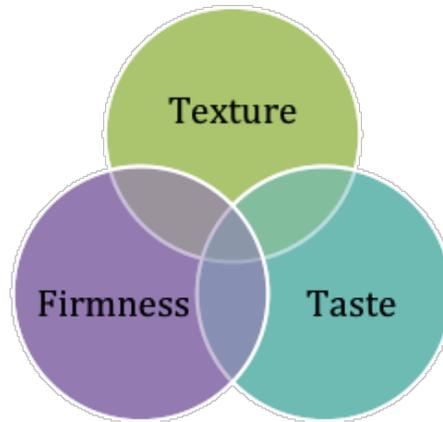
For David's experiment in the Unit Case Study, he wanted to show that there are 3 essential characteristics required for perfect pasta, which are texture, firmness and taste. All 3 of these characteristics are equally important. The overlap area right in the center shows the sweet spot that is the 'perfect pasta'.

Learning Activity 3: Create Visual Chart, Graph or Diagram

Please Note:
Make sure each survey question is relevant and useful to your research topic or question…

Complete the Learning Activity listed below…

1. Create a Simple Bar Graph or Line Graph

Using information from your research and information gathering create a simple bar graph or line graph that depicts a component or feature of your project data.

2. Create a Simple Pie Chart

Using information from your research and information gathering create a simple pie chart that depicts a component or feature of your project data.

2. Create a Simple Venn Diagram

Using information from your research and information gathering create a simple Venn Diagram that depicts a component or feature of your project data.

Unit 3: Building Vocabulary

Directions:

- Read the list of the terms below
- Use either Google, or an online dictionary, to define each word.
- On a piece of paper, write down the meaning of the word in English
- If English is NOT your first language translate it into your native language using an online translator tool such as https://www.babelfish.com/
- Do this for each word listed below

1. Overlap
2. Intersect
3. Factor
4. Concept
5. Numerical
6. Relative
7. Relate
8. Relationship
9. Trend
10. Impact
11. Features
12. Axis
13. Correlation
14. Compare
15. Contrast
16. Descriptive
17. Analysis
18. Vertical
19. Horizontal
20. Sampling
21. Exploration
22. Explore
23. Exploratory
24. Phenomena

References

1. http://www.businessdictionary.com/definition/context.html#examples

Radomski. Mary V. (2015) Assessing Context: Personal, Social and Cultural. http://downloads.lww.com/wolterskluwer_vitalstream_com/thePoint/9780781763 127_Radomski/samples/sampleChapter1.pdf

Francisco Tirado & Ana Gálvez. (2007). Positioning Theory and Discourse Analysis: Some Tools for Social Interaction Analysis. Forum: Qualitative Social Research. Volume 8, No. 2, Art. 31 – May 2007 Retrieved November 30, 2015 from: http://www.qualitative-research.net/index.php/fqs/article/view/248/547

Adapted from: Smith. J. Six types of Analysis Every Data Scientist Should Know, Retrieved on November 30, 2015 from http://datascientistinsights.com/2013/01/29/six-types-of-analyses-every-data-scientist-should-know/

TOWES – The Test of Workplace Essential Skills is Canada's premier literacy and essential skills assessment. Over 120,000 people have used TOWES on their pathways to success in education, employment and life.

TOWES' suite of assessment products have been used by various learning institutions and employers, with over 100,000 TOWES assessments completed by individuals across Canada.