MG-631 – Lecture 5

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Introduction: Topic Selection and Credible Sources

Welcome to the fifth lecture in MG-631! With ten lectures planned for the academic quarter, we've now reached the midpoint. As I write these lines, I see that just about everyone has posted at least one exercise response. As I mentioned in our face-to-face meeting, the course is designed to be flexible. Although it is recommended that you post an exercise response sometime in the week that the exercise is released, you are not absolutely required to do so. If you are experiencing problems in writing your exercise responses, and if you wish to discuss the situation, please don't hesitate to contact me.

This week's lecture is devoted to two seemingly disparate topics. The topics are **topic selection** and **credible resources**. Of course, we know that both topics are associated with research and writing, but other than this fact, they seem to be concerned with fairly distinct activities. We know that we need to select a topic in the first place to write an academic paper, and we know we'll be graded in part on our use of credible resources. After reading the previous lectures and completing previous exercises, we also probably understand that in most cases, in order to locate credible resources, we shouldn't limit our research to just a few keyword searches in Google.

For example, as of today's date, searching for "lean manufacturing" on Google, the first results retrieved are sponsored links to the web sites of consultants who help companies implement lean practices. The next link is to an article about lean manufacturing in Wikipedia, an open source, online encyclopedia. The Wikipedia link is followed by links to more consulting companies' web sites. Looking at these web sites, I find occasional articles and "white papers," but I don't find peer reviewed or scholarly articles, which are what RSOB faculty typically require. Finally, a "YouTube" video on lean manufacturing examples appears in the first few results, probably because Google owns YouTube.[1] I can respond to this state of affairs by re-running my search in Google Scholar, and my results certainly include books, scholarly articles, and other credible sources. One problem, however, is that I can't access a lot of this material without paying for it at the publisher's web site. Moreover, I can only access brief excerpts for many of the books in Google Books.

Turning to the ABI/Inform database, however, a quick controlled vocabulary search –

sub(lean manufacturing)

-- currently retrieves 1,662 articles. A total of 209 of these documents are peer reviewed, full-text articles.

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[1] See Hochstotter, N., & Lewandowski, D. (2009). What users see – Structures in search engine results pages. *Information Sciences XX*, 1796-1812. doi: 10.1016/j.ins.2009.01.028

By this point in the academic quarter, then, "topic selection" and "credible resources" seem to be pretty straightforward.

The Importance of a Critical Approach

In spite of the apparent simplicity associated with these topics, however, I'd like for us to spend time in this lecture thinking about them, and I'd like to start by suggesting that both topics are linked in an important manner: Success in working with each of them is determined in large part by one's *critical attitude*.

Here's this week's picture that I'll use for my personal interjections.

Yes, it's a picture of the cover of an issue of the *Weekly World News*. In a lecture that addresses "critical attitude" and "credible sources," the use of this picture seems somehow strangely appealing.

We laugh at these types of publications – they can't be true, of course. Can they? The *Weekly World News* seems to stand in a class of its own, particularly with its emphasis on aliens (notice the picture of an alien who "slimes" Teresa Heinz Kerry "with ketchup").

However, many people do seem to believe them. A 1991 Roper study showed that one in fifty adult Americans – 3.7 million – may have been abducted by a UFO.

Now, because I just cited a Roper study, do you believe me? Do you believe that people have been abducted by aliens? Or, do you believe that they believe they've been abducted?

Let me tell you a little more about the study. A total of 6,000 people were asked if any of a number of experiences had ever happened to them. If they said "yes" enough times, that strongly suggested UFO abduction, according to the authors of the study. On the list were things like having seen, as a child, a terrifying figure in your closet, or having found puzzling scars on your body. The survey contained a control question designed to weed out people who will say "yes" to anything. It was "hearing or seeing the word TRONDANT and knowing that it has a secret meaning for you." Eighteen people said that had happened to them more than twice.

What did this Roper study do, exactly? Did it prove what it set out to prove? Is the study useful? What other questions about the survey might be useful in seeking to understand whether or not its results are informative?

Please do *not* confuse a *critical attitude* with a *negative attitude*; don't mistaken "criticism" for "negativity." In today's common usage, the word "criticism" has come to be associated with "negativity" (*e.g.*, "You're soooo critical!"). The word "critical" is derived from two Greek roots: *kriticos* means "discerning judgment," and *criterion*

means "standards" (or "criteria").   A critical attitude, therefore, is a deliberate and proactive intellectual stance that seeks to reach judgments based on standards, criteria, and evidence. The primary tools of a critical attitude are questioning and investigation – not a disapproving or fault-finding methodology, or a deliberately contentious or adversarial approach. The word "evaluation" can refer to the ability to assess and judge issues in order to solve problems. Putting all of this information together, a standard definition of a "critical evaluation" is "the ability to analyze facts, generate and organize ideas, defend opinions, make comparisons, draw inferences, and solve problems."[2]

 Let's apply these ideas to the topics of topic selection and credible resources.

Topic Selection

Definition of "Topic Selection"

Dispensing with the formalities first, we can say that "topic selection" in the graduate programs entails the choosing of a subject or topic for a research paper, project, report, thesis, capstone report, or some other deliverable. "Topic selection" is one of the first activities associated with the writing of a paper or report. Sometimes in your graduate program, you will be asked to write about a specific topic or subject, in which case, you do not have to think about topic selection; more often, you will be given a broad subject area to consider, from which it will be up to you to determine a specific topic. At the graduate level, it is usually the student's responsibility to select and to refine a specific topic, often within a general subject area. For example, you may be asked to write a paper on the importance of Peter Drucker's work, or you may be asked to consider a "real-world," work-related problem, and how you can apply management principles, theories, and practices to develop solutions.

How You Handle a Topic is More Important than What You Choose for a Topic

By "topic selection," however, I mean more than merely choosing something to write about: I also mean *how* you can handle the topic once you've selected it. By "topic selection," I really am referring to a decision-making *process* that entails the consideration of several questions. For RSOB graduate-level academic papers, some of these papers might include the following questions with respect to the topic selection process. How can you develop a topic? Is a topic suitable for a graduate-level project? Is it possible – or necessary -- to narrow the topic, or to broaden it? Is your topic too technical? Can you exercise a management perspective in dealing with your topic? Can you articulate a *thesis statement* within your topic? A *topic* is what your paper or report is about; a *thesis statement*, however, is the *central point* that you wish to convey to your reader. A thesis statement is typically your opinion concerning the topic or some aspect of the topic. It is also the answer to a research question that you pose concerning your topic. Is your topic sufficiently rich enough, then, to ask an interesting question, and to

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[2] See page 6 of Chance, P. (1985). *Thinking in the classroom: A survey of programs.* New York: Teachers College, Columbia University.

answer it in an interesting manner? That is, does your topic permit you the opportunity to develop a thesis statement? These are all questions that should be addressed when selecting and developing a topic, and they are questions that often cannot be answered without additional information.

The Importance of Levels of Ability – or the "Six Capabilities" -- in Graduate-Level Academic Papers

In considering topic selection with respect to graduate-level academic papers, it's useful to understand first the *level of intellectual ability* that is expected in many reports, papers, projects, and other deliverables in the RSOB programs. The *level of intellectual ability* is not necessarily concerned with the type of research that you will be expected to do. In some courses, for example, you will be expected to carry out a small primary research project; for most deliverables, however, you will be expected to carry out research for secondary and tertiary literature sources. We've already discussed the differences between these types of source materials in Lecture 2, and Lectures 3 and 4 were devoted to an overview of the databases and tools you can use to carry out such research.

Instead of referring to the types of research that you will do in your graduate program, the *level of intellectual ability* that you will be expected to demonstrate is concerned with *how you handle* the research that you gather. Typically, how you handle the research -- and how you write about it in a report, paper, or project – is characterized in terms of *levels of ability.*

The levels of ability consist of six capabilities. These capabilities include *knowledge*, *comprehension*, *application*, *analysis*, *synthesis*, and *evaluation,* and in the context of levels of ability, these words feature special technical definitions.

Knowledge

The minimal level of ability expected is *knowledge*. A student who demonstrates knowledge in a written deliverable has clearly carried out research and – based on the research -- is able to summarize basic descriptions of major concepts, theories, dates, events, and places associated with a topic. A student who demonstrates knowledge is said to remember information. For example, in a paper on leadership, an RSOB student could demonstrate knowledge by summarizing various definitions of leadership.

Comprehension

The next highest level of ability is *comprehension*. A student who demonstrates comprehension in a written deliverable is said to understand information. This student moves beyond definition to explanation. In a paper on leadership, to continue our example, an RSOB student might demonstrate comprehension by explaining the importance of leadership in an organization.

Application

The third highest level of ability is *application*. Here, a student demonstrates the ability to use information in concrete situations, to explore and to solve real problems. Continuing our example, an RSOB student writing a paper on leadership might demonstrate this level of ability by writing about how management and leadership differ from each other in a work environment. Or, a student might write about a situation in their work environment that may have had a different outcome if leadership had been applied, or had been exercised differently.

Analysis

The fourth highest level of ability is *analysis*. A student who demonstrates this ability in written work is said to be able to break down information into component parts. The student can perceive patterns, recognize hidden meanings, categorize, compare, and contrast information. Once again, to continue our example, an RSOB student writing a paper on leadership may demonstrate this level of ability by first writing about various definitions, explanations, and applications of leadership, and then, secondly, by recognizing patterns and relationships in this material.

Synthesis

The fifth highest level of ability is *synthesis*. A student who demonstrates this ability in written work is said to be able to use information and skills to produce new or original insights. This process can occur in a variety of ways. For example, the student might use old ideas to create new ones, or the student might generalize from given facts, or the student may demonstrate the ability to connect knowledge from several areas. A student writing at this level is able to integrate a wide variety of information. Our RSOB student writing a paper on leadership, for example, may demonstrate this level of ability by first discussing patterns in the definitions, explanations, and applications of leadership, and then, secondly, by developing a theory of leadership, or more likely, by suggesting some insights regarding a theory of leadership. Some of those insights might be derived by applying concepts from completely different disciplines. An obvious example here might be the use of history to develop ideas about effective leadership: an RSOB student might study various historical leaders, and then try to develop leadership tools that can be used by the modern manager.

Evaluation

The highest level of ability is *evaluation*. A student who demonstrates this ability is able to compare and to discriminate between ideas, assess the value of concepts and theories, make choices based on reasoned argument and experience, verify the value of evidence, and recognize subjectivity. Students who demonstrate this level of ability in their writing are able to avoid rigid and narrow thinking (*i.e.*, thinking based on past practices without considering current data), prejudicial thinking (*i.e.*, the gathering of evidence to support a particular position without questioning the position itself), or emotive thinking (*i.e.*,

responding to the emotion of the message rather than to its content). Our RSOB student writing a paper on leadership, for example, may demonstrate this level of ability by first discussing insights concerning a theory of leadership developed from a consideration of various definitions, explanations, and applications of leadership, and then, secondly, by assessing theories of leadership. The assessment would be based on solid evidence from research and from experience. The assessment, furthermore, might demonstrate an ability to weigh different theories of leadership.

Key Graduate-Level Capabilities

Evidence of *synthesis* and *evaluation* in a paper or report particularly indicates graduate-level thinking. Accordingly, evidence of these two levels of ability are often required in RSOB graduate work. Sometimes, instructors deliberately encourage the development of these abilities in students by requiring them to write papers that must address two or more seemingly disparate topics to generate insights.

For example, a student might be asked to explore the broad topic of leadership as it relates to the subtopics of brand management and employee motivation. A search of the ABI/Inform and Business Source Complete databases might not retrieve any articles that simultaneously address all three concepts associated with the broad topic (i.e., leadership, brand management, employee motivation). Locating credible articles that address each of the topics instead – and many articles are available on each of the topics -- the student would next work to synthesize and to evaluate the information. The student's ability to synthesize and to evaluate the concepts – to connect them, to use them to shed light on each other, to assess them, and to develop insights – is characteristic of high-level graduate thinking.
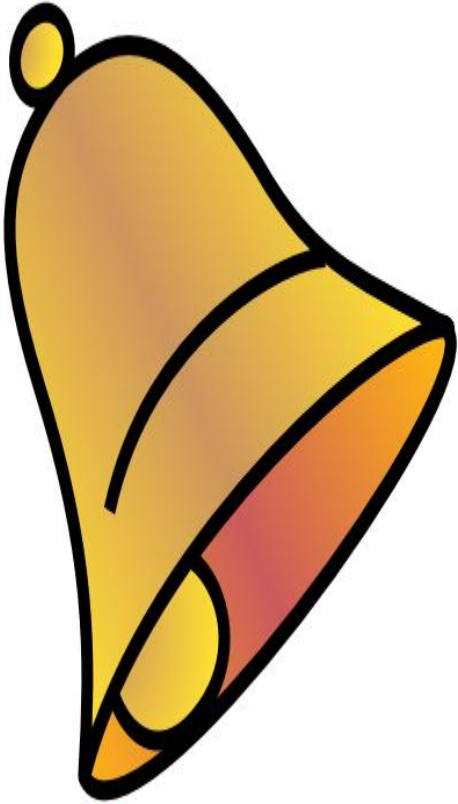
As a general rule of thumb, when you are asked to write a research report, paper, or some other written deliverable in your graduate program, you will be expected to demonstrate an ability to handle your research materials in a manner consistent with the three highest levels of intellectual ability. That is, you will need to demonstrate all six levels of intellectual ability, but you will be expected to write in a manner that shows you are able to *analyze*, *synthesize*, and *evaluate* information. Notice, in addition, that the development of a good thesis statement usually requires a writer to ask questions, and to eventually focus efforts on answering a single research question by analyzing, synthesizing, and evaluating information.

Topic Selection and the Six Capabilities

When considering a topic for a written deliverable in your graduate program, then, one of the first things to consider is whether or not the topic presents a sufficient opportunity for you to analyze, synthesize, and evaluate information. Or, to express the matter with a slightly different emphasis, you need to consider whether or not you see opportunities to analyze, synthesize, and evaluate information in a given topic. Often, before deciding if you see such opportunities, you must carry out a great deal of research, and you must study the results.

Sometimes, your professional knowledge and experience enable you to understand that a topic is sufficiently nuanced and complex to offer opportunities for analysis, synthesis, and evaluation, but typically, the actual opportunities themselves do not crystallize until you have worked your way through – and given yourself the chance to learn from – a significant amount of literature. Someone who has been doing new product development professionally for many years in the service of a world-class manufacturer undoubtedly knows and understands a great deal about product development. From years of experience, of course, such a person already understands that product development is complex; at the same time, however, they may not believe that the literature can inform them about something they don't already know. If you ever find yourself adopting a similar approach to a topic, consider for a moment that it's surely possible, if not probable, that you might not know *everything* about a topic area.

You will want to address other considerations in topic selection, of course. For example, you will likely wish to investigate topics that you find interesting. Regardless of these other considerations, though, every topic that you choose must be capable of providing you with an opportunity to demonstrate graduate-level thinking.

Do the six levels of ability (or, the six capabilities) ring a bell for you? Do they sound familiar? They may not be as intimidating as they sometimes first appear to some students. Some of you may have applied the six abilities or capabilities in the workplace!

After reading about the six abilities, one of my previous students in MG-631 noticed that he had been successfully and productively using the six abilities in the workplace. He suddenly realized that he merely had to deploy the same methodology in writing academic papers. Here are his comments.

"After reading the six capability levels of abilities for topic selections, I found that in one form or another, I have utilized the methodology in the workplace. For instance, when fundamentally reviewing a new product launch, I have developed a "Stage-Gate" presentation that incorporates the essential components of the six capabilities. I begin with reviewing the current product line and understand their position in the market place. Next, I determine how applicable the new product will be to the average consumer and whether it has relevancy to the existing brand or product offering. A thorough analysis is performed in the following stage where financial and market investigation is conducted. The subsequent process that can be closely described to the synthesis level includes a correlation of the new product to the existing manufacturing process. Productivity, efficiently, cost-savings, and proficiency questions are discussed at a detailed level to fully understand the impact of the new product introduction. Finally, if and when the new product is launched, the team members regroup to evaluate the outcomes and process improvements. Questions of whether the launch was successful and whether the financials met the forecasted scenarios are evaluated. At a higher level, finding an intriguing and relevant management topic and its credible resources is comparable to finding a new product to successfully launch."

With the levels-of-ability framework in mind, let's move on to discuss some practical steps that you can employ to facilitate topic selection.

Topic Selection Methods

Quick Database Search Method

In Lecture 3, you were introduced to library databases that you can use to locate articles published in journals and magazines. You can also use a series of quick searches in these databases to initially facilitate topic selection.

For example, let's assume that you have been asked to select a topic for an academic paper in an information technology class. Your only instructions are that you are to write on a software project management topic. It may be that you know very little about software project management, or, it may be that you *are* a software project manager with years of experience in the area. Regardless of your level of experience, you should consider using the *Quick Database Search Method* in your topic selection process.

If you don't know much about software project management, the *Quick Database Search Method* can provide you with a bird's-eye view of current issues, opportunities, problems, and topics in the area. In providing an overview of current issues, the *Quick Database Search Method* is equally useful to experts, as well. Why? Because knowledgeable and experienced professionals may know a great deal about a topic, but they likely don't know everything, and they can be misled by their own biases.

How does the *Quick Database Search Method* work?

Referring to information in Lectures 2 and 3, we know that we can use controlled vocabulary to search the ABI/Inform Business and Management database. For example, looking up "software project management" in the online Thesaurus, we see that "software project management" is *not* a controlled vocabulary term in the database. Instead, ABI/Inform employs

Software AND Project management

as a valid search term, along with other variations (such as "Project Management AND Software Engineering"). To do a subject search on "software project management," then, we would type and execute the following search:

sub(software and project management)

We also know that the following search --

ti(software and project and management)

-- will retrieve articles with the words "software," "project," and "management" in the titles of the articles. We can also execute similar searches focusing on the abstracts of articles.

We're now ready to do some focused searching. In ABI/Inform, we can employ the above searches, and we limit the results to the previous 24 months. Next, we can run equivalent searches in Business Source Complete, but in that database, the appropriate controlled vocabulary is different:

COMPUTER software development

Without looking at the actual articles themselves, we instead focus on keywords in the titles of the articles (some keywords are **bolded** in the results below).

For example, we might see the following results (from a search completed in 2010).

Avritzer, A., Paulish, D., Cai, Y., & Sethi, K.. (2010). Coordination implications of software architecture in a **global software development project**. *The Journal of Systems and Software*, 83(10), 1881. Retrieved October 1, 2010, from ABI/INFORM Global.

Balijepally, V., Mahapatra, R., Nerur, S., & Price, K. (2009). Are two heads better than one for software development? The **productivity** paradox of pair programming. *MIS Quarterly*, 33(1), 91-118. Retrieved from Business Source Complete database.

Bird, C., Nagappan, N., Devanbu, P., Gall, H., & Murphy, B. (2009). Does distributed development affect software **quality**? An empirical case study of Windows Vista. *Communications of the ACM*, 52(8), 85-93. Retrieved from Business Source Complete database.

Buschmann, F.. (2009). Learning from **failure**, part 1: **Scoping** and **requirements** Woes. *IEEE Software*, 26(6), 68-69. Retrieved October 1, 2010, from ABI/INFORM Global.

Canovas, J., & Molina, J.. (2010). An architecture-driven modernization tool for calculating **metrics**. *IEEE Software*, 27(4), 37-43. Retrieved October 1, 2010, from ABI/INFORM Global.

Carmel, E., Espinosa, J.A. & Dubinsky, Y. (2010). "Follow the Sun" workflow in **global software development**. *Journal of Management Information Systems*, 27(1), 17-37. Retrieved from Business Source Complete database.

de Barcelos Tronto, I., da Silva, J., & Sant'Anna, N. (2008). An investigation of artificial **neural networks** based **prediction systems** in software project management. *Journal of Systems & Software*, 81(3), 356-367. doi:10.1016/j.jss.2007.05.011.

DeLine, R., Venolia, G., & Rowan, K. (2010). Software development with **code maps**. *Communications of the ACM*, 53(8), 48-54. doi:10.1145/1787234.1787250.

Erdogmus, H.. (2010). Tracking progress through **Earned Value**. *IEEE Software*, 27(5), 2-7. Retrieved October 1, 2010, from ABI/INFORM Global.

Ganesh, M.P. & Meenakshi Gupta. (2010). Impact of virtualness and task interdependence on extra-role performance in software development **teams**. *Team Performance Management*, 16(3/4), 169-186. Retrieved October 1, 2010, from ABI/INFORM Global.

Haines, M., & Rothenberger, M. (2010). How a service-oriented **architecture** may change the software development process. *Communications of the ACM*, 53(8), 135-140. Retrieved from Business Source Complete database.

Jaisingh, J., See-To, E., & Tam, K. (2008). The impact of **Open Source** software on the strategic choices of firms developing proprietary software. *Journal of Management Information Systems*, 25(3), 241-275. Retrieved from Business Source Complete database.

Korrapati, R., & Rapaka, S.. (2009). Successful **leadership** styles in software projects in **offshore centers** in India. *Allied Academies International Conference*. Academy of Information and Management Sciences. Proceedings, 13(2), 56-59. Retrieved October 1, 2010, from ABI/INFORM Global.

Lee, G., & Xia, W. (2010). Toward agile: An integrated analysis of quantitative and qualitative field data on software development **agility**. *MIS Quarterly*, 34(1), 87-114. Retrieved from Business Source Complete database.

Li, Y., Chang, K., Chen, H., & Jiang, J.. (2010). Software development **team** flexibility antecedents. *The Journal of Systems and Software*, 83(10), 1726. Retrieved October 1, 2010, from ABI/INFORM Global.

Mcavoy, J., & Butler, T.. (2009). The role of project management in ineffective decision making within **Agile** software development projects. *European Journal of Information Systems: Special Issue: Agile Processes in Software Development*, 18(4), 372-383. Retrieved October 1, 2010, from ABI/INFORM Global.

Niazi, M., Babar, M., & Verner, J.. (2010). Software **process improvement** barriers: A cross-cultural comparison. *Information and Software Technology*, 52(11), 1204. Retrieved October 1, 2010, from ABI/INFORM Global.

Parkinson, S., Hierons, R., Lycett, M., & Norman, M. (2010). Practitioner-based **measurement**: A **collaborative** approach. *Communications of the ACM*, 53(3), 142-147. Retrieved from Business Source Complete database.

Rainer, A.. (2010). Representing the behaviour of software projects using **multi-dimensional timelines**. *Information and Software Technology*, 52(11), 1217. Retrieved October 1, 2010, from ABI/INFORM Global.

Slabospickaya, O., & Koval, G.. (2009). An integrated technology for intelligent software **risk management**. *Cybernetics and Systems Analysis*, 45(6), 971-976. Retrieved October 1, 2010, from ABI/INFORM Global.

Thatcher, M., & Pingry, D. (2009). Optimal policy for software **patents**: Model and comparative implications. *Journal of Management Information Systems*, 26(3), 103-133. Retrieved from Business Source Complete database.

Wiegers, K.. (2010, July). The **requirements** payoff. *InformationWeek*,(1273), 39-40,42. Retrieved October 1, 2010, from ABI/INFORM Global.

Woolridge, R., Hale, D., Hale, J., & Sharpe, R. (2009). Software project **scope** alignment: An outcome-based approach. *Communications of the ACM*, 52(7), 147-152. Retrieved from Business Source Complete database.

Xu, P., & Ramesh, B. (2008). Impact of **knowledge support** on the performance of software process tailoring. *Journal of Management Information Systems*, 25(3), 277-314. Retrieved from Business Source Complete database.

Noticing keywords in the article titles provides a quick overview of topics addressed in the current literature. As a result, these article titles begin to suggest a number of possible topics for research papers on software project management, including:

- Prediction in software projects.

- Global software project management.

- Metrics in software project management.

- Knowledge management in software project management.

- Risk in software project management.

- Success and failure in software projects: What are the success factors? What are causes of failures?

- Software patents.

- Software quality in software project management.

- The impact of Open Source on software product management.

- Agile software project management.

The next step is to consider, first, if any of these broad topics sounds interesting, and second, to make an initial determination as to whether or not the topic can be handled in a manner that enables you to demonstrate your abilities to analyze, to synthesize, and to evaluate information. To make this initial determination, you'll need to locate and retrieve additional literature on the selected topic, and then scan the literature to see if you think it presents opportunities to compare and to contrast information, to leverage insights from other areas, and so forth.

When you scan literature at this time, focus on reading *only* the following elements in a document: the title, the abstract, headings, the captions of figures and tables, topic sentences, the introduction, and the conclusion. At this point, you need to practice *ruthless reading*. You are reading quickly to aid in a decision-making process.

One way to obtain additional literature is to use advanced search methods in the databases, such as controlled vocabulary searching, title searching, and footnote searching. A footnote search, for example, on "Agile" and "software" --

REF("agile software")

-- retrieves documents that feature references on agile software.

To see if a selected bird's-eye topic presents graduate-level opportunities, you also should combine the *Quick Database Search Method* with the *Critical Attitude Method*.

The Critical Attitude Method

Whereas the *Quick Database Search Method* entails the limited and disciplined evaluation of several article citations in the effort to select a broad topic, the *Critical Attitude Method* focuses on just a few credible source documents – usually peer reviewed journal articles. Entire libraries of materials are devoted to the subject of critical thought skills; this lecture is not the place to describe and to summarize that material. It's sufficient to point out that a critical attitude is a proactive and deliberate habit of thought that entails *questioning*. Who, what, where, when, and how are all good places to begin when adopting a critical attitude with respect to a text.

For example, consider the following paragraph:

The research in leadership development has recently turned toward identifying

leadership competencies. The logic is that once the competencies can be

identified, the leadership development process can be more effectively focused on

improving the deficiencies identified in each individual. It is also known that all

leadership occurs in some context. The word "competency" comes from a Latin

word which means "suitable." An individual's competency refers to an

individual's ability to respond to the demands placed on them by their

environment. The most important leadership competencies are those that can best

transfer across cultures, both within organizations and from one country to

another. The results presented in this paper indicate that leaders identify (1)

communication skills, (2) motivation to learn, (3) flexibility, (4) open-

mindedness, (5) respect for others, and (6) sensitivity as the most frequently

mentioned competencies of an effective global leader.

Take a moment to *reflect* on this paragraph about leadership and develop at least three questions that you might be interested in researching. Notice how much time is necessary to develop the questions.

After several minutes of thought, my own initial questions include the following.

(1) What does it mean to be a "global leader" and how is this different from being a "regular" leader?

(2) "Competencies" appear to be based on personal style and personal characteristics. Are there other components of leadership, such as technical knowledge expertise or experience?

(3) In speaking of "competencies" of leadership, does this notion imply a "competency-based" model or theory of leadership? Do other models of leadership exist?

(4) What research in leadership development is the author referring to, and if the research focuses on "leadership competencies" now, what did it focus on before?

(5) "Flexibility" is mentioned as a leadership competency. Do good leaders demonstrate more flexible thinking than bad leaders? How is a good leader's thinking "flexible"? Does a difference exist between the thinking of good leaders versus bad leaders? Can a study of leaders in history help me to understand leadership?

(6) What about decision-making, judgment, and discernment? Are these things competencies for global leaders? Are they handled differently by different global leaders?

(7) What is the future of global leadership?

In the *Critical Attitude Method*, no question is incorrect. Some of the questions may feature easy-to-find answers; others – with further investigation – may prove not worth following up; still others may lead to potential topics worthy of exploring in a research paper. Looking at my questions, I begin to think about paper topics such as "defining the global leader today," or "an overview of theories of leadership," or "how good global leaders think." I can now carry out some preliminary research on these potential topics, study the results, and reapply the *Critical Attitude Method* to refine the topic. I may need to repeat the entire process several times before I am satisfied with a topic. As a graduate student, when reading course materials, as well as primary, secondary, and tertiary source materials, cultivate the habit – the attitude or the stance – of questioning. The subsequent development of questions likely can lead to fruitful topics.

The Critical Attitude Method and the Research Question

Eventually, however, I must dig deeper. I must evaluate the list of questions that I have developed. I need to attempt to articulate a single, suitable *research question*. A good research question is narrowly focused and sufficiently defined so that it can be addressed effectively. A question that is too broad, too vague, too conventional, and too open-ended is an unsuitable research question. A question that actually consists of multiple questions can also create problems, particularly if the questions address different concepts. A good research question should also hint at possibilities for the analysis, synthesis, and evaluation of information.

Applying these criteria to my own questions, I see, for example, that the question, "What is the future of global leadership?", is simply too vague and too open-ended. The question concerning models of leadership, on the other hand, is too conventional: I can find the answer in virtually any leadership textbook.

Instead, I find myself focusing on the series of questions in Item (5), and I attempt to articulate a sufficiently focused research question: *Do good leaders demonstrate more flexible thinking than bad leaders?* The question implicitly presents opportunities for analysis, synthesis, and evaluation: it's likely, for example, that I will have to draw upon multidisciplinary literature to answer it (i.e., the management literature as well as literature from the social sciences). However, the question is not without challenging difficulties that will also require analysis, synthesis, and evaluation. It is necessary, for example, to define a "good leader," a "bad leader," and "flexible thinking." If additional research can provide me with guidance on establishing functional definitions, I could then answer the question. My answer to the question will serve as my *thesis statement* in my academic paper. My professional experience might help me to form a *tentative* thesis statement – that is, a tentative answer to the question – but my final thesis statement should only emerge after I have studied a significant amount of literature. The development of a research question in the topic selection process, however, obviously serves now to focus my research efforts. Starting with a broad text on "global leadership competencies," I have moved to the focused evaluation and assessment of a significant leadership characteristic.

Although the *Critical Attitude Method* is best practiced in the context of peer reviewed literature, an advantage associated with this method is that it can be practiced with a wide array of information sources. In Lecture 3, we discussed types of serial publications, including scholarly and peer reviewed journals, trade journals, popular magazines, and so forth. In the exercises associated with Lecture 4, you were asked specifically to compare a peer reviewed journal article with a trade journal article on the same topic. Although in your graduate program you will often be asked to write research papers that cite scholarly and peer reviewed journals, this requirement does not mean that you cannot make use of other types of serial publications, including trade journals or popular magazines. One way you can make use of these materials is precisely by reading them and applying the *Critical Attitude Method* in which you generate questions. Look particularly at any assumptions by authors, in addition to vague definitions and procedures, and explicit or implicit limitations.

The *Critical Attitude Method* requires perseverance. The good news is that its use is generally confined to excerpts from information sources. However, it's clearly easier to skim an article for the purposes of gathering information than it is to read it slowly and carefully in order to develop questions about the text. To a large extent, though, your graduate education – to say nothing of your management career, for that matter – is very much in your own hands. Your willingness and your ability to become engaged with -- and to proactively ask useful questions about -- literature, discussions, events, and assertions -- will help to determine your success.

Nonetheless, we all must contend with constraints. It is not the case that you will need to read everything in your graduate education in a slow and deliberate manner, but you will need to read many things in such a manner, particularly if you wish to use the *Critical Attitude Method*. Give yourself enough time to reflect in these situations.

Leveraging the Interrelationship Diagramming Methodology to Define a Topic Associated with a Work-Related Opportunity, Problem or Process

The *Quick Database Search Method* in combination with the *Critical Attitude Method* can be used to select a topic, refine the topic, articulate a research question, and identify a tentative thesis statement for many academic papers – especially for those papers that are developed as a result of working exclusively (or almost exclusively) with relevant research and literature.

In many courses in your RSOB graduate degree program, however, you will be asked to write an academic paper on a "real-world," work-related opportunity, problem, or process. In these situations, before you engage in a significant literature search, Dr. Kelly Ottman in the Rader School of Business recommends the use of an *interrelationship diagramming methodology* (IDM). The IDM entails the use of a series of questions – similar to the *Critical Attitude Method* – but focusing on determining cause-and-effect relationships among critical issues.

The IDM is best illustrated by an example.

Let us say that you have been asked to write an academic paper that identifies and explains a work-related problem at your place of employment, and that employs management principles and practices to offer a solution to the problem. In addition, you have been asked to use credible literature to support your solution.

To identify a topic in this situation, you must consider problems at your place of employment. You would not start with the *Quick Database Search Method*. Instead, you would identify a problem, and this problem would serve as the starting point of your topic selection.

In thinking about the problems at your place of employment, for example, let's say that you eventually decide that a problem with the sales force exists. After an expensive development process, your organization developed a new product offering – the "Super Widget" – which is being actively marketed. The problem – and your initial topic -- is that the sales force has been reluctant to sell the "Super Widget," and as a result, sales are flat. The new product launch is failing. Your initial research question may be, "Why is the sales force not selling the "Super Widget"?" The question is too open-ended, but it is a place to begin. Based on your own professional experience with the sales force, a *tentative* answer to the question – and thus, a *tentative* thesis statement – might be that the sales people are not good, and that the organization's sales force needs to be improved.   With this research question and tentative thesis statement in mind, you might

move ahead and carry out research in an effort to locate literature on how an organization can improve its sales force.

The following search in ABI/Inform, for example –

ti("sales force") and ti(improv*)

-- retrieves a number of potentially useful articles, including the following documents.

Vadlamudi, Pardhu. (1996, June). Sales-force apps improve data access. *InfoWorld*, 18(25), 50. Retrieved October 1, 2010, from ABI/INFORM Global.

Ashraf M Attia, Earl D Honeycutt Jr, & Mark P Leach. (2005). A three-stage model for assessing and improving sales force training and development. *The Journal of Personal Selling & Sales Management*, 25(3), 253-268. Retrieved October 1, 2010, from ABI/INFORM Global.

Anonymous. Break the 80/20 rule: Increase profits with improved sales force selection. (1984, May). *Small Business Report*, 9(5), 37. Retrieved October 1, 2010, from ABI/INFORM Global.

Lawrence, R., Perlich, C., Rosset, S., Khabibrakhmanov, I., Mahatma, S., Weiss, S., Callahan, M., Collins, M., Ershov, A., & Kumar, S.. (2010). Operations research improves sales force productivity at IBM. *Interfaces*, 40(1), 33-46,91-93,95-98. Retrieved October 1, 2010, from ABI/INFORM Global.

Rajesh Srivastava, David Strutton, & Lou E Pelton. (2001). The will to win: An investigation of how sales managers can improve the quantitative aspects of their sales force's effort. *Journal of Marketing Theory and Practice*, 9(2), 11-26. Retrieved October 1, 2010, from ABI/INFORM Global.

Skiera, B., & Albers, S.. (2008). Prioritizing sales force decision areas for productivity improvements using a core sales response function. *The Journal of Personal Selling & Sales Management*, 28(2), 145. Retrieved October 1, 2010, from ABI/INFORM Global.

These articles suggest a number of possibilities for improving a sales force, including the use of better automation, the use of operations research, the use of training and development, and the use of technology. At this point in your topic selection decision-making process, however, without further consideration, these articles could also mislead you. Before moving on, Dr. Ottman instead recommends the use of the *interrelationship diagramming methodology* (IDM) to first focus your research efforts.

The IDM first identifies in a clear and complete manner the problem statement. In this case, the problem statement is that the sales force at your organization has been reluctant to sell – and has therefore not been selling – the new "Super Widget."
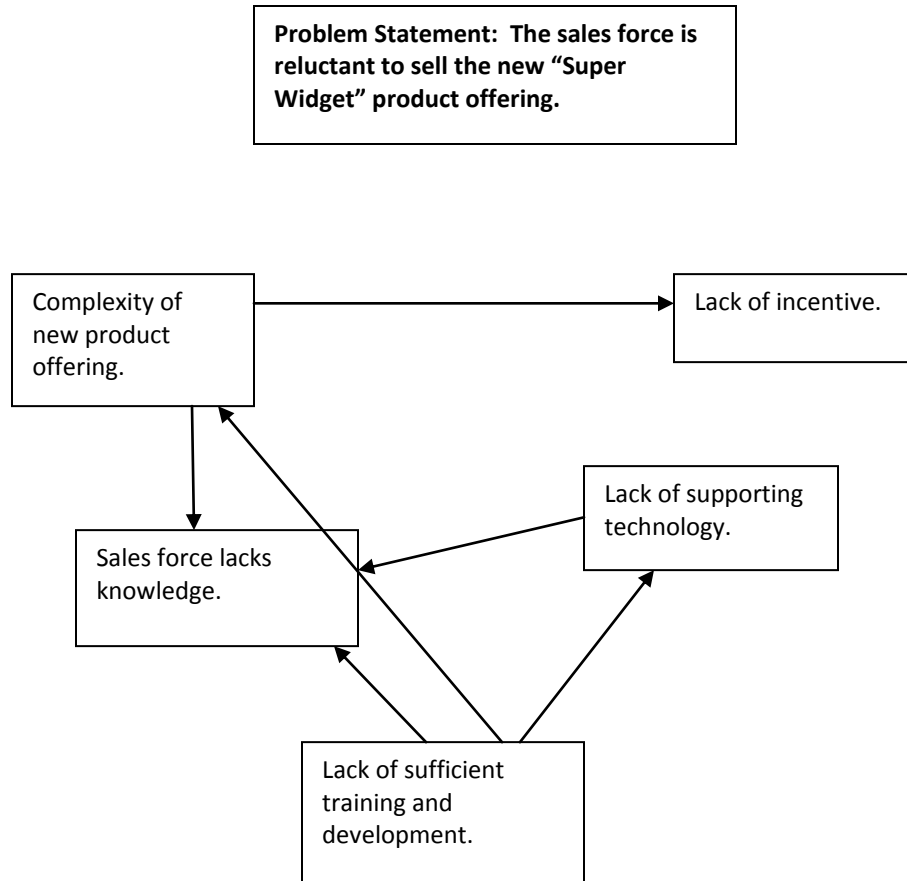
Next, the IDM requires the re-statement of the problem in question form. In this case, the question is, "Why is the sales force reluctant to sell – and is therefore not selling – the "Super Widget"?"

The third step in the IDM is to identify specific and general answers to the question. Answers may be based on brainstorming techniques, on personal observations, and on the results of a *Quick Database Search*. In this case, brainstorming and personal observation

might suggest that the sales force is reluctant to sell the "Super Widget" because (1) it is a complex product offering that requires a sales person to learn and to master a great deal of technical material. The sales force also (2) lacks the knowledge to sell the product. Personal observation might additionally suggest that (3) the sales people do not believe enough incentive exists to sell the new offering. Results of the *Quick Database Search* suggest other general reasons, such as (4) the lack of adequate sales force technology, and the (5) lack of sufficient training and development.

It is possible that all of these factors have influence in the situation, but the fourth and crucial step of the IDM is an attempt to determine if any of the factors is ultimately more influential than the other factors. This analysis is performed by diagramming the answers, and then by diagramming cause-and-effect relationships through a series of questions designed to elicit causal directions. The factor with the most outputs is the most influential factor in the situation.

For example, does the complexity of the product offering, requiring the mastery of technical material, cause the sales people to believe that insufficient incentive exists to sell the product, or does the belief that an insufficient incentive exists influence the sales force to be reluctant to master the necessary technical material? Does the lack of knowledge to sell the product influence the lack of training and development, or does the lack of training and development cause a lack of knowledge? Figure 1 illustrates the IDM for the problem of the reluctant sales force.

Problem Statement: The sales force is reluctant to sell the new "Super Widget" product offering.

Complexity of new product offering. → Lack of incentive.

Sales force lacks knowledge.

Lack of supporting technology.

Lack of sufficient training and development.

Figure 1. Interrelationship Diagram for the problem of the reluctant sales force.

In Figure 1, the factor with the most outputs is the lack of sufficient training and development. The IMD has here clarified and sharpened the topic and its research question. The sales force is reluctant to sell the new "Super Widget," not because the sales people are bad, but because they have not received sufficient training and development. A more appropriate research question might be, "How can an organization provide its sales force with sufficient training to handle new and complex technical product offerings?" Your answer to this question, developed after evaluating relevant literature, would constitute your thesis statement for your academic paper. A *Quick Database Search* would begin to focus your attention on relevant literature that highlights some of the current issues associated with sales force training and sales force adoption of new products.

Final Topic Selection Considerations

When thinking about the selection of a topic for a written deliverable, you may wish to consider the following tips.

▪ While research often involves an investigation of a specialized issue or problem, solutions sometimes can be found by a transfer of knowledge from an unrelated discipline. Consider selecting a topic that could benefit from knowledge transfer, or at least consider applying knowledge transfer during your research.

▪ In order to limit the amount of information with which you have to contend during the topic selection phase, deliberately practice techniques that will narrow the number of results retrieved. For example, add more terms to a search string, rely exclusively on articles retrieved with controlled vocabulary, examine only peer reviewed or scholarly articles, and so forth. When you have a pool of documents to work with, look for keyword patterns, and apply the *Critical Attitude Method* in order to finalize the potential topic selection.

▪ It should go without saying, but if you have the opportunity to select your own topic, select a topic that is inherently interesting to you, and that has some relevance to the job you currently have, or to the job that you would like to have. Of course, some topics may require considerably more time to investigate than others. Practical considerations, such as time constraints, may also influence topic choice.

▪ Use a reiteration technique of the *Quick Database Search Method* to identify potential topics that are associated with a literature extensive enough to offer differing viewpoints, extensive enough to offer opportunities to synthesize information, and extensive enough that it identifies inadequacies and deficiencies. Does this mean you cannot select topics that do not feature an extensive literature? No, you may choose such topics *if* your professor permits you to do so, and *if* you have access to primary source material (*e.g.*, primary source material that you generate or that is available through primary company documents, and so forth). However, even if you rely heavily on primary sources, you will generally still use secondary and tertiary sources to provide a context, and even, perhaps, to provide a benchmark.

▪ Keep your mind open to possibilities as you work with the literature results that you retrieve in your initial searches. Learn from the literature and from your search results. For example, if you can't locate useful literature on a topic, don't neglect to ask yourself why the literature doesn't seem to exist. Is the topic new? Should you approach the topic in a different manner? The topic of the strategic importance of the engineering function in large manufacturing companies, for example, might be more fruitfully considered today by means of a slightly different approach: Why shouldn't large manufacturing companies outsource their engineering functions?

Credible Resources

For most reports, papers, projects and other written deliverables in your graduate program, you will be required to use "credible resources." In some of my previous lectures, I've mentioned "credibility" and "credible resources," but I really haven't discussed them in detail. We need to take some time to do that right now.

Identifying Credible Sources Requires a Critical Approach

To practice good topic selection techniques, you must exercise a critical attitude. Similarly, in preparing to carry out research in support of written assignments, you must approach the task with a critical eye in order to identify credible resources. Whereas at the undergraduate level it may have been sufficient to complete a report or project by simply locating and using a stipulated number of resources, at the graduate level, students must at all times go beyond simple quantity measures and seek out quality information resources. In other words, the graduate student must at all times critically evaluate the results obtained in all research.

Not all information obtained in research is reliable or valid or unbiased. David Stewart[3] and Michael Kamins[4] observe that

> (t)he regular user of ... information often develops a healthy
>
> skepticism about information provided by others. There are many
>
> ways that data may be misleading if they are not evaluated
>
> carefully [David W. Stewart and Michael A. Kamins, 1993,
>
> *Secondary Research: Information Sources and Methods* 2nd ed.
>
> (Newbury Park: Sage Publications), p. 17].

In an excellent chapter titled, "Evaluating Secondary Sources," Stewart and Kamins, in their book *Secondary Research*, illustrate the need to "question information collected and reported by others" (p. 18) by considering the case of *Tambrands vs. the Warner-Lambert Company* [see David W. Stewart and Michael A. Kamins, 1993, *Secondary Research:*

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[3] David Stewart (Ph.D., Baylor University) holds the Robert E. Brooker Chair in Marketing at the University of Southern California. Past President of the Society of for Consumer Psychology, a Fellow of both the American Psychological Association and the American Psychological Society, Stewart has authored or co-authored more than 100 publications and six books on consumer decision making, advertising effectiveness, marketing research, and marketing strategy.

[4] Michael Kamins (Ph.D., New York University) is Associate Professor of Marketing at the University of Southern California. Kamins has published several peer reviewed articles in leading marketing journals, such as the *Journal of Marketing Research*, primarily in the area of advertising.

Information Sources and Methods 2nd ed. (Newbury Park: Sage Publications), pp. 17-32 for Chapter 2; see pp. 17-18 for the *Tambrands* summary].

Warner-Lambert claimed that their home-pregnancy test EPT Plus provided results in "as soon as 10 minutes" (Stewart and Kamins, p. 17). Warner-Lambert claimed that these results were based on a research study. Questioning the validity of the claim, Tambrands (a competitor) took Warner-Lambert to court.

In court, Warner-Lambert revealed that the research study employed to substantiate the claim actually involved testing of only 19 pregnant women (Stewart and Kamins, p. 18). A total of 10 (52.6%) of these women obtained results in 10 minutes, and on this basis, Warner-Lambert made their advertising claim (Stewart and Kamins, p. 18).

In fact, the 19 women who were tested "were actually enrolled at a Cincinnati fertility clinic" (Stewart and Kamins, p. 18): more importantly, the 52.6% of women who obtained results in 10 minutes was not statistically significant. In this case, a statistically significant sampling would have entailed the testing of "approximately 1,400 women." Warner-Lambert's claim was meaningless (Stewart and Kamins, p. 18).

It follows that part of the preparation for research entails asking questions in order to try to determine the reliability and validity of the literature that you locate. In evaluating information that is retrieved in library research, consider seeking answers to some of the following questions (when relevant).

What are your own biases and are you prepared to evaluate information?

- That's right. Begin by trying to honestly assess your own biases and your own views. Do you favor a certain ideology? An ideology can be defined as a system of ideas that motivates preferences and actions. An ideology may be political, but it just as likely may not be. For example, are you "PC or Mac"?

- Try to think through your approach to assessing information. Ask yourself questions. With respect to information, for example, who do you trust? Why? Who don't you trust? Why? To whom do you give the benefit of the doubt? Why? Use the answers to these questions to assess your own approach. I once knew a student who was writing a thesis on software quality management – and refused to consider any research articles that discussed software standards because he believed that standards were an example of "regulations," and "regulations" thwarted "innovation." Needless to say, the student's thesis committee required him to carry out additional research on this topic and address it in his thesis.

- Try to keep reliable facts, statistics and data handy so that you can quickly verify information that you encounter in your reading. In today's web-based world, it's fairly easy for most of us to access reliable sources, but you can also use a good almanac (such as *The World Almanac and Book of Facts*). I

mentioned two excellent statistics and data web sites in Lecture 4: FedStats at http://www.fedstats.gov and the *Statistical Abstract of the United States* at http://www.census.gov/prod/www/statistical-abstract-us.html.[5]

How accurate is the information?

• Does the information appear to be reliable and error-free?

• Is there an indication that someone (an editor, a review board) checks and verifies the information?

• For information that reports primary research: Who was responsible for collecting data? What data were actually collected? What were the questions on a survey instrument? How were the data collected? How were the data measured? Were the methods employed to collect data standard for the research area? A credible source will clearly explain how information was gathered. If a survey was used, the survey instrument should be available. Although raw data from primary research traditionally has not been readily available, a "data sharing" movement has been gathering momentum in recent years in some academic disciplines. Some scholarly and professional journals now require authors to share their data that were generated from primary research reported in a secondary research article. Many scholars hesitate to share their data, but increasingly, it is being recognized by some investigators that data generated in primary research should be available to other researchers, if for no other reason than to verify the validity of the data. It is not unusual, for example, to find that a researcher has made a mistake (sometimes a simple typo) in the compilation of raw data. One leader in the data sharing movement is Dr. Andrew Vickers (author of *What is a p-value, anyway? 34 stories to help you really understand statistics*). An interview with Dr. Vickers on the topic of data sharing is available on the Scientific Data Sharing Project website at http://scientificdatasharing.com/medicine/interview-with-dr-andrew-vickers/.

• For information that features the use of statistics, are the statistical methods valid? Are the statistical inferences valid?

• Read the documentation – the references, the bibliographies, the sources – that are cited. Actually track down the sources and read them. Were they used in an accurate manner?

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[5] Unfortunately, because of budget cuts, the U.S. Census Bureau terminated the collection of data statistics for the *Statistical Abstract of the United States*. The last edition is the 2011-2012 edition. The U.S. Census Bureau states that "(t)o access the most current data, please refer to the organizations cited in the source notes for each table of the *Statistical Abstract*."

• Check tables, charts, figures, and graphs that appear. Are they poorly designed? Are they clear? Can they be readily understood? Examine any data in these visual items and try to assess internal consistency. Look for abnormally large or small numbers. Round off and quickly add up columns of numbers to see if totals appear to be accurate.

• If possible, evaluate equations and formulas. At the very least, are constants, parameters, and variables defined? Does the equation or formula seem to make sense? It's easy for writers to make mistakes with numbers, equations, and formulas, because our eye tends to skim such things in a piece of text. I've unknowingly made mistakes many times myself with equations and formulas in writing.

• Are definitions and terminology clear and unambiguous?

How authoritative is the information?

• Who is the author? For web sites, consider checking the owner of a web site by using a domain registry, such as the Whois InterNIC site at http://www.internic.net/whois.html.

• Is the author an expert? Is he or she generally recognized by experts in the field? Is the author qualified to write on the topic? Is the author an expert or authority in one field, but writing about an area that is outside of his or her field of expertise? Are the author's credentials given? If you are working with secondary or tertiary research material, is the publisher known?

• For information that reports primary research: Did a particular group or organization sponsor the research? Did the group or organization have a purpose in mind for carrying out the primary research? A credible resource will not feature a "pre-established conclusion."

Always be aware of authoritative pronouncements. In his wonderful book, *Turning Numbers into Knowledge: Mastering the Art of Problem Solving*, John Koomey (Oakland, CA: Analytics Press, 2008) offers examples (p. 72) of "conventional wisdom" from "well known authorities."

"But what … is it good for?"
-- Engineer at the Advanced Computing Systems Division of IBM, 1968, commenting on the microchip

"There is no reason anyone would want a computer in their home."
-- Ken Olson, president, chairman and founder of Digital Equipment Corp., 1977

"This 'telephone' has too many shortcomings to be seriously considered as a means of communication. The device is inherently of no value to us."
-- Western Union internal memo, 1876

"The wireless music box has no imaginable commercial value. Who would pay for a message sent to nobody in particular?"
-- David Sarnoff's associates in response to his urgings for investment in radio in the 1920s

"Who the hell wants to hear actors talk?"
-- H.M. Warner, Warner Brothers, 1927

"Professor Goddard does not know the relation between action and reaction and the need to have something better than a vacuum against which to react. He seems to lack the basic knowledge ladled out daily in high schools."
-- 1921 *New York Times* editorial about Robert Goddard's work on rockets

"Stocks have reached what looks like a permanently high plateau."
-- Irving Fisher, Professor of Economics, Yale University, 1929

"Everything that can be invented has been invented."
-- Charles H. Duell, Commissioner, US Office of Patents, 1899

"Louis Pasteur's theory of germs is ridiculous fiction."
-- Pierre Pachet, Professor of Physiology at Toulouse, 1872

Is the information objective?

• Is the information presented in a manner that seeks to minimize bias? Do personal beliefs or biases affect the research of an author? Is it possible that biases could affect the research or claims or conclusions of an author in a specific document? Are potential conflicts of interest disclosed? Is the information presented in such a way that a distinction is made between facts and values?

• Is the information an example of "advocacy research"? That is, is its purpose from the outset to provide support for a particular conclusion? Or, does it begin with a "clean slate" and no preconceived notions about conclusions?

• For information that reports primary research: What are the findings? The claims? The results? For other types of research, what conclusions are presented?   Are numbers, claims, results, conclusions consistent with other sources? Compare numbers with something else with which you are familiar, and see if the numbers make sense.

• Do the authors place limitations on their topic? Are there limitations on findings, claims, or conclusions? Do authors reveal assumptions? Do they concede other points of view (when appropriate) or other explanations (when appropriate)?

• For information that purports to be objective, is it supported by scholarly apparatus, such as footnotes, references, a bibliography? Can you track down these sources?

• For information that purports to be objective, do the authors use a strident tone? Do the authors exhort or attempt to persuade in an unreasonable manner? Do they engage in a "sales approach"? Or do the authors deploy a reasonable and moderate tone? Do the authors appropriately "hedge" bold or controversial conclusions?

• Have the authors employed the accepted rules of reason and tools of research, or have these things been abandoned in favor of other techniques or thought processes that lead to a desired conclusion?

• Does the information hold up against any possible "guestimation" checks? Sometimes, in order to independently assess the claims or conclusions featured in a document, significant fact-checking is required. Other times, however, it's possible to employ "guestimation" or "back-of-the-envelope" techniques to make an initial evaluation as to whether or not claims or conclusions are reasonable. Create your own simple spreadsheet models to test and to verify numbers that you encounter. Realize that data can be inaccurate – survey takers can write down the wrong numbers, data entry people can type in the wrong numbers. Try using simple models to check the data you encounter.

An excellent book full of wonderful "guesstimation" examples is the following volume by Lawrence Weinstein and John Adam:

guesstimation: Solving the World's Problems on the Back of a Cocktail Napkin

The book is a 2008 Princeton University Press publication, and it's available in the MSOE library at **QA 276.8 .W45 2008**. Here is one example from pages 107-108 in the book.

Tire Tracks

How far does a car travel before a one-molecule layer of rubber is worn off the tires?

Answer: First we need to figure the lifetime of tires in miles. As usual, there are a few ways to do this. You can estimate the lifetime of a tire in years and assume the usual 12,000 miles per year. Tires definitely last more than 1 year and less than 10, so estimates of between 3 and 5 years are reasonable. Alternatively, you can read the tire ads, which advertise the tire lifetimes, or remember the lifetime of the last set of tires you bought. Tires typically last 30-60 thousand miles. They typically have between ¼ and ½ in. (i.e., about 1 cm) of tread.

Thus, 1 cm of tread is worn off in about 4×10^4 mi. We want to know how long it takes to wear off a thickness of one molecule or 5×10^{-10} m of tread. That distance is

$$d = \frac{4x10^4\,mi}{1cm}\,x\,\frac{100cm}{1m}\,x5x10^{-10}\,m$$
$$= 20x10^{-4}\,mi$$
$$= 2x10^{-3}\,mi$$

Now we need to make sense of this result. 10^{-3} mi is hard to figure out, but 10^{-3} km is just 1 m. Since a mile is only a little bigger than a km, we have

$$d = 2x10^{-3}\,mi = 3x10^{-3}\,km = 3m$$

Three meters is about 10 feet. That is only one or two complete rotations of the tire.

Thus, you wear off a one-molecule thickness of rubber with every rotation of your tire.

How current is the information?

- Is the information dated?

- For information that reports the results of primary research: When were the data collected? Is it clear how old data and numbers are?

- Have numbers and data been normalized when appropriate?

Does the information offer adequate coverage of the topic?

- Is the information consistent with information available from other sources?

- Is a literature review included? If so, is it comprehensive?

- Are varied aspects and perspectives of an issue provided?

- For books, are book reviews available? What do the book reviews say? Who are the book reviewers? (You can sometimes find reviews of business and management books in the ABI/Inform Database and in the Business Source Complete database.) For articles, do other articles exist that comment on the original article? If so, what do these other articles say?

- For information that reports primary research: What suggestions are made for future studies?

- Have claims associated with primary research been verified by another source? Do any primary research claims fit with what we know about "how the world works"?

Earlier in this lecture, I included a quotation from an article on global leadership. In that article, the authors carried out a series of interviews with global leaders, and then drew their conclusions about global leadership competencies from those interviews.

In the article, the authors described "limitations" in their research. They interviewed only 26 "global leaders," for example; more than 70% of the participants, moreover, were born in South America. How the participants were selected was never explained. Therefore, at the very least, the research is flawed because it did not rely on a random study.

If you were writing a paper on global leadership, could you use the article?

You certainly could use it to generate topic selection questions, as we did above.

However, you could also use it in your paper in support of assertions that global leaders must be "flexible" and have good "communication skills." Nonetheless, when you do this, you must do it accurately. In other words, you must use it with care. What does it mean to use a source with care? You must report to your reader that the information you are using is based on flawed research. You could write, for example, something like the following:

"Smith and Jones have carried out research on the required competencies associated with global leadership. Their research was based on a series of interviews with participants who were described as "global leaders," without an explanation as to why they were considered global leaders. Participants were not selected at random, and the research was not statistically significant. Their work does provide anecdotal evidence, however, that "flexibility" and "communication skills" are among those competencies required by global leaders."

Thinking About Sources in Terms of an Information Hierarchy

As a general rule of thumb in the RSOB graduate programs, we encourage the recognition of an "information hierarchy" with respect to credible resources cited in written deliverables. Those resources that enjoy the greatest credibility tend to be scholarly, professional and peer reviewed journal articles, and books (however, see the comments below concerning the fascinating research by John Ioannidis). Nonetheless, even for scholarly, professional, and peer reviewed articles and books, book reviews, follow-up studies, and commentary on research in other articles, when available, should always be consulted. *Harvard Business Review* is an example of a good professional journal, although it is not peer reviewed; Harvard Business Press enjoys an excellent reputation for the business and management books that it publishes. Next in the information hierarchy are business publications (such as *Business Week*) and trade publications. Popular magazines, newspapers, and web sites whose authoritativeness is not explained to the reader generally enjoy the least credibility.

Does this situation mean you cannot use a trade magazine article in the writing of a paper? No, you may use such an article. Often there are very good reasons for using trade journal articles. For example, experts who produce scholarly, peer reviewed articles may sometimes also write valuable and informed opinion pieces or feature articles in a trade journal. Trade journal articles may also feature marketing and industry data not available anywhere else. Nonetheless, if there's one message that I need to communicate clearly in this lecture, it's this: trade journal articles – *all information, in fact – used in the writing of a deliverable should not be used uncritically*.

The evaluation of information and research can entail a great deal of work. In some cases, an in-depth evaluation of resources may not be necessary, but in all cases, you should approach the research process with both an understanding of, and a willingness to perform, the critical evaluation of resources.

Why do we emphasize "credible resources" in the RSOB graduate programs? We emphasize the use of credible resources because graduate-level work requires an awareness of what constitutes credible research. We also emphasize credible resources because as managers and as citizens, we must use data and information to make decisions. We have a tendency to put our faith in data, in numbers, but to make truly effective decisions, we must acquire the habit of asking critical questions about those numbers and those data.

Some Final Thoughts on the Credibility of Research Findings: The Important Body of Research Produced by John Ioannides

I want to conclude my discussion of credible sources by discussing the work of John Ioannides. I am indebted to Dr. Brian Akers, M.D., J.D. for drawing my attention to Ioannides's work. Dr. Akers teaches in the Medical Informatics program at MSOE.

Dr. John Ioannides teaches at the University of Ioannina School of Medicine in Greece, at the Tufts University School of Medicine in Boston, and at the Stanford University School of Medicine (see the brief entry on Ioannides in Wikipedia at http://en.wikipedia.org/wiki/John_P._A._Ioannidis).

The main finding in Ioannides's body of research is nothing short of stunning. His essential contention is that most published research findings are false. "Published research findings" include published results in academic, scholarly, and peer reviewed medical journals. Ioannides focuses on the field of medicine, but his results have been generalized to include published research findings in other scientific fields. If his findings are true – and they appear to be – it's probably safe to say that the published research findings in non-scientific fields – such as the social sciences and business – also feature similar problems.

Ioannides's work is technical. It relies heavily on statistics and on methodologies – such as citation analysis (a concept that I discussed in Lecture 2) – that in turn rely on advanced statistical concepts, methods, and techniques.

Nonetheless, Ioannides's own published research is also written in such a manner that its essential concepts and findings are accessible to most readers. Ioannides's most important published article is titled, appropriately, "Why Most Published Research Findings Are False" [Ioannides, J.P.A. (2005). Why most published research findings are false. *PLoS Medicine 2*(8), 696-701. doi:10.1371/journal.pmed.0020124. Retrieved from http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.0020124]. In this fascinating article, Ioannides employs statistical techniques to prove "that most claimed research findings are false," and then goes on to suggest "several interesting corollaries" that a reader should keep in mind as they evaluate research claims.

I believe that Ioannides's astonishing findings are extremely important – which is why I am highlighting them in a lecture that is in part devoted to the notion of credibility. I also believe that his findings are useful, because they underscore the need to exercise a critical approach in the evaluation of information – even information contained in sources high in the information hierarchy. Of particular value in Ioannides's work is his finding that human bias plays such an important role in most research claims – and by extension, in most assertions and statements about how things really work. Ioannides's work teaches us to never underestimate the power of bias.

The picture is not completely bleak: not every published research finding is false. But Ioannides's work underscores the need for vigilance. As you research, retrieve and read

source material for your RSOB graduate papers – journal articles, magazine articles, books, web site documents, and so forth – keep in mind Ioannides's "corollaries," which I believe can be generalized to include research findings published in most fields.

Ioannides's "Corollaries"

Here are Ioannides's "corollaries," along with my explanations of how I "translate" them in order to use them in the evaluation of research and information in the business and management literature.

Corollary 1: The smaller the studies conducted in a scientific field, the less likely the research findings are to be true.

We can generalize this corollary to the business and management literature by recognizing that the use of a larger statistical sample is more likely to result in valid findings than the use of a smaller statistical sample. Earlier, I described some research on "global leadership" that relied on a sample size of 26. A larger sample size would be more likely to be associated with valid findings.

Corollary 2: The smaller the effect sizes in a scientific field, the less likely the research findings are to be true.

We can generalize this corollary to the business and management literature by recognizing the effects associated with interventions. For example, the findings associated with the study of interventions or actions in a workplace that have a greater effect are more likely to be valid than the findings associated with small-effect interventions.

Corollary 3: The greater the number and the lesser the selection of tested relationships in a scientific field, the less likely the research findings are to be true.

We can generalize this corollary to the business and management literature by slightly re-stating it. What Ioannides is saying here is that valid research designs – such as randomized sample testing – are more likely to result in findings that are true, while findings not based on valid research designs are less likely to be true.

Corollary 4: The greater the flexibility in designs, definitions, outcomes, and analytical modes in a scientific field, the less likely the research findings are to be true.

We can generalize this corollary to the business and management literature by recognizing that research studies that feature "creative" changes in the research methodology, or "creative" changes in the definitions of important concepts, are less likely to result in true research findings.

Corollary 5:   The greater the financial and other interests and prejudices in a scientific field, the less likely the research findings are to be true.

This corollary is extremely important.

The *Milwaukee Journal-Sentinel* has recently published a series of investigative articles about Infuse, a spinal infusion surgery product produced by a company called Medtronic. Infuse was approved by the Food and Drug Administration in 2002 after a series of successful clinical trials, whose research findings were published in prestigious specialty journals. Infuse has been implanted in more than 500,000 patients worldwide, and its annual sales are in the hundreds of millions of dollars range. What the *Journal-Sentinel* reporting has revealed is that the published research findings on Infuse are false, or more charitably, inaccurate because they are incomplete. It appears that Infuse is associated with serious harmful side effects, none of which were reported in the published findings. Worse, the *Milwaukee Journal-Sentinel* has now established that all of the authors of the published research findings have received significant "royalty" payments from Medtronic. [See Fauber, J. (2011, June 21). U.S. Senate panel probes Medtronic: Finance Committee seeks documents on spine surgery product. *The Milwaukee Journal-Sentinel.* Retrieved from http://www.jsonline.com/watchdog/watchdogreports/124326534.html; Fauber, J. (2011, May 25). Researchers get royalties, papers omit sterility link: Doctors receiving funding differ from others on complication. *The Milwaukee Journal-Sentinel*. Retrieved from http://www.jsonline.com/watchdog/watchdogreports/122553053.html]. This situation is quickly developing into a scenario that Ioannides addresses in this fifth corollary. It is easy to imagine, of course, how financial incentives, "other interests and prejudices" might influence the published research findings in the business and management literature.

Corollary 6:   The hotter a scientific field, the less likely the research findings are to be true.

This corollary is another important one. We can generalize this corollary to the business and management literature by recognizing that published research studies on "hot" topics should be handled with care, primarily because the initial important research studies in a topic area are likely to be rejected or to be significantly modified later. A classic example of this situation in the business and management literature is the topic of business process reengineering – as discussed in the 1995 bestselling book, *Reengineering the Corporation*, by James Champy and Michael Hammer – which was subsequently discredited and then significantly modified.

MG-631 EXERCISE 5

Lecture 5 discusses the fascinating research of John Ioannides, contending that most published research findings are false. The purpose of Exercise 5 is to carry out an "Ioannides-inspired" investigation of a research article that features statistical data, in order to begin to assess whether the article is likely credible, or whether the article might feature some problems that diminish or undermine its credibility.

Step 1.

Review the discussion about controlled vocabulary in Lecture 2. In addition, review your use of database field tags, as well as the online Thesaurus in the ABI/Inform and the Business Source Complete databases, which were highlighted in MG-631 Exercise 3.

Step 2.

Select one management-related topic. For example, possible topics include Six Sigma, Theory of Constraints, Lean Manufacturing, Total Quality, Core Competencies, manufacturing, project development, and so on. Choose one topic that interests you.

Step 3.

Access either the ABI/Inform database or the Business Source Complete database, and use the database's online Thesaurus to verify whether or not the topic you selected is a valid controlled vocabulary search term.

For example, I selected the topic of "leadership." Using the online Thesauri in each of the databases, I discover that **leadership** is a valid controlled vocabulary search term in both databases.

If you discover that your topic of interest is not associated with a valid controlled vocabulary search term in either database, then select a different topic that is associated with a valid search term.

Step 4.

Now, using either ABI/Inform or Business Source Complete, and using your valid controlled vocabulary search term, execute a search that retrieves journal articles that feature a research investigation on your topic, and which also include statistical data or statistical analysis.

An effective method for retrieving articles with statistical data or statistical analysis – with respect to a specific topic – is to use additional controlled vocabulary.

For example, the online Thesaurus in ABI/Inform indicates that all of the following terms are all valid controlled vocabulary search terms:

Studies

Statistical analysis

Statistical data

Correlation analysis

Statistics

The online Thesaurus in Business Source Complete indicates that all of the following terms are all valid controlled vocabulary search terms:

Statistics

Quantitative research

Correlation (statistics)

Regression analysis

Multivariate research

Therefore, in order to attempt to retrieve articles on the topic of leadership, which also feature statistical data, I could execute the following searches – featuring database field tags -- in the ABI/Inform database:

sub(leadership) and sub(studies)

sub(leadership) and sub(statistical analysis)

sub(leadership) and sub(statistical data)

sub(leadership) and sub(correlation analysis)

sub(leadership) and sub(statistics)

Similarly, to attempt to retrieve the same types of articles in the Business Source Complete database, I could execute the following searches, also featuring relevant database field tags:

(SU leadership) and (SU statistics)

(SU leadership) and (SU quantitative research)

(SU leadership) and (SU regression analysis)

(SU leadership) and (SU multivariate research)

<u>Step 5.</u>

Using the results of your search, select a journal article that you find interesting and read the article. Evaluate how the authors in the article carry out their research investigation, and in particular, evaluate how the authors handle the statistical data featured in the article. Ask yourself questions about the research methods employed in the article, and ask yourself questions about the statistical data and the statistical reasoning.

For this exercise, it is not necessary to draw upon advanced statistical methodologies, techniques, and knowledge that you may have learned about in a Statistics course – although you are free to do so, if you wish. It is true that a reader must sometimes possess a substantial understanding of statistics in order to understand research and results that might be discussed in a given journal article. You may therefore need to select an article that does not feature the use of techniques and methodologies that are not familiar to you.

Instead, for this exercise, I am more interested in having you apply some of the fundamental questions that I discuss in Lecture 5 concerning the credibility of sources. For example, does the article explain clearly how the data were gathered and counted? If the article features a discussion of the results associated with a survey, do the authors explain how the survey respondents were selected? Do the authors provide a copy of the survey? Do the authors, themselves, acknowledge any limitations in their research methods or in their statistical results?

One or two examples might help here.

In Lecture 5, I mention an article on global leadership (see page 28 in Lecture 5). In my comments about the article, I noted that "(i)n the article, the authors described 'limitations' in their research. They interviewed only 26 'global leaders,' for example; more than 70% of the participants, moreover, were born in South America. How the participants were selected was never explained. Therefore, at the very least, the research is flawed because it did not rely on a random study."

In other words, in evaluating the research conducted by the authors, and in assessing the statistical data generated by their research, as well as their own acknowledged limitations, I became aware of some problems, including a sample size that was too small and not diverse enough to be statistically significant. Moreover, as I pointed out in my comments, the authors never explained how they selected the sample of "global leaders."

The fact that the authors acknowledged some limitations in their results is good.

However, in my comments in Lecture 5, I did not indicate that I also noticed other problems that the authors themselves did not mention. For example, the authors

indicated that they employed a "16-question script" to interview the "global leaders," but they did not include a copy of the script in an appendix. As a result, I don't really know what they asked – and what they asked, or how they asked it, might have affected the results.

As I indicate in Lecture 5, these issues do not mean that I cannot use the article, but they certainly restrict or even diminish the usefulness of the research results.

Joel Best is a Professor of Sociology and Criminal Justice at the University of Delaware. Best has written extensively about questionable statistical data in such books as *Damned Lies and Statistics*, *More Damned Lies and Statistics*, and *Stat-Spotting: A Field Guide to Identifying Dubious Data*. In *Stat-Spotting*, Best uses numerous examples of questionable statistical data to develop criteria for assessing credibility. Here is just one of the many interesting examples in the book.

When birds fly into windows, the collisions are often fatal. These are sad events. We enjoy looking out our windows at birds, and we hate to think that our windows are responsible for killing those same birds. This seems to be just one more way that people disrupt nature.

In recent years, a big round estimate for the number of fatal bird collisions each year has found its way into the news media. For example, an architecture professor interviewed on National Public Radio in 2005 put the annual number of bird collision deaths at one *billion*. The reporter conducting the interview expressed skepticism: "How accurate is that number, do you think? How would you ever calculate something like that?" After all, a billion is a lot. It is one thousand millions – a very large, very round number. But the professor insisted that the one-billion figure was "based on very careful data."[1]

Well, not exactly. The previous best estimate for bird deaths due to fatal window collisions was 3.5 million – a whole lot less than a billion. This estimate simply assumed that the area of the continental United States is about 3.5 million square miles, and that each year, on average, one bird per square mile dies after striking a window.[2] In other words, the 3.5-million figure wasn't much more than a guess.

Convinced that that number was too low, an ornithologist decided to do some research.[3] He arranged to have residents at two houses keep careful track of bird collisions at their homes: one in southern Illinois, the other in a suburb in New York. By coincidence, the Illinois house belonged to former neighbors of ours – an older couple who loved birds and who built a custom home with lots of windows, surrounded by trees, bushes, bird feeders, and so on. Their house was a bird magnet. Over a two-year period, they observed 59 fatal bird strikes at their home. (In contrast, we lived for eight years in a house a few hundred yards away; however, most of our windows were screened, and, so far as we knew, no birds died striking our house during those years.)

But how do we get to that one-billion estimate? The ornithologist did not extrapolate from the two-house sample. Rather, he found government estimates for the numbers of housing units, commercial buildings, and schools in the United States – a total of 97.6 million structures. He then estimated that each year, on average, between one and ten birds would die from flying into each building's windows. Thus, he concluded that between 97.6 million and 975.6 million fatal bird strikes occurred annually. Advocates seized on the larger figure, rounded up, and – viola! – concluded that "very careful data" indicated that one billion birds die each year from window collisions.

Clearly, a large number of birds die this way. As there is no way to measure this number accurately, we have to make estimates. If we assume one death per square mile, we get 3.5 million deaths; one death per building gets us about 100 million; ten deaths per building gets us a billion. Certainly a billion is a more arresting figure, one that is more likely to receive media coverage.

However, not everyone agrees with it. One bird-death Web site suggests that only 80 million birds die from window strikes annually (it offers no basis for that figure). However, it states that "pet cats that are allowed to roam free account for some 4 MILLION bird deaths EACH DAY in North America, or over 1BILLION songbirds each year. This figure does not include the losses resulting from feral cats or wild populations of cats" (emphasis in the original).[4] Just to put that big round number in perspective, the American Veterinary Medical Association estimates that there are about 71 million pet cats (including, of course, some who are restricted to an indoor lifestyle).[5] To kill a billion birds, each of those cats would have to kill an average of 14 birds annually.

[1]"A Major Risk Factor for Birds: Building Collisions," *All Things Considered*, National Public Radio, March 11, 2005.

[2]R.C. Banks, "Human Related Morality of Birds in the United States," *U.S. Fish and Wildlife Service Special Scientific Report*, Wildlife No. 215, 1979.

[3]Daniel Klem Jr., "Collisions Between Birds and Windows: Morality and Prevention," *Journal of Field Ornithology* 61 (1990): 120-128.

[4]Chipper Woods Bird Observatory, "Modern Threats to Bird Populations," www.wbu.com/chipperwoods/photos/threats.

[5]American Veterinary Medical Association, *U.S. Pet Ownership & Demographics Sourcebook* (Schaumburg, IL: AVMA, 2002).

From Best, J. (2008). *Stat-spotting: A field guide to identifying dubious data.* Berkeley: University of California Press, 31-32.

Step 6.

After selecting and evaluating your article, write the Exercise Response for Exercise 5. Write a 250- to 600-word response that summarizes your evaluation of the statistical reasoning associated with the journal article that you selected. Be sure to provide full bibliographic information for the article that you selected.

Even though I am the person who will read your response, write the response using the assumption that your reading audience is not familiar with the exercise assignment. Therefore, you need to state the purpose of the exercise.

Post your Exercise Response in the **Exercise 5 Responses** Discussion Forum in the MG-631 Blackboard site. You may write your response in Word and then post it as an attachment, or you may write the response in Blackboard itself.

Examples are frequently important to students, so here is an example of a nice Exercise 5 response from a previous section of MG-631. This response was written by Peter Mihajlov and is included with his permission.

The purpose of this exercise is to evaluate a journal article that uses statistics or describes the results of a statistical research study to make its point. The goal is to ask questions about the research methods employed in the article and analyze the authors' statistical reasoning.

The article I selected focused on project management. The authors' goal was to determine whether a project cost reduction, a dependent variable, was positively correlated with each of five independent variables. Those variables were: starting from the top, create ownership, communication of message, prepare for the unexpected, and speak to the individual.

The authors conducted their research by selecting a sample of 120 executives from various construction companies around Pakistan and administering a questionnaire. My immediate concern was that the sample size was too small to obtain quality results, especially for a study with five hypotheses. That doubt was alleviated when the authors address the limitations of their study in detail toward the end of the article. They freely admit that their study was limited by the sample size, lack of time, and the need to limit themselves to local companies. They offer that their model should be extended to other organizations, cities, and countries. I thought that was a fair concession after their detailed discussion of their statistical findings.

In regard to the questionnaire, the authors chose not to publish a copy of the survey but did provide an example of the scoring scale. I would have liked to have seen the questionnaire, but they did provide the scoring scale for their survey. It was a simple 5-point opinion scale, with 1 being "Highly Agreed" and 5 being "Highly Disagreed." I mention this because without seeing the questionnaire, I am skeptical about their enthusiastic relaying of their results. I don't know how they worded the questions, but at first glance, the means listed in their descriptive statistics table indicated scores that would not support their alternative hypotheses. However, I thought about it a little more and assumed that they worded their questions in a way that "agreement" indicates support of their alternative hypotheses. It's confusing at first glance to a relative layperson like me and a simple sample question or two might have sufficed rather than a republishing of the entire survey.

There is one statistical note I would like to point out that struck me. They provide a regression table and relay an R-squared value of .489 and say that it indicates a strong correlation. Another reason I am skeptical of their study is that an R-squared value that low indicates a mediocre-to-weak relationship. It is also tempting to criticize them for the rosy language they use to relay their results, but it is obvious that English is not their first language. They were able to adequately make their point and they should be commended for that. I will add the caveat that their broken English did make initial comprehension difficult.

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Thinking About Writing

When my daughter was younger, I would have a little fun by deliberately mispronouncing her teachers' names. "Mrs. Swanson" might become "Mrs. Swizzle," for example, or "Miss Porter" might become "Miss Peecher" (the name of a character in a novel by Dickens).

"Now," I would feign innocence and ask, "what did you learn about writing in Miss Peecher's class today?"

"It's PORTER, Dad!" And then after a brief glare: "We learned about outlining."

Outlining. Certainly in high school, probably in middle school, and maybe in grade school, we all somewhere, sometime, learned that in order to write, we needed to create an outline. It's writing's secret weapon. We probably heard it so often, that it became trite for us, and we soon ignored it. Who wrote an outline, unless you were forced to write one? Besides, the paper is due by five o'clock today: who has time for an outline?

What I'd like to suggest in this week's discussion on writing is that Miss Peecher, Mrs. Swizzle, Miss Trotwood, Mrs. Hemlock, and all the countless other middle school and high school English teachers in reality had the right idea. Outlining can help your writing. Even a little outlining is better than no outlining. But I'd even like to go beyond this notion: outlining is actually an important all-purpose writing tool, and it should be in your writing tool box. In fact, I like to think of outlining as the "Swiss Army knife" of writing. We're all familiar with the ubiquitous Swiss Army knife that features not just a knife, but all kinds of other tools that can be used for lots of other purposes. That knife isn't just a knife: it has a scissors, a nail file, a can opener, and other neat tools.

With respect to writing, outlining similarly features many uses. It's a research and comprehension tool, it's a planning tool, it's a writing tool, and it's a revision tool. In these lectures, and in online discussions, if there is one thing that I have stressed about good writing, it's that it requires *time*. You need to give yourself the time to write well. Outlining, as part of that writing process, is well worth the time and effort.

Why is this technique useful and how does it work?

Most of us are familiar with the basic principles of how to develop an outline. We carry out research, we identify and obtain appropriate research materials (*e.g.*, books, articles, web sites), we read the research materials, we formulate a purpose and a thesis for our paper, and we then outline our plan for the paper. We typically employ Roman numerals, letters (both upper case and lower case), numbers, and even decimal numbers to designate the parts of an outline. Thus:

I.
    A.
    B.
        1.
        2.
            a.
            b.

II.
    A.
    B.
        1.
        2.
            a.
            b.

We use the Roman numerals to designate main categories, and we arrange them in some kind of logical order. For each main category, we use capital letters (*e.g.*, "A," "B") to designate subcategories. Tertiary (*i.e.*, third-level) categories and smaller divisions are designated by Arabic numerals, lower case letters, and other symbols, if necessary. Each category type should feature minimally two entries (*i.e.*, "A" and "B," "1" and "2," "a" and "b"). The logical order, or the flow, of the outline is dependent on your purposes. If your purpose is to provide the history of a topic, you might arrange categories chronologically. Other arrangements include "general-to-specific," "specific-to-general," "compare-contrast," "simple-to-complex," "problem-causes-solution," and so forth.

You may write the outline using a *topic* approach that features brief words and phrase, without punctuation, or you might use a *sentence* approach in which each category and its entries feature complete sentences. Proper *coordination* and *subordination* are important in the creation of the outline. An example of correct coordination within a main category is:

A. Musky fishing soft plastic lures
B. Musky fishing jerkbait lures
C. Musky fishing crankbait lures
D. Musky fishing spinner-bait lures

All of the entries are "equal" – they all represent types of musky fishing lures.

An example of incorrect coordination within a main category is:

A. Musky fishing soft plastic lures
B. Trolling motors for musky fishing boats
C. Musky fishing records

Here, the entries are not "equal" – they represent very different topics, not subtopics of a single topic.

In the last lecture, I discussed paragraph coherence and flow. These examples of outline coordination should demonstrate that a thoughtful outline can help you to achieve overall coherence and flow in the entire document. Specifically, the outline can help you to develop the logical progression for your document. But keep in mind that you still need to *connect the sentences* within paragraphs by using the sentence-connecting techniques that I discussed in Lecture 4.

Subordination, on the other hand, refers to the existence of some type of proper ordering in your outline. An example of correct subordination follows:

A. Musky fishing soft plastic lures
    1. Bulldawg
    2. Storm WildEye Shad
    3. Storm Kickin' Minnow

B. Musky fishing spinner-bait lures
    1. Mepps' Giant Killer Bucktail
    2. Boogerman Buzz Bait
    3. Weed Warrior Bucktail

An example of faulty subordination is:

A. Musky fishing soft plastic lures
    1. Bulldawg
    2. Usefulness
    3. Trolling applications

In this example, under a single category of a *type* of lure, an *example* is placed, along with a discussion of the *qualities* and *applications* of the type of lure. We've mixed up lots of things here. A better subordination, if we wished to focus on qualities, might be:

    A. Bulldawg
        1. Positive features
        2. Negative features
    B. Storm WildEye Shad
        1. Positive features
        2. Negative features

I'd like to suggest that this description on how to develop an outline is highly idealized. If this is how you outline, that's wonderful, but you don't have to outline in this manner for it to be helpful, and you can use outlining in other ways, besides planning your papers.

Instead of the traditional outlining technique described above, you might consider using webbing or mapping techniques (such as mind maps and concept maps) in which you graphically represent categories, subcategories, and further divisions, and their relationships. Here is an example of a webbing technique from an article by Florence Pieronek ("Using Maps to Teach Note Taking and Outlining for Report Writing," July/August 1994, *The Social Studies*, p. 168).

FIGURE 3—Webbing
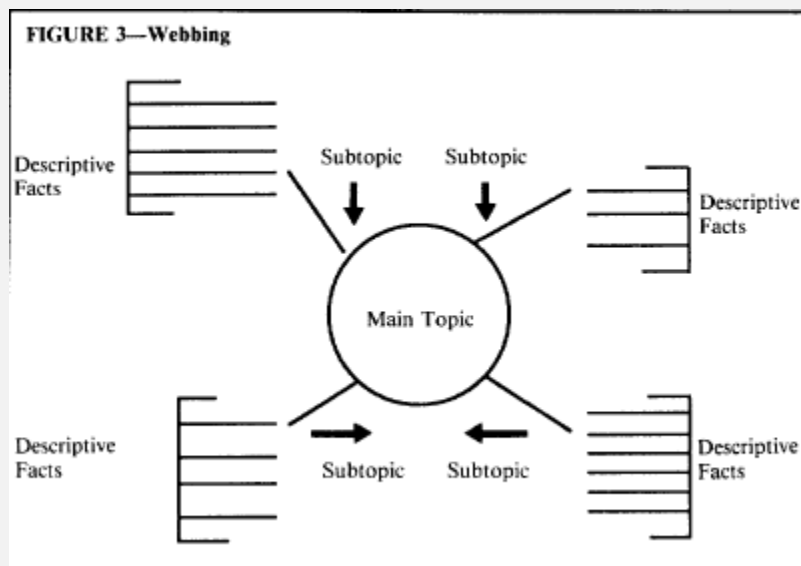
Webbing is similar to the concept of mind maps, or spider diagrams, which help to establish a central focus, and then illuminate the relationships between ideas with respect to that main focus. One difference between webbing and mind maps is that webbing might feature a hierarchical structure. Following is an example of a mind map from an article published in a nursing journal (C.S. Kern, K.L. Bush, and J.M. McCleish, April 2006, "Mind-Mapped Care Plans: Integrating an Innovative Educational Tool as an Alternative to Traditional Care Plans," *Journal of Nursing Education*, p. 114).
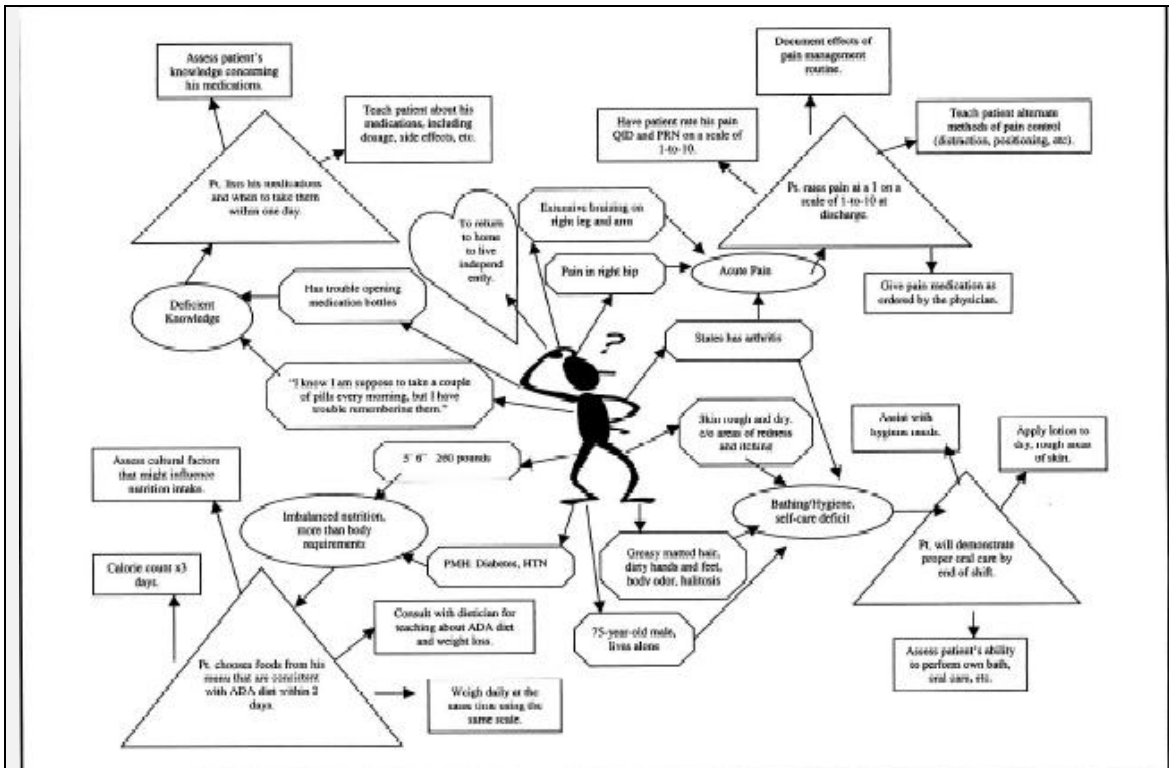
Many benefits are associated with the creation of an outline as a means for planning a paper. William Baker, a management professor at Brigham Young University, claims that "(r)esearch consistently shows that writing generated from an outline is superior to writing without an outline" (see William H. Baker, December 2005, "Writing For Today's Workplace," *Government Finance Review*, p. 48). Among other things, outlining in the early writing stages, and after most of the research has been completed, can give you a place and a method for starting your writing. It prevents digressions, helps you to avoid confusion, provides a framework and a plan, and can help prevent the loss of good ideas (have you ever said to yourself, "I'll remember to include this when I write," only to forget it five minutes later?). Outlining can even let you know what the ending of your paper is going to be, which is a genuine benefit for those writers who are frequently surprised by their endings.   Outlining can help you to assess the relative importance of concepts, to ensure continuity of thought, and to promote document completeness. Detailed outlining can facilitate the writing process and save time. Not bad.

Outlining is a tool, however. In most cases, the reader never sees it. For this reason, don't hesitate to be open to improvisation and change in your outline. Don't hesitate to use minimal outlines. Don't hesitate to create messy outlines.

However, I especially wish to emphasize that you shouldn't hesitate to use outlining to help you to *comprehend* your research materials, and to *revise* your paper once you have completed a draft version.

Richard Nixon, our enigmatic 37th President -- who resigned in disgrace after Watergate, one of America's greatest constitutional crises – was also an individual who possessed "great abilities." Richard Reeves (*President Nixon: Alone in the White House*, 2004, New York: Simon & Schuster, p. 13) recounts this story about Nixon, told by Bryce Harlow, his first congressional liaison:

> Firm instructions not to bother him would go out … . He would bring
> along memoranda, studies, and reports and lean back on a kind of
> lounge, half-supine, would read, study, make notes, *and prepare an*
> *outline of it all* (italics added) on his pad. When through, he would
> throw away his notes. He was now master of that issue; it was

engraved on his mind. That's Nixon. That gift enabled him to achieve
more than less gifted people could.

When you carry out research, you might consider outlining research materials that you use, in addition to taking notes. The extra effort to outline an article is worth the time. Use an outlining technique that is comfortable, easy, and fast. When you outline someone else's work, you can quickly determine the "big picture," and as such, you can better evaluate the logic and coherence of the document. Outlining deployed in this manner can clearly increase your comprehension of an article. Keep in mind that the outline does not need to be detailed. Words that you use in your outline can also be employed to generate additional database search strategies.

Save the outlines that you make of your research materials. When you're ready to produce an initial outline for your own paper, start by using the research outlines, and combine them. This technique can be used to very quickly generate a first outline. If you're researching a topic, but do not yet have a clear thesis and focus in mind, this technique can also help to clarify your thesis.

In preparation for this lecture, I tried this technique myself. First, I selected a topic: Six Sigma and Marketing and Sales. I had no idea if any research was available on this topic. I know there's something called "Six Sigma," and I know there's something called "Marketing and Sales," and I wanted to see if any research exists that addresses both things. Checking ABI/Inform, I found a handful of articles, and I selected two of them. The first one is entitled, "Apply Six Sigma To Sales and Marketing," by Michael Pestorius, published in the January 2007 issue of *Quality Progress*. Let's call the first article "Article A." The second article I selected is "Six Sigma Comes To Marketing," by John Quelch and Brian Harris, published in the Autumn 2005 issue of *European Business Forum*. Let's call this second article "Article B."

Considering only the main categories addressed in each article, here are their outlines.

Article A

      I.   What is Six Sigma?
      II.   Why Hasn't Six Sigma Been Applied to Sales and Marketing?
      III.   The Evolution of Six Sigma
      IV.   Challenges of Applying Six Sigma to Sales and Marketing
      V.   Opportunities for Applying Six Sigma to Sales and Marketing

Article B

   I.   What is Six Sigma?
   II.   Why Hasn't Six Sigma Been Applied to Sales and Marketing?
   III.   Six Sigma is being used by Sales and Marketing for three main reasons
   IV.   Case Study: Young & Rubicam Brands
   V.   Maintaining Six Sigma
   VI.   Lessons learned / Guidelines based on case study

If I were going to write a paper using these two articles, my next step would be to combine the outlines. One possible combination I conceived follows.

Combination of Article A and Article B

   I.   What is Six Sigma?
   II.   Why Hasn't Six Sigma Been Applied to Sales and Marketing?
   III.   Challenges of Applying Six Sigma in Sales and Marketing
   IV.   Current Uses of Six Sigma in Sales and Marketing
   V.   Further Opportunities for Applying Six Sigma in Sales and Marketing
   VI.   Guidelines for Applying Six Sigma in Sales and Marketing

This example is rendered at the main category level, but I would also combine deeper divisions. For example, both articles feature a section that attempts to answer the question of why Sales and Marketing departments have avoided use of Six Sigma. Some of the reasons overlap, but each article also presents unique reasons. In my paper, of course, I would wish to describe *all* of the reasons.

One word of caution about this method: Be sure you keep track of which ideas were drawn from which articles. In Lecture 9, we'll discuss plagiarism. For now, let me just point out that in your graduate reports, you need to document ideas (and words) that you derive from other sources.

After you have written a complete draft of your paper, use outlining to revise your work. You may be able to write a paper without an outline, but if you can't produce a good outline of your paper *after* you've written it, your paper might be poorly organized. During the revision phase of your writing – which should be the lengthiest phase – outlining can suggest areas where your paper needs additional information or supporting details. Alternatively, outlining can help you to see where some pruning needs to take place. Outlining can also suggest where stronger transitions between ideas should occur.

Research tool, comprehension tool, focus-identifying tool, planning tool, writing tool, clarification tool, coherence tool, flow tool, revision tool: outlining, indeed, is an all-purpose tool that can help you to produce good writing.