This paper describes a case study of an assignment in a university graduate project management (PM) class of semester duration of seventeen students. The assignment, called “Library of Tools,” gave students a free hand to critically analyze PM tools and templates that they found using Internet resources. Students engaged in critical thinking by organizing and evaluating the tools they had selected, numbering over one hundred in one case, using criteria provided by the instructor and also their own criteria.

KEYWORDS: Project management, Critical thinking

INTRODUCTION

During fall semester, 2013, seventeen graduate students were enrolled in a large university’s graduate project management class, which introduces students to the core concepts in project management. Typically this course included a group project, in which a project from industry was undertaken as an experiential learning activity. However, as is often the case with “realworld” projects, unforeseen circumstances arose, requiring termination of the student’s projects with their industry client.

Given that “necessity is the mother of invention,” a new assignment was created and introduced for the class. This assignment was very well received by the students, and subsequent offerings of this course by this instructor will include this assignment. The assignment is called the “Library of Tools” (LT). This paper will describe the LT assignment, provide a description and examples of the assignments submitted, report student feedback regarding the assignment, discuss why it was a useful and successful assignment, and suggest revisions and extensions for the assignments. Also addressed are selected elements of critical thinking, including discussion of how this assignment incorporates critical thinking. Because the assignment includes elements of critical thinking, it promotes a progressive, mature view of the discipline of project management.

The Library of Tools assignment successfully addresses weaknesses previously identified in project management education. Crawford, Morris, Thomas, and Winter (2006, p. 731) state:
Project management education must be able to teach project managers how to be reflective practitioners in touch with the best and newest theory and research, and their day to day practice of managing. This requires a coaching approach over a longer term aimed at developing, in the workplace, managers capable of thinking critically about their own project management practice and anything provided to them as “best practice.” Competent project managers need to be able to apply technical project management tools contextualized for their specific project in a manner appropriate to the organization and project type. Research and pedagogy is needed to define these categorisations and more importantly how to think about the differences in project management practice necessitated by these differences.

The present assignment merges critical thinking with PM knowledge and practices applicable to the student / manager’s workplace. As such, it operationalizes the idea of a “reflective practitioner” who not only studies abstract theoretical concepts, but evaluates their appropriateness in varying situations.

BACKGROUND

The university’s graduate project management course was taught totally online, and included primarily working adults, most of whom had project management experience. Many were employed in information technology, and a handful were working in other fields, including property management and renovation, infrastructure construction projects within a natural gas utility, mortgage lending, and customer service. The course was required as part of a project management program offered by the university.

LIBRARY OF TOOLS (LT) ASSIGNMENT DESCRIPTION

There are many tools and templates used in project management at various stages of the project management life cycle. These include templates for tools such as team charters, project screening matrices, work breakdown structures, network diagrams, risk matrices, and many others. The variety and number of different types of tools and templates in the field of project management can be overwhelming to students of project management. An organizing framework providing a set of criteria by which users can sort and find the appropriate tools and templates for various projects is potentially useful for students in their workplaces after they complete their university course. One purpose of the LT assignment is to provide that organizing framework.

Students are required to review many tools and templates over the course of the semester during their online discussion assignments and reading assignments. Many of their online discussion assignments involve searching the web for tools and templates that address various project management problems and situations, and evaluating these tools and templates. The LT assignment requires students to review, compare, organize, and aggregate individual pieces of information into a coherent whole. As such, students move from the analysis of data to creation of meta-data. This has implications for how the students understand the field of project management.

Two major components comprised the deliverables in the assignment: (1) a document serving as an organizing framework, and (2) a collection of thirty or more tools or templates. Students were permitted to submit an individual assignment or a group assignment, where the group
assignment included at least 30 tool documents per person in the group. So, a two-person group would submit an organizing document with at least 60 associated tools, a three-person group would submit an organizing document with at least 90 associated tools, and so forth.

In the organizing document, students chose meaningful criteria by which they would analyze each tool, including such categories as:
- type of document (WBS, Team Charter, etc.),
- template or example of a document,
- level of complexity of the document,
- industry for which the document would be appropriate,
- numerical or categorical evaluation of the document (Excellent, good, fair, poor, etc.),
- brief qualitative evaluation of the document (one or several sentences commenting on features of the document not captured by the evaluation criteria), and
- other criteria deemed important to the student.

Students were required to post their LT assignment submission in a discussion forum in the course website, and were encouraged to review and comment on their peers’ assignments. Criteria for grading the assignment included number and quality of the documents submitted, quality of the evaluation of the documents, and overall general impression of the assignment submitted. The full description of the assignment is provided in Appendix 1.

**ABOUT CRITICAL THINKING**

Critical thinking, higher order thinking and creative thinking are terms that are often used interchangeably. They are also terms that are defined in many different ways. Appendix 2 includes a sampling of views and models of critical thinking from the literature. Concepts of critical thinking from these sources will be used to illustrate how the Library of Tools exercise supports critical thinking in the area of project management.

Classical views of critical thinking include Glaser (1937) and Watson and Glaser (1952, 1980, 1994), who emphasize evaluation of assumptions and drawing conclusions. Bloom developed a widely used taxonomy (later revised by Anderson, Krathwohl, and Bloom, 2001) which includes six levels of increasingly sophisticated intellectual behaviors: knowledge, comprehension, application, analysis, synthesis, and evaluation. The progression of intellectual activity requires students to move away from knowing concepts and facts to understanding complex ideas, with their nuances and implications.

Later, Facione (1990) and Facione and Facione (1994) addressed critical thinking with the concepts of analysis, evaluation, inference, explanation, and meta-cognitive self-regulation. Facione’s (1990) views explicitly identify meta-cognition, where people organize and identify characteristics about data and information.

Bloom’s and Facione’s ideas about what constitutes increasingly sophisticated critical thinking can be applied to project management education, and specifically to the LT assignment described here. The LT assignment involves analyzing and evaluating, based on Bloom’s taxonomy, and also involves evaluation, explanation, and meta-cognition as discussed by Facione.
We will use following six domains from Bloom’s taxonomy and discuss how these domains are addressed by the LT Exercise. The domains and their associated examples are:

1. **Knowledge**: collect, define, enumerate, etc. (examples: dates, events, places, vocabulary, key ideas, parts of diagram, 5Ws)
2. **Comprehension**: associate, contrast, cite, etc. (examples: find meaning, transfer, interpret facts, infer cause and effect, etc.)
3. **Application**: apply, calculate, relate, collect, prepare, (examples: use information in new situations, solve problems)
4. **Analysis**: analyze, classify, breakdown, infer, etc. (examples: recognize and explain patterns and meaning, see parts and wholes)
5. **Synthesis**: combine, create, adapt, reinforce, etc. (examples: discuss "what if" situations, create new ideas, predict and draw conclusions)
6. **Evaluate**: assess, convince, appraise, etc. (examples: make recommendations, assess value and make choices, critique ideas)

**DESCRIPTIONS OF SELECTED STUDENT ASSIGNMENT SUBMISSIONS**

Fifteen students chose to submit the assignment as individuals, and two people formed a group and chose the group option. The ratio of individual submissions to group submissions was a surprise to the instructor, as group assignments are promoted in the curriculum of business schools due to the need for business professionals to work well in groups and teams. The instructor does not know why so many students chose to work as individuals, but she speculates that the time required for group coordination and the uncertainty and lack of control associated with fellow team members’ performance caused most students to choose to work alone on the assignment.

Most students submitted Excel spreadsheets, and embedded examples of their tools or templates in the spreadsheets. URL’s indicating the sources of the documents were also generally included. Categories added by students for purposes of classifying the documents included “Improvements,” “Phase of Project Life Cycle,” “Suggested Applications,” “Stand-Alone Document or Part of a Collection,” “Treasure Trove for Future Use,” “Skill Set Used,” and others. Many of the spreadsheets were color-coded, enhancing their appearance and readability. Some students included their narrative evaluations in the spreadsheet, and others included separate documents. Because of the large number of documents, only selected examples will be provided here.

**A Typical Submission**

To provide an understanding of the content of student submissions, including their breadth and scope, a portion of the spreadsheet of a typical student’s assignment is shown in Appendix 3. This student organized her documents according to the project phase, with the selected example in Appendix 3 showing documents associated with the “Initiating” phase of the project life cycle. This student included a template for a project proposal which she evaluated as being useful for all sizes of projects, and projects in any context. She provided the source of the project proposal template, evaluated the project proposal template as “Good,” and provided a brief narrative description of the template. She felt that the template was useful for project managers creating project proposals, but “may not be the best template for a new project manager.”
Other documents evaluated in the initiating project phase by this student included two project charters, one of which was classified as both a template and an example, a statement of work, and a stakeholder management strategy template. The stakeholder management strategy template was oriented towards information technology contexts, but could be adapted to project in any context, in the view of the student. She rated the statement of work template and the stakeholder management strategy template both as excellent.

This student evaluated 25 additional documents (not shown here) associated with other parts of the project life cycle to complete her assignment. Other students submitted spreadsheets that were similar to this, but varied in the format used, the manner in which source documents were made available, and the categories used for classification.

This student’s submission illustrates how the LT assignment addresses critical thinking. Not only does she show knowledge and comprehension of the tools (levels one and two of Bloom’s taxonomy), but she classifies the documents (level four) and evaluates them (level six).

The Best Submission

The best assignment submission was submitted by the only group (a two-person group) in the class, based on the qualitative judgment of the instructor. This group submitted an assignment that included a simple Microsoft Access database where the tools and templates were categorized, and from which they were accessible; a PowerPoint file serving as an instruction manual for using the database; and a large file with the accumulated tools and templates. This group of two students collected 37 of what they called “tool definition files” and 81 of what they called “tool supportive files,” for a total of 118 documents categorized. The database was designed to be expandable, and the students expected to continue to use it in their workplaces in the future. Appendix 4a includes a screen shot of one of the pages of the students’ instruction manual, which included “PM Tool Definition,” or the topic addressed by the tool, the team member contributing the document or defining the tool, the context, a definition of the tool, the URL if appropriate, related documents, and the related textbook chapter. The “PM Tool Supportive Documents” also included the name of the document, its size and type, and categorical and narrative evaluations. The quality of this assignment submission impressed the instructor, and she requested that this assignment be provided for future classes as an example.

Appendix 4b lists the 37 categories and associated documents from the list of contents in the best assignment. The 37 assignment categories provide comprehensive coverage of many topics within PM, and documents associated with the 37 categories include tutorials, example documents, case studies, and articles. The students’ collection of documents reflects their creativity and an enlightened view of PM.

Critical thinking is exemplified by these students’ LT submission, with multiple dimensions of Bloom’s taxonomy illustrated. The students demonstrate knowledge and comprehension of the tools and templates, which characterize levels one and two of Bloom’s taxonomy. Not only did they classify and evaluate the documents (levels four and six), but they created a database that can be extended in the future to meet new and more complex needs (level five).
Utility in the Workplace

In another case, a student who was a project coordinator for a commercial construction firm used the assignment to organize and evaluate her organization’s PM templates. (She did not post her assignment for other students to view, since the documents were proprietary, and excerpts will not be posted here.) She advised that the assignment had enabled her to obtain “exceeds expectations” in her yearly review.

STUDENT FEEDBACK ON THE ASSIGNMENT

Students were given the opportunity to provide feedback on the course, and their feedback on the LT assignment was very positive. One theme that emerged from student feedback was that they liked the LT assignment because they believed it would be useful for them in their future careers. Seven of the seventeen students in the class discussed this issue in their feedback about the course:

Student #1: The ‘Library of Tools’ project is something that we could use for future reference for our professional use.

Student #2: I’m sure that we all found plenty of documents that could be useful to us in the future.

Student #3: I enjoyed researching the final project, Library of Tools. I was able to locate many tools online which can be utilized in the future as I hope to begin my career in Project Management.

Instructor’s Question: In five years, what will be the one or two things that you will want to remember from this course?

Student #4: My Library of Tools, I feel I created a useful tool I can reference in future endeavors should I forget the basics learned from this course, I can look back upon them and find the information with ease.

Student #5: The activities I enjoyed the most in this class are the … project and the Library of Tools exercise….The Library of Tools exercise was also a practical exercise that I enjoyed because it allowed me to research many different templates and tools that led to my development.

Student #6: The library of tools exercise allowed me to review all of the templates and tools that are utilized by the Project Coordinators and Project Managers at my company to complete projects. Through this exercise, I was able to make helpful recommendations to the Project Management Operations team that assisted them in creating a new playbook and updating the templates so that each template or tool will be more effective to the project team.

Student #7: …also we finished a project that can benefit us for a long time.

One student did not like the open-ended assignment description for the LT assignment, although his criticism might not necessarily reflect badly on his learning experience:
Student #8: The thing I didn’t like was the lack of direction given on the Library of Tools project. We were given some high level detail, and some deliverables. This made the project open to interpretation. I think the lesson learned here however was that in project management, the outcome is not defined and it is often up to the project manager to define.

Three of seventeen students indicated that the LT assignment was interesting or inspired creativity for them:

Student #5: Because it was an open ended project – meaning we had few guidelines and was able to form an idea and run with it – I was able to be creative and successfully complete this project with a perfect score.

Student #9: The Library of Tools and the … Project were easily some of my favorite activities in the course. These assignments tested our knowledge and understanding of the material covered, but were also challenging enough and encouraged me to dig a deeper into the project management field.

Student #10: Further giving the students the option to choose their own template or style for the library made us use our creativity and knowledge.

One of the two students who worked on the LT assignment as a group indicated that he and his fellow group member used PM tools during their project, using it as an experiential PM learning experience.

Student #11: I love the group PM library project the most. It provides us an excellent opportunity for us to work as a group implementing a real project while we are in the process of learning project management. We used lots of PM tools in the group project, such as agile, sprint, PM communication, PM documentation, responsibility allocation, multi-project management skills, and etc.

While the experience of this small group was not typical of the class, it nevertheless illustrates that the assignment could be used in the future to provide experiential PM learning activities.

One concern was that so many in the class chose to do the LT assignment as individuals rather than in groups. One student addressed this in her feedback:

Student #12: I liked the independent nature of the Library of Project Management Tools exercise. I’m sure that we all found plenty of documents that could be useful to us in the future. I do not think that the lack of a true hands-on group project in the class was much of a hindrance for me. At work I am already involved with a couple of ongoing projects where I can see the course themes in action. Learning in a context that is relevant to your everyday life and work can hardly be beat.

This student’s opinion was that she and her fellow students already possessed much experience working in groups and on teams, and there was little incremental value of more group interaction in the PM class. Rather, she was able to study about project groups and teams and apply that knowledge in other areas of her life.

One additional feature of the LT assignment is that students were to post their documents and review each other’s work. There was not a formal grade component for the review of other
students’ work, and thus very little of this occurred. However, one student commented on the value of being able to engage in peer review:

Student #1: Also, encouraging the students to share their project work with the class is very thoughtful as other students could use it for their reference.

Overall, the students believed the assignment was of value because they were able to create customized repositories of PM knowledge and tools beneficial to them in their futures.

MODIFICATIONS AND EXTENSIONS FOR THE LT ASSIGNMENT

Overall, the LT assignment was well-received by students, and comments about its outcomes were very positive. However, the assignment can be modified and improved for the future. First, the small group that created their Library of Tools reported greater satisfaction and more different types of learning outcomes than those who completed the assignment as individuals. One possible modification would be to require that the assignment be completed by a small group. To retain the utility of the assignment for the students, groups could be formed by industry, such as those interested in PM in information technology, construction, government, or other areas. By requiring that the students complete the assignment as a group, larger more impressive databases could be created, with presumably more utility for the students.

Secondly, higher-order learning can be encouraged even more by requiring that individuals or groups conduct a formal peer review of their fellow students’ assignments. Peer evaluation of assignments has benefits for those conducting the evaluation, in terms of generating greater critical thinking skills. This will place more emphasis on the critical thinking domains of analysis and evaluation, levels four and six in Bloom’s taxonomy.

Lastly, students in the future will be given examples of Libraries of Tools from prior classes, and asked to create new libraries of their own that are of higher quality than the sample assignments. It is expected that this will generate a competitive spirit in students, who will want to exceed the quality of the sample assignments, and speed the design process that is necessary when first creating the documents.

IMPLICATIONS OF THE ASSIGNMENT AND RELATIONSHIP TO PRIOR FINDINGS

While this assignment has been portrayed as addressing educational issues in PM, there are deeper implications inherent in the design and use of this assignment. PM education has been criticized as lacking in relevance and rigor (Berggren and Soderlund 2008, Crawford et al., 2006). Clearly the students have endorsed the relevance of the Library of Tools assignment, as they have selected tools and templates appropriate for their organizations and interests, and have critically evaluated the tools and templates and suggested improvements.

The assignment includes rigor in the form of critical or higher-order thinking. Bloom’s taxonomy has identified application, analysis, synthesis, and evaluation as intellectual activities that are at a higher level than knowledge or comprehension. The assignment moves beyond learning facts about PM, such as descriptions of processes, metrics, and concepts, to evaluation of artifacts and creation of classification and categorization schemes.

Project management as a discipline has been criticized for being too rigid in its application of concepts and processes, without regard for the variety of different contexts and environments.
involved (Lenfle and Loch, 2010). Lenfle and Loch (2010), in reviewing the history and evolution of PM, indicate that the decision tools of the 1950’s recognized the need for parallel trials and experimentation in certain situations. This orientation differs strongly from today’s PM, which emphasizes discipline and control. The LT assignment addresses this problem by asking students to critically evaluate tools and templates and identify situations in which each is appropriate. In some cases, students also suggested enhancements to the tools, in essence adopting an orientation of fitting the tool or template to the situation rather than mindless use of what others have deemed to be “best practices.” To summarize, the LT assignment, by its design, promotes a view of the discipline of PM that is contextual: different practices are appropriate in different situations. Therefore this assignment promotes a more progressive view of the discipline of PM.

Regarding “best practices,” Crawford et al. (2006) have stated:

“... in order to develop appropriate training and development programmes, we must first have a solid understanding of what the underlying knowledge base must contain. Given the criticism of the BOKs and the conceptualisation of projects and project management in other chapters in this volume, the increasing perception of complexity of projects and breadth of application of project management practices, it is almost criminal to propogate a “best practise” or “one best way” approach to project management training when there is no empirical or theoretical foundation for these assertions.”

The LT assignment inherently causes the students to move away from thinking about the PM discipline as prescribing “one best way,” and encourages variations in practices to fit different situations.

Leybourne, Kanabar, and Warburton (2011) have described Boston University’s Master of Science in Project Management, explaining their institution’s goal of equivalence between online education and the face-to-face experience. BU initially had as their primary goal making assignments in online classes indistinguishable from those in face-to-face classes. This was necessary to convince the administration that BU’s online program would be of high quality. In the institution where the LT assignment was implemented, online education is accepted and often preferred by students. The LT assignment is very suitable for an online class, and takes advantage of online resources in a manner that would have been much more difficult had it been modelled after an assignment in a face-to-face class. This suggests that defining the quality or rigor of a program by comparing it with pre-internet curricula results in a failure to take advantage of the capabilities of technology. The utilization of online resources and processes creates a better quality learning experience, one that bears more similarities to the IT-based PM processes used by progressive organizations in today’s business environment.

Ashleigh, Ojiako, Chipulu, and Wang (2012), in a study of undergraduate PM students in classes that included both face-to-face and online sessions, identified two critical learning themes relevant for the students: transferrable skills and utilization of e-learning environments. The characteristics of the students and environment reported in Ashleigh et al. were very different from the students and environment involved in the case profiled here. Differences include the educational level of the students (undergraduate versus graduate), employment status, PM experience, student status (full-time versus part-time, not employed versus employed), and potentially experience level with online courses (much versus little). However, the critical theme of transferrable skills would appear to have been important in both environments. Students strongly endorsed the LT assignment on the basis of its applicability to
their workplaces, supporting the importance of *transferrable skills*. The e-learning environment was not specifically mentioned by the students in this study as an important factor. E-learning is a commonly-used mode at this university, and students probably would not identify this factor as unusual or critical, since it is a feature of their normal learning environment.

**CONCLUSIONS**

There are several preliminary conclusions that can be drawn from this assignment case study. First, this assignment represents an experience of one graduate section at one university with a limited number of students (17). Hence it is hard to generalize it to a larger body of students, students in different academic environments, or practicing project management professionals.

Second, students were given free hand in selecting any useful types of tools and offered their critique on any number of factors that they found relevant. They also were able to evaluate the tools that others had selected. This exercise involved creativity in that students were able to develop categorization schemes to address many facets of the technical ground in project management. Many tools selected were “technical” tools aimed at the famous “triple” objectives of projects: cost, schedule and performance. While evidence was not provided here, one instructor observed that behavioral aspects of PM were less emphasized by students in this exercise. Given the importance of the “customer-satisfaction” goal of most projects, it is important that in the future the assignment needs to stress the importance of including “behavioral” tools.

Third, the depth, quality and the sheer number of tools that the students evaluated (estimated at over 500 tools by the 17 students) suggests that there exist vast quantities of PM-related content freely available. An organization must select and adapt various tools for their own goals – depending on its size, project purpose, budget, duration, possible impact, team size, etc.

This exercise also illustrated for students the variety and complexity of factors to be considered in PM. The process of comparing, contrasting, and synthesizing various tools within PM creates an appreciation for the sophistication of the discipline. It also showed students that creativity is required when designing artifacts to suit a given company environment and management style.

As discussed above, one of the most important outcomes of this assignment was to promote critical thinking. Given that critical thinking can be defined in variety of ways, some of the goals of critical thinking have been met: students are able to assess, analyze, draw conclusions (as to which tools are suitable) and discern, compare and contrast and synthesize. In a spirit of continuous improvement, this assignment will be used again, with changes to further emphasize critical thinking and its applicability to the discipline of project management.

**APPENDIX 1**

**Library of Tools Assignment Description (abridged)**

*Library of Tools:*

*For this assignment, you should create a library of project management tools. The purpose of this assignment is for you to collect and critically analyze a selection of project management tools and templates, which hopefully would be useful for you in your workplaces and your future career and personal development. The “library” should consist of two major components: the*
organizing document and the component documents (see Deliverables section below). Deliverables: One deliverable for this project is a spreadsheet, which should be used to organize data about your library of tools. The second deliverable is the collection of document files and narrative evaluations.

Group or individual: This project may be completed as an individual or in a group. The expectation is that at least 30 documents per person will be referenced in the library. Thus, a two-person group should have a library of at least 60 documents, a three-person group should have a library of at least 90 documents, etc.

Possible Tools: Following is a list of some of the types of tools you might evaluate. You may evaluate templates or completed examples.

1. Team Charter
2. Scope Statement
3. Project Selection Models
4. Communication Plan
5. RFQs
6. WBS
7. OBS (organizational breakdown structure)
8. Estimating Database
9. RBS (risk breakdown structure)
10. Risk Registers
11. Priority-Impact Matrix
12. Project Schedule
   a. Gantt chart
   b. Network diagram
13. Project Budget, including the Baseline Budget
14. Status reports (including performance metrics such as EVA)
15. Project Closeout Checklist
16. Retrospectives
17. Other (not listed above)

Provide an Organizing Structure for the Tools (spreadsheet): The purpose of the assignment is for you to create a tool/database that can be expanded, extended, and used by others. By including a spreadsheet as an organizing tool, you can find a given document later through simple searching if your “library” becomes very large. The criteria used to organize and search for tools and templates should be specified. They include:

- Type of document (WBS, Scope Statement, etc.)
- Template or Example
- Large, medium, or small
- Context (IT, Construction, etc.)
- Evaluation of the document: Categorical (Excellent, Good, Fair, Poor) and Narrative (explain verbally the advantages and/or disadvantages of the document)
- URL (if applicable)
- Other as you deem appropriate (improvements to the criteria will receive extra consideration during grading)
Critical Narrative Evaluation of Tools (based on “my” preferred context): Your evaluation of a given tool will be influenced by the context or environment for which it is intended. A narrative evaluation of each document should be included in the assignment. This narrative need not be extensive, but would probably range in length from one or two sentences to several paragraphs. The narrative evaluation is qualitative, and could include these or other topics as you believe appropriate:

- Purpose (may be IT, construction, or other industry / purpose)
- Context in which they are useful
- Suggested modifications for tools for other contexts?? For your context?

Posting Required: You will be required to post your finished product so others can add your library to theirs if they wish, after everyone’s assignment is completed. The purpose of this is so that everyone in class can benefit from each other’s research.

Due Dates: The assignment will be due November 25, 2013, which is just before our Thanksgiving Break Week. There is some flexibility in the due date, but please contact me if you plan to submit the assignment later than November 25. You will not want to submit the assignment much later than this, since you will be working on your take-home final between December 2 and 14, 2013.

Point Value: This assignment is worth 30% of your course grade.

Evaluation Criteria for the Assignment: My evaluation of your assignment will be based on these criteria:

- Number of documents
- Quality of documents (higher quality documents merit higher grades) • Quality of evaluations of documents.
- Unspecified (overall general impression of the assignment submission).
### Appendix 2

## Multiple Views of Critical Thinking

<table>
<thead>
<tr>
<th>Authors</th>
<th>Critical Thinking View</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glaser (1937), Watson and Saade, Morin and Thomas (2012)</td>
<td>Critical thinking is defined as (1) recognizing assumptions (R), (2) evaluating arguments (E) and (3) drawing conclusions (D). This is called Glaser (1952, the RED model). Critical thinking is defined as abilities of discernment, analysis, and evaluation to achieve logical understanding. They used the ART scale to evaluate/measure critical thinking in an online course.</td>
</tr>
<tr>
<td>Anderson, L. W., Krathwohl, D. R., &amp; Bloom, B. S. (2001)</td>
<td>including critical thinking. Anderson, Krathwohl, and Bloom (2001) revised his taxonomy, proposing six levels (domains) – increasing in sophistication: In each of these domains, anchors have been defined which can be a guide to measure critical and or higher order thinking. The domains and their anchors are:  • Remembering – Recall or locate information  • Understanding – Understand learned facts  • Applying – Apply what has been learned to new situations  • Analyzing – “Take apart” information to examine different parts  • Evaluating – Consider evidence to support conclusions  • Creating – Create or invent something; bring together more than one idea</td>
</tr>
<tr>
<td>Facione and Facione (1994)</td>
<td>A scale, increasing in sophistication, has been created which is anchored on the following attributes:  • Interprets evidence, statements, graphics, questions, etc.  • Identifies the salient arguments (reasons and claims) pro and con.  • Analyzes and evaluates major alternative points of view.  • Draws warranted, judicious, and non-fallacious conclusions.  • Justifies key results and procedures, explains assumptions and reasons.  • Fair-mindedly follows where evidence and reasons lead.</td>
</tr>
<tr>
<td>King, Goodson and Rohani (n.d.)</td>
<td>King, Goodson and Rohani suggest that higher order thinking skills include critical, logical, reflective, metacognitive, and creative thinking. These skills are activated when individuals encounter unfamiliar problems, uncertainties, questions, or dilemmas. Successful applications of the skills result in explanations, decisions, performances, and products that are valid within the context of available knowledge and experience and that promote continued growth in these and other intellectual skills. Higher order thinking skills are grounded in lower order skills such as discriminations, simple application and analysis, and cognitive strategies and are linked to prior knowledge of subject matter content. Appropriate teaching strategies and learning environments facilitate their growth as do student persistence, self-monitoring, and open-minded, flexible attitudes.</td>
</tr>
<tr>
<td>Facione, (1990)</td>
<td>A view of critical thinking is that, in order to reach a judicious, purposive judgment, a good critical thinker engages in analysis, evaluation, inference, explanation, and meta-cognitive self-regulation. The disposition to pursue fair mindedly and open-mindedly the reasons and evidence</td>
</tr>
</tbody>
</table>
wherever they lead is critical to reaching sound, objective decisions and resolutions to complex, ill-structured problems. So are the dispositions such as systemacity, reasoning, self-confidence, cognitive maturity, analyticity, and inquisitiveness.
APPENDIX 3

Portion of Typical Student’s Spreadsheet Assignment Submission (part 1)

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Document</th>
<th>Context (IT, Construction, etc.)</th>
<th>Template or Example</th>
<th>File</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiating</td>
<td>Project Proposal</td>
<td>All Size Projects</td>
<td>Projects of Any Context</td>
<td>Template</td>
</tr>
<tr>
<td>Initiating</td>
<td>Project Charter</td>
<td>Small Project; Summarization of Medium to Large Projects</td>
<td>Projects of Any Context</td>
<td>Template</td>
</tr>
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<td>Initiating</td>
<td>Project Charter</td>
<td>All Size Projects</td>
<td>IT; can be adapted to Projects of any context</td>
<td>Example/Template</td>
</tr>
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<td>Statement of Work</td>
<td>All Size Projects</td>
<td>IT; can be adapted to Projects of any context</td>
<td>Example/Template</td>
</tr>
<tr>
<td>Initiating</td>
<td>Stakeholder Management Strategy</td>
<td>All Size Projects</td>
<td>IT; can be adapted to Projects of any context</td>
<td>Example/Template</td>
</tr>
</tbody>
</table>

APPENDIX 3

Portion of Typical Student’s Spreadsheet Assignment Submission (continued)

Source                      | Categorical | Narrative | The template is broken into 5 sections: project-management—Positioning the Project, Justification and Benefits templates/project-start—Strategy, Scope and Stakeholders. This template template/ is useful for Project Managers with experience in creating Project Proposals - but may not be the best template for a new project manager. This Project Charter template provides project_management_templates.detailed instructions on what information belongs php in each section, and would likely be more helpful

http://projectnewstoday.com/pr Good
http://www.consulting.ky/free_p Fair
<table>
<thead>
<tr>
<th>Misterek &amp; Saraph</th>
<th>The Library of Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong><a href="http://www.projectmanagementdocs.com/initiating-process-long.html">http://www.projectmanagementdocs.com/initiating-process-long.html</a></strong></td>
<td>Good on smaller projects or to summarize larger project charters.</td>
</tr>
<tr>
<td><strong><a href="http://www.projectmanagementdocs.com/project-documents/statement-of-scope-work.html">http://www.projectmanagementdocs.com/project-documents/statement-of-scope-work.html</a></strong></td>
<td>This example allows Project managers to provide details about complex projects of any size.</td>
</tr>
<tr>
<td><strong><a href="http://www.projectmanagementdocs.com/project-initiation-templates/stakeholder-strategy.html">http://www.projectmanagementdocs.com/project-initiation-templates/stakeholder-strategy.html</a></strong></td>
<td>Excellent This SOW template allows project managers to document background of the project, the scope of work to be addressed, the period and place of performance, work requirements, schedule/milestones, acceptance criteria, and other requirements. Overall, this template provides a single place for critical information regarding the project work.</td>
</tr>
<tr>
<td><strong><a href="http://www.projectmanagementdocs.com/project-initiation-templates/stakeholder-strategy.html">http://www.projectmanagementdocs.com/project-initiation-templates/stakeholder-strategy.html</a></strong></td>
<td>Excellent This Stakeholder Management Strategy template identifies and documents the approach to take in order to increase support and decrease negative impacts of stakeholders throughout the life of the project.</td>
</tr>
</tbody>
</table>
APPENDIX 4A

Screenshot from Instruction Manual from Best Library of Tools Assignment

APPENDIX 4B

Categories and Documents from the Best Library of Tools Assignment

1. Agile Methodology
   Agile Best Practices
   Agile Methodology Tutorial Difference between Traditional and Agile methodologies Using MS project for Agile PM
   VersionOne - Agile PM tool
2. Baseline
   Managing the Baseline Schedule When can baseline be changed?
3. Bottom-Up Estimating
4. Change Management
   Change Request Form and Log
5. Critical Chain Project Management
   CPM Vs. CCPM
6. Critical Chain Project Management Overview
7. Critical Path Method (CPM)
   CPM Tutorial - Part 1
   CPM Tutorial - Part 2
   CPM Tutorial - Part 3
8. Develop Project Network - Backward Pass
   Doing a Backward Pass
9. Develop Project Network - Forward Pass
   PMP - Critical Path Method - Doing a Forward Pass - Part A
10. Earned Value Analysis
    Earned Value Analysis (EVA)
    Video Tutorial 1: Basic concepts of Earned Value Analysis
Value Management
Video Tutorial 2: Intermediate level
Video Tutorial 3: Advanced Level
10. Five Stage Team development model/ Importance of Team Development Model and Case Study
11. Gantt Charts
Developing a Basic Gantt Chart / Bar Chart Using Critical Path Method (CPM)
Gantt Chart using Excel
Gantt Chart using MS Project
12. Kanban
Kanban 101
13. MS Project Tutorials
25 Microsoft Project Tips and Tricks
Other Project Management Software
What’s new in MS Project Professional 2013?
14. Outsourcing
Best Practices in Outsourcing project work
Outsourcing Example
Outsourcing will remain a risky business
15. PERT Vs. CPM
PERT and CPM Calculations
16. Program Evaluation Review Technique
(PERT)
Part 1: PERT and Standard Deviation calculation
Part 2: How do we use Standard Deviation for estimation
PERT - Understanding Beta distribution and Z-Score
17. Project Charter
Project Charter Example 1
Project Charter Example 2
Project Charter Template
18. Project Closure
Project Closure Example 1
Project Closure Example 2
Project Closure Template
19. Project Communication Plan
Project Communication Plan Template & Guidelines
Sample Communication Plan
20. Project Life Cycle
Talent Triangle/Value of Project Management
Which Life Cycle Is Best for Your Project?
21. Project Management Structures
Organizing Projects as Dedicated Teams
Organizing Projects within a Matrix Arrangement
Organizing Projects within the Functional Organization
22. Project Scope Checklist
Project Scope Sample 1 (Small Project)
Project Scope Sample 2 (Large Project)
Project Scope Template
23. Project Selection Financial Criteria
Net Present Value (NPV)
Payback Model
24. Project Selection Non-Financial Criteria
Checklist Models
Multi-Weighted Scoring Models
25. Requirements Signoff Template
Business Requirement Document Sample
Sample Requirements Sign off document
Tips to gather good requirements
26. Resource Leveling
About resource leveling
IBM Rational Portfolio Manager Help - Resource Leveling Resource Leveling – Can You or Should You Level?
27. Resource-constrained scheduling
Solving the Resource Constrained Project Scheduling Problem
28. Responsibility Matrix
Responsibility Matrix: Example 1
Responsibility Matrix: Example 2
29. Risk Breakdown Structures (RBSs)
Risk Breakdown Structure
Risk Breakdown Structure (RBS)
Sample Risk Breakdown Structure
30. Risk Severity Matrix
Risk Matrices
SAMPLE - Safety Management System
REFERENCES


