

CBA Problem-Solving References

This document contains ideas for content to cover in CBA courses for student learning objectives (SLOs) in problem-solving based on the College's assessment rubric. It addresses the major dimensions of the rubric: problem definition, assumptions, potential alternatives formulation, solution evaluation, solution selection and justification, and other problem-solving factors. The Presentation dimension is omitted because it is covered in greater detail in the oral communication resource document.

The ideas here are drawn from educational services such as Coursera, edX, and Lumen, which offer online courses and certifications for various specializations. Coursera offers each course approximately once a month. Some edX courses provide a certification for a fee, some courses are free, and others can even be used to earn university credit. Lumen offers learning materials at low costs.

Some components of these courses are relevant for the criteria used in the CBA assessment rubrics. Miscellaneous online resources and/or videos are also provided that discuss the more specific criteria.

This document may serve as a starting point for developing instructional content based on what other educational services tend to offer.

Problem Definition

“Given one hour to save the world, I would spend 55 minutes defining the problem and 5 minutes finding the solution.”

~ Albert Einstein

1. <https://hbr.org/2012/09/the-power-of-defining-the-prob>
This Harvard Business Review website provides real-world examples of problem re-definition that led to major breakthroughs, which may be useful for case studies or class discussions.
2. <https://blog.iqmatrix.com/defining-problem>
This website gives specific questions for gauging a problem’s scope. Example questions to ask:
 - a. What is this problem preventing me from doing?
 - b. What will happen if I do nothing about this problem?
 - c. Is this the real problem or is there something else below the surface that I am not seeing?
3. <https://www.youtube.com/watch?v=o4dddmOpQ5s>
This YouTube video describes the Problem Definition Template, which asks what motivated people to find solutions, who is affected by the problem (stakeholders), whether the problem can be reframed, etc. The Template may be particularly useful to ensure that students follow a systematic method for defining the problem and cover all bases before seeking solutions.

Assumptions

1. <https://www.edx.org/course/critical-thinking-problem-solving-ritx-skills103x-0>
A free 3-week edX course on critical thinking from the Rochester Institute of Technology. Topics covered in this course include:
 - How to perform strategic analysis and assessment
 - How to perceive a critical need and design a tailored solution (relevant for Problem Definition dimension as well)
 - How to identify key stakeholders and ensure their needs are met
 - How to employ adaptive problem-solving
 - How to work through obstacles collaboratively (may be relevant for group projects)
 - How to analyze failure to improve future performance (addresses the follow-up steps criterion)
2. <https://ctb.ku.edu/en/table-of-contents/participation/encouraging-involvement/identify-stakeholders/main>
This page from the University of Kansas Community Tool Box explains who are primary, secondary, and key stakeholders; types of interests stakeholders may have (e.g., safety and security, economics, social change); why it is important to know the stakeholders in one's problem; examples of stakeholders in each of 3 categories; strategies for identifying less obvious stakeholders; etc. This information may be useful to ensure that students know whom to consider as they design the solution.
3. <http://www.studygs.net/problem/problemsolvingv1.htm>
The issue of assumptions is addressed at the bottom of this webpage, stating that what some may consider "facts" is actually accepted on faith and can jeopardize the foundation of the problem. It is therefore important to question the source of one's facts/knowledge before basing decisions on them. This can serve as a reminder for students to separate facts from opinion.

Potential Alternatives Formulation

1. <http://www.studygs.net/problem/problemsolvingv2.htm>
This website recommends brainstorming alternatives, no matter how ridiculous they may seem at first. This way, many options are generated, and one can discover possibilities not considered before. Evaluation of alternatives should be done without prejudice or preferential treatment of one solution over another. Students often spend little time brainstorming and more time arguing for a single solution. The arguments on this webpage defend brainstorming as a necessary step in solution generation.
 - a. Best solution should be suitable, feasible, and flexible (website defines these).
 - b. When selecting the best alternative, consider: your intuition; opinion of trusted outsider(s); don't see one alternative as "perfect"; compromise among several alternatives may work even better.
2. <http://asq.org/learn-about-quality/problem-solving/overview/overview.html>
This American Society for Quality webpage states that having several alternatives can enhance the standard to which the final solution will be held, because many issues are considered in the process. Some specific considerations are listed in Step 3 (evaluating and selecting an alternative):
 - a. A particular alternative will solve the problem without causing other unanticipated problems.
 - b. All the individuals involved will accept the alternative.
 - c. Implementation of the alternative is likely.
 - d. The alternative fits within the organizational constraints.
3. <https://courses.lumenlearning.com/boundless-management/chapter/decision-making-process/>
Lumen, a service similar to Khan Academy, here advises brainstorming in groups for best results. This page introduces the concept of **decision trees**, which are visual depictions of potential options; they consist of broad alternatives that are further broken down into specific components that may have alternatives of their own, and we stop adding more when viable alternatives in a given branch are exhausted.
4. <http://web.csulb.edu/~msaintg/ppa670/p&sch6.htm>
California State University-Long Beach Public Policy and Administration professor and Director of Program Review and Assessment, Michelle A. Saint-Germain, provides a list of 14 sources from which solution alternatives can be generated (e.g., moving from generic to custom-made alternatives; case studies of real-world experiences; using typologies of stakeholders to determine reactions to alternatives; considering constraints; etc.). This is a great resource for brainstorming.

Solution Evaluation

1. <https://www.structureddecisionmaking.org/steps/evaluationcriteria1/good-evaluation-criteria/>

This webpage covers characteristics of good criteria for evaluating a solution. It mentions that criteria should be additive—that is, multiple criteria can be applied to evaluating an alternative without overlap.

2. <https://www.coursera.org/learn/problem-solving>

This 5-hour Coursera course on problem-solving and decision-making from the University of California-Irvine has some relevant lessons. These are:

Section 3

- Group Decision Making
- Decision Methods
- Consensus and Ethical Decisions

Section 4

- Basing Decisions on Information
- Implementing Decision Results

3. <http://www.eastgate.com/DeenaLarsen/guide/step7.htm>

Eastgate is a hypertext/hypermedia writing service and store. This webpage by Deena Larsen explains that evaluation of alternatives can help to refine existing options, since the best solution rarely comes up in the first round of brainstorming. Potential consequences can also be discovered by asking pointed questions:

- How will the solution interact with other processes and actions?
- Could this solution create larger problems elsewhere?
- Are there indirect effects? (if X happens, then Y might occur, which would influence Z)
- What is appropriate data to collect to measure these consequences?

4. <https://personal-development.com/chuck/consequences-actions.htm>

This Personal Development blog entry discusses consequences of decisions, but the discussion can apply just as well to potential solutions to a problem.

- Consequences can be intended (what we hope the solution will bring) and unintended.
- Unintended consequences are further broken down into 4 kinds of consequences: positive, negative, perverse, and unforeseen (described and supplemented with examples on the website).
- Perverse consequences are the opposite of what was intended. Unforeseen consequences are usually out of our control, but they can be positive, negative, or neutral.
- Just like we have to deal with assumptions made when a problem is being defined, we need to be aware of unintended consequences of our solution just as much as intended ones.

Solution Selection and Justification

1. <http://www.itseducation.asia/implement.htm>

ITS Education Asia is an education service linked to accredited schools in Hong Kong and Singapore. The Online Education website provides free articles on specific subjects. One page is all about problem-solving in detailed steps. The Solution Implementation section discusses formulating an action plan. This plan should include:

- Actions required (goals, desirable outcomes of each action, sequence of actions)
- Schedule of the actions (timeline for completing each task; may use a diagram or flowchart to depict this)
- Resources required (time, space, manpower, money, materials, information)
- Measures to buffer against negative consequences
- What could potentially go wrong (e.g., two activities coinciding, unintended consequences, resources are used up, etc.)
- Action management (who supervises activities, when progress toward goal will be measured, who will measure the progress and how, deadlines)
- Review of the action plan

The landing page for the entire problem-solving process can be found here:

<http://www.itseducation.asia/problem-solving.htm>

2. <http://www.studygs.net/problem/problemsolvingv3.htm>

This Study Guides and Strategies webpage describes the solution implementation stage and discusses the importance of informing stakeholders of the chosen solution and helping them prepare for the change, as well as being prepared to compromise with the most important stakeholders' wishes.

3. <http://www.eastgate.com/DeenaLarsen/guide/step10.htm>

Long-term monitoring of the solution involves tracking changes following implementation. This involves:

- Gauging whether all stakeholders understand the solution
- Does everyone have access to information about the solution
- Making sure that those involved know what their role is in implementation
- Monitoring the community in which the solution will be implemented to detect any changes during implementation that may or may not be part of the solution

4. <http://blog.minitab.com/blog/quality-business/5-tips-to-make-process-improvements-stick>

This blog provides 5 tips for making sure that the implemented solution “sticks” in the long term. This involves providing feedback on activities related to the solution, providing positive reinforcement to those working on implementing the solution, and updating procedures outlined in the action plan as necessary. These five tips should be applicable to any project's follow-up steps.

Other Problem-Solving Factors

1. <http://asq.org/learn-about-quality/problem-solving/overview/overview.html>

The American Society for Quality outlines the rational (classical) decision-making model, which is also covered in students' coursework. To ensure that a logical process is being used to solve a problem, there are four essential steps:

- a. Identify the problem or opportunity
- b. Think of alternative solutions to the problem
- c. Evaluate alternatives, select the one that meets needs best
- d. Implement the solution and periodically evaluate success of implementation

These steps are the bare-bones outline of what should be covered by students in the problem-solving class project. It also ensures that a systematic approach is used for problem-solving that incorporates techniques learned in class.

2. <http://www.itseducation.asia/presentation.htm>

ITS Education Asia webpage for problem-solving that describes how to effectively cover one's solution implementation and follow-up steps in oral and written presentations. Specific notes are provided for oral presentations, and four aspects (contents, structure, style, and layout) for written presentations.