Are we really having an impact? A comprehensive approach to assess improvements on critical thinking at an MBA Program

Abstract

This paper describes our experience in measuring the improvement of critical thinking skills in the MBA program at our Business School. We proceeded to apply three different approaches to gauge its impact on student problem-solving ability: From this experience we concluded two things: first, our MBA program does have an impact, not only improving our students’ critical thinking skills, but also leveling the playing field in this area with respect to their U.S. counterparts. Second, assessing improvement in critical thinking skills is a complex task calling for a multi-measures approach.

Keywords: critical thinking, learning assessment, MBA.
i. Introduction

While executives and faculty recognize the importance of critical thinking skills for business graduates, according to Datar, Garvin and Cullen (2010) it is often debated whether students come into the MBA program with these skills or not, as well as if they can be effectively taught to in case the answer is not. This case study describes our experience measuring the advancement of critical thinking skills at our Business School. Given that the school’s strategy regarding teaching and learning is to develop critical thinking skills through the use of student-centred teaching / learning methodologies, it was of the essence that we developed a process to assess the improvement of our MBA students in this matter.

But what do we mean by critical thinking? It seems that definitions of critical thinking range from the general to the particular. For instance, Schoenberg (2007) defines critical thinking as a set of higher order thinking skills that include metacognition (thinking about your thinking), frames of reference, and seeking evidence. Arons (1985) defines critical thinking as an approach that focuses on the thinking and reasoning processes that underlie analysis and inquiry. And Facione (1990) looks at it as purposeful, self regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based.

Meanwhile, Paul (1990) starts from a similar general statement (thinking that displays mastery of intellectual skills and abilities) all the way to a contextualization when states that it is disciplined, self-directed thinking which exemplifies the perfections of thinking appropriate to a particular mode or domain of thinking. Fisher and Scriven (1997) expand the definition to include communications, information and argumentation. Nickerson, Perkins and Smith (1985) develops a little further the concept by saying that critical thinking is the ability to judge the plausibility of specific assertions, to weigh evidence, to assess the logical soundness of inferences, to construct counter-arguments and alternative hypotheses. In order to do so, Paul and Elder (2005) identify eight essential elements underpinning critical thinking: purpose, questions, points of view, information, assumptions, concepts, conclusions, and consequences. Finally, Ennis (1989) focuses critical thinking on decision making by relating it to action: it is reasonable reflective thinking that is intended on deciding what to do or believe.

Due to the practical nature of business skills, we follow Ennis when we state that one of the academic objectives of our master programs is for the graduates to possess an attitude toward action, characterized by the ability to recognise problems and conflicts that occur in organisations, a sense of critical judgment, capability to make firm decisions, and talent to convert their decisions into action programmes consistent with the particular situation of their organisation. Hence, when we try to foster critical thinking skills, we focus on critical thinking for action.
From an informing systems perspective this means not only that the case can be used as a devise to inform the decisions of practice by action research and student discussions, but also becomes a tool to teach students to learn from their previous decisions. This is a very important skill for managers in current (volatile) times, since managerial decisions usually need to be made without the scientific luxury of previously testing one’s hypotheses, and we can only hope to refine our abilities so we can perform better next time.

We are aware of a few studies that try to measure the development of critical thinking skills in business students. For instance, Garvey and Buckley (2011) look at the use of technology on the teaching or risk management to improve critical thinking on this subject. McLellan (forthcoming?) founds that standardize tests can be used to measure critical thinking skills on accounting students on Abu Dhabi. Williams and Lhama (2009) analyze online forums and conclude that online discussion promotes student engagement and the development of critical thinking skills. Finally, Pomonis (2009) studies how using participant-centered methods can enhance critical thinking skills when teaching financial management at the University of Patras, Greece.

With the exception of Williams and Lhama, all these studies focus on measuring the improving of critical thinking skills on one particular subject. But even the aforementioned authors restrict themselves to one aspect of the learning process. In this sense, they all follow Paul to the extreme and confine themselves to a very specific context. And while from the previous definitions critical thinking seems to be a very complex set of skills involving deduction, inference, oral and written communication, etc., methodologically all but Pomonis used one specific way to judge critical thinking.

We contribute to this discussion by departing from these studies in the two dimensions. First, we look at the development of critical skills not within the realm of one specific subject, but actually in a broader sense as part of the achievements of a two year full time MBA program. It seems that doing so will be more intricate. However, when we look at some of the available tools, like standardize tests, it is easy to see that they were designed to ascertain critical thinking skills in a wider framework, and therefore could be better suited to analyze critical thinking at the program level as opposed to the subject one. Second, we address the multifaceted aspect of critical thinking by devising an equally comprehensive scheme. We applied standardized tests in critical thinking skills to new incoming students and later on just when they were close to finish their studies; we compared the written analyses of cases both at the beginning and at the end of the MBA program; and we also used the capstone “Management Consulting Practice” as a course-embedded assessment instrument that evaluates critical thinking skills for action in order to refine our conclusions from the previous measurements.

From this experience we are able to conclude two things: our MBA program, based on participant-centered learning methods, does have an impact not only improving our students’ critical thinking skills, but also leveling the playfield in this
area with respect to their US counterparts. We also realized that assessing improvement on critical thinking skills is indeed a complex task calling for a multi-measures approach.

The rest of the paper is organized as follows. The next three sections introduce (in listing order) our measuring efforts and obtained results in each of the aforesaid instruments: standardize tests, the comparison of pre and post written case analysis, and the capstone assessment. The final section discusses our findings and offers some concluding remarks.

ii. First Approach: Standardized Tests on Skills and Dispositions Generally Associated with Critical Thinking

Our first approach to measure the impact of our MBA program in our graduates is the use of two standardized tests offered by Insight Assessments: the California Critical Thinking Skills Tests (CCTST) and the California Critical Thinking Disposition Inventory Test (CCTDI). The focus of the tests is, as their names indicate, the measure of critical thinking at two different levels: skills and dispositions. Both types of test are based on the consensus exposition of Critical Thinking presented in The APA Delphi Report (1991).

The first test, the CCTST, is made of 34 multiple-choice questions ranging in difficulty and complexity. According to Insight Assessment, these items “broadly represent reasoning ability required to succeed in those educational and workplace settings in thoughtfully forming a judgment regarding what to believe or what to do is a prerequisite.” The tests are scored on five different scales: analysis, inference, evaluation, deduction, induction.

The second test, the CCTDI, is designed to be a tool for surveying the dispositional aspects of critical thinking. As it was claimed in the Delphi report, “each cognitive skill, if it is to be exercised appropriately, can be correlated with the cognitive disposition to do so”. The respondents of the tests are asked to express agreement or disagreement on Likert-scale with “75 statements expressing beliefs, values, attitudes, and intentions that relate to the reflective formation of reasoned judgments.” The tests are scored on 7 different scales: truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness and maturity of judgment.

Both tests were administered to the same group of students at two points in time: The first one was taken three months after the students joined the MBA program, on June 8th 2009. The second test was taken on May 13th 2010, the very last day of class in the program. The first test was used as our measure of before-the-program performance; the second test was our measure of after-the-program performance. As an additional measure of the effect of our program, we compared the scores of our students with the scores of two groups of students in the United States: 4-year college graduates and graduate students.

Table 1 shows descriptive statistics for the different components of the CCTST Test as well as for the total score. The upper panel reports these results for the first test taken in 2009---61 students took that test. The lower panel does the same for the second test taken a year later---52 students took that test. In all categories, with the sole exception of “Evaluation”, the
results show increases in the average score for the second attempt. This result could be offered as a measure of the effect our program, and in particular of the case methodology, has on improving the critical thinking skills of our students. To formalize the result, in the last row of the table, we report the p-value associated with the null hypothesis that “MBA program has not improved these scores”. The null is rejected easily in favor of the alternative hypothesis (“Positive Effect of the program”) at any standard level of significance for all categories with the exception of evaluation and deduction. These two categories appear statistically to be the same before and after the program.

Figure 1 shows the results graphically. Each column represents a component of the CCTST test. The average scores for each group (before and after the MBA) are represented by circles of different colors. Two standard errors are added and subtracted to each mean to form a traditional confidence interval for the mean. These graphs can be used, although they are not entirely equivalent to the formal tests above, to determine which components improved significantly. The intervals for categories “Analysis”, “Induction” and “Inference” show no overlap confirming the rejection of the null. The same is true for the Total Score (not shown in the graph). The intervals for categories “Evaluation” and “Deduction” do show some significant overlap. No significant effect was detected for them.

The sellers of the CCTST publish aggregate statistics for the results of the test for American universities at the undergraduate and graduate levels. We used these results as another benchmark against which we could compare the results for our students. No data about averages were published, but we had median scores. In Figure 2 we compare for each of the five scales the performance of four groups: MBA students before and after the program, US 4-year college graduates and US graduate students. With the exception of the category of “Deduction”, MBA students when they arrive at our school score the same or worse than 4-year college graduates in the United States. As expected graduate students in the United States score the same or better than 4-year College graduates in the United States.

This finding confirms a generally held opinion among our faculty that our students are coming mostly from college programs in Latin America that underdeveloped their critical thinking skills with respect to their American counterparts. Fortunately, when our students leave our program this gap has been closed significantly. Compared to the 4-year college graduates, our students are now the same or better in all categories but “Induction”. But even in this category, the progress is remarkable since this was the worst when they enter the school and was the category where we would expect to see the greatest improvement given our teaching methodology. Finally, in the case of “Analysis” we even manage to close the gap to US post-graduates.
Now we review the results of the dispositions’ tests. Table 2 reports statistics for each component of the test. The upper panel reports the results for the first test taken in 2009—a total of 63 students took that test. The lower panel reports the results for the second test taken in 2010 weeks before they left the program—52 students took that test. While for the skills part of the test we were able to show a noticeable improvement in almost all measured categories, for the dispositions part the results are quite different: the evidence in favor an improvement is weak at best.

[INSERT TABLE 2 HERE]

With the sole exception of the component “Truth-seeking”, we do not observe any significant changes in student behavior. The last row of Table 2 reports p-values associated with the null hypothesis that “the program has not had any positive effect on the students’ values as measured by this test”. All p-values, except the one corresponding to “Truth-seeking”, are above the standard 5%. “Confidence” and the total score also show mild improvements which are significant at the 10% significance level.

At a first reading, these results are somewhat discouraging; they seem to suggest our MBA program has had no impact on the values more important to develop critical thinking. Still, compared with other studies that have documented a deterioration of values for students in programs in Economics\(^1\), for instance, the results are not as discouraging. Figure 2 repeats the analysis graphically. The general impression of no change is confirmed by the overlapping of confidence intervals in all components of the tests. However, it is possible that this result lies at the heart of the issues that will be discussed in the next two sections.

[INSERT FIGURE 3 HERE]

ii. **(Pre and Post) Written case analysis**

Our second approach to measure the impact of our MBA program in our graduates was to compare a sample of “Written Analysis of Cases” (WAC), both at the beginning and at the end of the program. “Managerial Decisions” (MD) is a required course offered in the first year of the MBA program, that acquaints students with a framework for analyzing and solving management problems. Based on the “Written Analysis of Cases” course at the Harvard Business School, it is the course most directly related to the development of critical thinking skills and skills in the WAC are attributes of the target profile for our MBA graduates. Associated with this goal are three program objectives: 1) The students will identify business problems and their causes in an organizational setting; 2) The students will make decisions based upon the selection of appropriate criteria and their application to the evaluation of alternatives; 3) The students will formulate action plans that enable the execution of their decisions.

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The pre-post-WAC can measure student learning outcomes related to each of these three objectives. For this purpose, the course faculty developed a general rubric for the analysis of managerial decision cases.

**The Pre-Post Test Design**

MD was the logical choice of a course in which to embed this instrument for initial measure. It is a ten-session course given during the first eight weeks of class. However, the time elapsed between the first and final written case analysis (WAC) was considered to be simply too short to use a pre-post instrument as a measure the impact of the Program on student learning outcomes. Therefore, we decided to use a written case analysis performed at the end of the second year rather than at the end of the MD course as the “post-WAC.”

The second-year course whose final exam was most appropriate for the post-WAC was “Managerial Processes,” about the implementation of strategy. Though not required, between 80 and 90 percent of the second-year students choose to enroll in this course. However, final exams are scheduled for four hours and WAC’s are assigned over a period of two days. To make the pre- and post-WAC’s comparable, it was necessary to prepare a special assignment for the final exam in the Managerial Processes course, which would also allow for two days’ preparation.

The 56th promotion of the Masters’ Program, which graduated in May 2010, was selected as the class with which to apply the pre-post-WAC. It was decided to use a sample of approximately one-third of the class. Students in that class were asked to submit ungraded copies of their first WAC (the course professor maintains only graded copies in PDF files) and the first twenty to submit their original work were selected. The profile of the sample reflected that of the entire class: 63% male and 37% female; 74% from Central America and 26% from other regions, principally South America.

As mentioned before, the first (pre) WAC was assigned to this class in the Managerial Decisions course. The second (post) WAC was assigned to all members of the Managerial Processes course in May 2010. So that it would be comparable to the pre-WAC, students were given two days to study the case. Upon receiving the case, they were given a first set of instructions, in which they were asked to read the case over the weekend and present themselves in the classroom at first hour on Monday for a four-hour exam. At that time they were given a second set of instructions, with a specific question and a set of guidelines for answering it.

As a first step in implementation of the pre-post-WAC instrument, two professors from the MD and Managerial Processes courses evaluated the agreed-upon sample. They began with a pilot (blind) evaluation of the pre- and post-WAC’s of three students, and they met in August 2010 to discuss the results. Surprisingly, the professors found that the pre-WAC’s were more structured and coherent than the post-WAC’s. This could be attributed, at least in part, to the highly structured guidelines that were provided for the pre-WAC, versus the open-ended nature of the questions posed in the post-WAC.
The pilot was essential in establishing uniform criteria. In the faculty discussion that followed, several reasons for the divergent scores were uncovered and resolved. For example, in the MD course, the “context” refers to both external (environmental) and internal (organizational) forces that influence a decision-maker; whereas in the Managerial Processes course, “context” is understood to mean the business environment that surround the company. These clarifications helped ensure greater consistency among professors in the evaluations.

The professors then proceeded to evaluate the 38 WAC’s (19 pre-, 19 post-). The mean of the 19 observations Pre-WAC was 12.93 vs. 10.63 Post-WAC, which implies a decrease on this global score of about 18%. The relative changes in each of the rubrics but one was negative, signaling a general worsening in each one of the rubrics. The only two exceptions were those related to the use of the evidence and to the communication and implementation of the decision. In these two specific rubrics there were no statistically significant changes at the beginning versus at the end of the program. All these findings are summarized in table 3.

[INSERT TABLE 3 HERE]

Since the two tests were just only partially compatible, there are obvious limitations on this analysis. The pre-WAC (MD) taught a process much more structured regarding critical thinking whereas the post-WAC (Managerial Processes) was more focused in the implementation of a decision rather than in the identification and justification of the problem, the analysis of the context, the definition of objectives or criteria, and the analysis of alternatives previous to the decision-making.

These results also confirm the findings of the pilot, in that entering students did a better job of identifying the problem and the objectives of the decision-maker, which we has attributed (at least in part) to the highly structured guidelines provided to the entering students versus the open-ended nature of the questions given to the graduating students.

In the subsequent faculty discussion it was concluded that (notwithstanding the greater specificity of the pre-WAC instructions) greater emphasis must be given to the analysis of problems and their causes in complex decision situations, not only in the MD course but in case discussions within all functional areas. It is also important for students to understand the objectives, frequently conflicting, that the decision-maker seeks to achieve, as well as the perspectives and interests of other key players in the situation. Graduating students seemed to take these for granted and to go straight to the action questions rather than questioning their assumptions about the underlying causes of problems or examining peoples’ motives.

However, graduating students are better at using evidence in supporting their analysis of a decision problem than students entering the program. This is presumably due to the rigor of case discussion, in which opinions must be supported by case data. This is a strength that requires reinforcement. Graduating students are also better able to articulate their conclusions and recommendations, and to link these with specific action steps for implementation.
There was little difference between the pre- and post- scores regarding “context.” Since there was little information provided in the cases about the environmental context in which the decisions were being made and therefore little to distinguish one student’s performance from another’s, the faculty concluded that this area required more data and new tests. With respect to “alternatives,” graduating students performed slightly worst, perhaps due to the greater complexity of the post-WAC. However, it is worth noting that very few entering students considered alternatives that were not clearly stated in the case.

The general conclusions drawn by the faculty from the first full round of the pre- and post-WAC assessments are, then, the following: 1) The case method as used strengthens the students’ ability to find and use evidence to support their analyses of decision problems; 2) The Masters’ Program does build students’ abilities in communicating action plans in support of their decisions, but there is much room for improvement. This could be done by increasing the number of written assignments, where students must go beyond the analysis of alternatives to consider the ways in which they will implement their decisions; 3) Though students learn early on to define problems, they may later on acquire the habit of neglecting this important step in the decision process. The decision to reinforce and lengthen the MD course should help address this concern; 4) The case method may have the unintended result of reinforcing a unitary decision-maker paradigm that does not reflect how decisions are made in the real world. Courses in such areas as political analysis, negotiation, and culture & values should help to broaden the students’ understanding of multiple perspectives, and the content of these courses should be reviewed to ensure that this is achieved.

iii. Capstone assessment

Our third and final approach to assess the development of critical thinking was to use the capstone course Management Consulting Practice (MCP). The MCP experience begins with an introductory half-course on “Consulting” which is conducted at the beginning of the second year. During this course, students form teams of 4-5 people, make contact with the client company, and develop a proposal, to be submitted to the MCP faculty by the end of the third week of class. Proposals are reviewed by the MCP faculty and are returned to the students within 5 working days. They must then submit a revised proposal, including a detailed work plan by the end of the sixth week of class, and a signed letter of agreement with their client, including a detailed budget, at the end of the seventh week.

During the eight weeks in the field, students work full-time in the client company, interacting with executives to solve a real-world business problem of a strategic nature. They receive at least two one-day visits from their assigned faculty advisor, who also provides continuous feedback on progress and makes comments on drafts. On the first day of the next term the student teams submit a written report, and over the following two weeks, each team makes a presentation to the MCP faculty plus invited executives (45 minutes), followed by a question-and-answer session of one hour fifteen minutes.
A panel of at least three (and usually four) MCP professors evaluates the students on their presentation, with particular importance to five elements (Logical, sequential order of the presentation; Quality of the visual and other special effects; Clarity and effectiveness of the presentation; Understanding and response to questions; Effective use / allocation of time), where it is possible to measure individual performance, even though all team members may not participate in the formal presentation. Those that do not are expected to participate actively in the questioning period.

The grades to be assigned are Pass, Fail, and High Pass. These grades are not averaged in the GPA except in the case of Fail, which would be equivalent to three grades of “C” (no more than five C’s are allowed during the second year). The system facilitates the formation of teams and the incorporation of exchange students without reducing the motivation to work hard and perform with excellence. In a formal Awards Dinner, the top two teams receive plaques for First Place and Runner-Up.

In a retreat held in February 1-2, 2008, the faculty mandated that a comprehensive measure of the graduating students’ ability to think and act as professional managers be carried out through an evaluation of their performance in the MCP, which is the one single experience that already tests them on all the elements of this target profile (a description of the MCP is included in Exhibit 3). This instrument has two major advantages: first, the close alignment that exists between the objectives of the capstone MCP experience and the seven goals of the residential masters’ programs. In particular, as it pertains to critical thinking:

- **Possess an attitude toward action, characterized by the ability to recognise problems and conflicts that occur in organisations, a sense of critical judgment, capability to make firm decisions, and talent to convert their decisions into action programs consistent with the particular situation of their organisation.** _Critical thinking for action_

The second advantage is the thoroughness of the existing evaluation process, involving several weeks’ investment by a team of six faculty members from different disciplines,² who evaluate the student reports and presentations using the same rubric designed for the assessment of student learning outcomes. The rubric is shown in Figure 4.

_INSET FIGURE 4 HERE_

**Implementation**

The first step in operationalizing this course-embedded instrument was to develop a rubric for each of the ten areas evaluated in the written report (later increased to eleven) and other five areas evaluated in the oral presentation. The second step was to apply the rigorous grading process already in place. It was decided to use the same one-to-five scale for evaluation purposes, primarily because faculty members were already accustomed to this scale. However, whereas the group grades would continue to be awarded using the traditional curve, the assessment of learning tool would look at

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² Disciplines of MCP faculty include Finance, Operations, Marketing, Strategy, Organization, and Quantitative Methods.
absolute numbers, in which each number corresponded to a specific learning expectation as shown in the rubric: 5: Merits an Award; 4, High Pass; 3, Pass; 2, Low Pass; 1, Fail.

The third step was to determine how individual contributions to the team results would be measured. Three methods were considered: 1) observations by faculty guides on effectiveness in the field (ex ante); 2) a questionnaire on individual contributions to the Final Report; and 3) individual performance in the two-hour presentation and questioning period. Of the three methods, the third was the most effective in determining individual performance. The MCP faculty panel noted the individual contributions of each team member and discussed their individual strengths and weaknesses, immediately after each presentation and again during the grading week.

To determine individual contributions to the written report, students were surveyed for their participation in each of relevant categories. This was done following the delivery of the report so as not to influence the work assignments of the team.

However, students in well-integrated teams had difficulty placing a percentage on their participation, and response rates were low. Some students marked 20% under all categories.

Observations by supervisors on performance in the field included four criteria: planning (detail and quality of weekly progress reports and work plans), skills in data collection, management of the relation with the client, and level of team effort. These data proved difficult to obtain and standardize because expectations regarding weekly reports and the quality of observations of student interactions with the client organization varied among faculty advisors.

Assessing critical thinking on MCP

In this case we are not measuring improvements, like in the previous two sections, and consequently it is not possible to discern whether the program had or not an impact on students’ skills. For that we would need a baseline comparison equally comprehensive, and there is no such equivalent within the MBA program. However, looking into the student’s MCP performance shed a different light to our results and helped us to put things into perspective.

Of the criteria used to evaluate MCP, there are three dimensions most related to critical thinking skills: problem identification; the understanding of company strategy and its implications; and the identification and evaluation of alternatives. According to the defined rubric, the MCP faculty considers that if the point average achieved on any given dimension is 3.5 or above, the student exceeds faculty expectations for performance in the course. The student meets expectations whenever the point average is 2.5 or above. If the point average is below 2.5, the student does not meet expectations.

3 The “Low Pass” is not used for grading purposes and is not explicitly shown in the rubric, but is applied where the use of evidence and / or the quality of analysis is satisfactory, but weak in relation to the standard. This enables greater precision in ranking and more useful feedback to students.
When this process was applied to MBA students during 2010 (although to a different group than the previous two assessments), score results for the 21 teams ranged from a high of 4.47 to a low of 2.00. The lowest group received a failing grade; other than that group and a single exchange student with a score of 2.80 (both exceptional circumstances), the next lowest score was 3.12. Table 4 shows the scores for the eleven criteria in the final report and Table 5 shows the same for the five criteria in the oral presentation.

[INSERT TABLE 4 HERE]

We can see on Table 4 how the understanding the company strategy and its implications gets the lowest average score out of the eleven items. Meanwhile, problem identification seems to be in the middle of the pack, but it certainly is below the average. These results seem to confirm the findings from the previous section with respect to this particular difficulty: students seem to have trouble defining and framing problems correctly. However, students did meet faculty expectations on the understanding of company strategy and exceeded expectations on problem identification. Hence, in these cases the issue seems to be more of a relative comparison than one of absolute level.

On the previous section it was concluded that the student’s skills with respect to the analysis of alternatives had actually worsened when comparing written analysis of cases at the beginning and at the end of the MBA program. But it turned out that when looking at MCP results, students performed relatively well on this facet of critical thinking, exceeding expectations. On the MCP, more often than not students do not have a set of predefined alternatives to evaluate and must spawn them based on all the analysis they have done up to that point. The fact that they are indeed doing a good job could be explained by the focus on offering the company a feasible solution to its problem, since this is one of the most important parts of the consulting project from the client’s perspective, which in turns makes it a priority for the students. Hence, we find some support for the caveat advanced in the previous section that some of the results could be at least partially due to the different nature of the WAC assignments.

[INSERT TABLE 5 HERE]

Finally, results in Table 5 are more consistent with the findings with respect to the students’ ability to communicate effectively, with the average scores exceeding expectations in all categories of MCP presentations. This is a dimension that by its nature cannot be captured on standardize tests or even on WAC, but that we nonetheless consider an integral part of critical thinking for action.

Finally, it is worth to notice that these results are obtained after coaching and feedback from MCP supervisors during the MCP process and prior to the delivery of the final report and the presentation of the findings and recommendations. Even though interim reports are not graded, there is consensus among MCP faculty that students improve in these areas from the interim reports to the final one.
iv. **Discussion and concluding remarks**

Critical thinking for action is a complex task that demands an array of very different skills and predispositions. From problem recognition and framing, to communicating your findings, going through the ability to weight evidence, assess your own reasoning, and even developing counter-arguments and alternative hypothesis.

As showed earlier, the application of standardize tests allowed us to established several facts. To start, incoming MBA students, most of which were Latin-Americans, had underdeveloped critical thinking skills with respect to US college graduates. By applying the same tests at the end of the program, we could also establish that on average students improve their critical thinking skills during the MBA, closing in some instances the gap with their US peers. While the fact that the program didn’t seem to have an impact on predispositions related to critical thinking could be construed as either a positive or a negative issue, these were nonetheless encouraging results. However, they turned out to be not enough.

When we compared written case analyses both at the beginning and at the end of the MBA program, we found out that the students’ ability to identified and analyze problems slightly deteriorated along the program. As we stated earlier, this result could the consequence of a bias on the analysis induced by the fact that the nature of the assignment was not exactly the same. However, at the very least it means that students require to be given a very specific set of instructions in order to perform as expected. Hence, it seems that students were not transferring key critical thinking skills outside the realm of the managerial decisions course.

Alternatively, following Kahneman (2011), it is possible to suggest that since critical thinking is a set of higher order thinking skills, students will not exercise them unless the situation calls specifically for it (due to either an explicit set of rules, like on MD, or a specific set of incentives, like on MCP), trusting otherwise their more basic intuitive thinking mechanisms. This could be the result of the lack of impact on critical thinking dispositions. Or, it could be precisely why we are not having an impact in that specific area: dispositions might be more *hardwired* and related to how the brain actually functions. But assessing such a claim is beyond the scope of the current work.

This result was somehow corroborated when analyzing student performance on the capstone course MCP. Students struggled to correctly define the problem when they faced a situation in which rather than analyzing a case, they were asked to build one using the information available to the management team. On the bright side it seems that the MCP experience, together with the training received during the MBA, enabled the students to improve their capabilities to formulate action plans, a very important result within the context of critical thinking for action.

In order to address the issues above, the school decided to introduce a second managerial decisions course at the end of the first year. This ten-session course was designed to reinforce the analytical framework in the context of complex managerial decision cases. But these results also yielded an interaction between managerial decisions professors, functional areas
professors, and even MCP advisors, because in order to achieve an even better performance the analytical framework should also be applied on the discussion of cases within the discipline of every functional area and to the consulting projects. A schematic description of this informing network is depicted in figure 5.

The arrows in dark blue represent the traditional interactions in between and across different groups of faculty. The arrows in light blue represent the new interaction that arose between functional areas faculty and managerial decisions faculty. By highlighting how students were not applying the analysis framework outside the managerial decisions courses, it was clear that it has to be reinforced on the functional areas courses as well. Just as well, a similar pattern arose between MCP advisors and the managerial decisions faculty. Both groups needed to revise what they were doing and make sure that they were consistent on their approach to critical thinking.

It is important to notice that we were only able to consider these issues because we applied different assessing approaches to the task of measuring the impact of student-centred teaching / learning methodologies in the development critical thinking for action. If anything is clear from this work is that the intrinsic complexity of the critical thinking process makes it impossible to formulate a comprehensive evaluation while using just one appraisal instrument. For this reason we propose that when evaluating the core skills acquired through participating in case discussions, in particular improved critical thinking, it is crucial to apply different instruments selected accordingly to the kind of skills and attitudes that are being tested. Otherwise we could be fooled by the biases implicit on every assessment approach. Finally, it is also important that the results of the assessment are broadly shared and discussed with other faculty, such that from a program perspective the required adjustments can be made in order to close the loop. This is even more important in light of the result that it is indeed possible to have a positive impact on the critical thinking for action of MBA students.

References


### Table 1

Results CCTST Exam

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<td>7.57</td>
<td>3.82</td>
<td>6.20</td>
<td>4.05</td>
<td>14.17</td>
</tr>
<tr>
<td>St. Deviation</td>
<td>2.27</td>
<td>2.06</td>
<td>1.42</td>
<td>1.56</td>
<td>2.30</td>
<td>3.02</td>
</tr>
<tr>
<td>St. Error Mean</td>
<td>0.29</td>
<td>0.26</td>
<td>0.18</td>
<td>0.20</td>
<td>0.29</td>
<td>0.39</td>
</tr>
<tr>
<td>Nobs</td>
<td>61</td>
<td>61</td>
<td>61</td>
<td>61</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td><strong>Second Test</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>8.79</td>
<td>7.79</td>
<td>4.63</td>
<td>8.06</td>
<td>3.88</td>
<td>16.58</td>
</tr>
<tr>
<td>St. Deviation</td>
<td>2.25</td>
<td>2.30</td>
<td>1.39</td>
<td>2.18</td>
<td>1.65</td>
<td>3.81</td>
</tr>
<tr>
<td>St. Error Mean</td>
<td>0.31</td>
<td>0.32</td>
<td>0.19</td>
<td>0.30</td>
<td>0.23</td>
<td>0.53</td>
</tr>
<tr>
<td>Nobs</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>P-Value</td>
<td>0.00000</td>
<td>0.325526</td>
<td>0.001884</td>
<td>0.000001</td>
<td>0.298770</td>
<td>0.000197</td>
</tr>
</tbody>
</table>

### Table 2

Results CCTDI
### Table 3

Pre vs. Post-WAC on Critical Thinking Skills

<table>
<thead>
<tr>
<th>Critical thinking skill</th>
<th>Pre-WAC</th>
<th>Post-WAC</th>
<th>Difference</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifies problems and causes, interrelations among problems, and priorities facing the decision-maker</td>
<td>2.34</td>
<td>1.39</td>
<td>-40.4%</td>
<td>0.0012</td>
</tr>
<tr>
<td>Understands the perspective, objectives, and assumptions of the decision-maker as well as those of other key actors</td>
<td>2.26</td>
<td>1.16</td>
<td>-48.7%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Identifies and considers the influence of the economic, political, technological, cultural, and ethical context on the issues</td>
<td>2.52</td>
<td>2.07</td>
<td>-17.9%</td>
<td>0.0876</td>
</tr>
<tr>
<td>Identifies and evaluates the reasonable alternatives, their implications and consequences using objective criteria</td>
<td>2.11</td>
<td>1.86</td>
<td>-11.7%</td>
<td>0.2479</td>
</tr>
<tr>
<td>Makes effective use of evidence; assesses the quality of that evidence in problem identification and in the evaluation of alternatives</td>
<td>1.99</td>
<td>1.99</td>
<td>0.0%</td>
<td>1.00</td>
</tr>
<tr>
<td>Communicates the conclusions of her analysis and a realistic action plan</td>
<td>1.70</td>
<td>2.15</td>
<td>26.4%</td>
<td>0.0684</td>
</tr>
<tr>
<td>Score Total</td>
<td>12.93</td>
<td>10.63</td>
<td>-17.8%</td>
<td>0.0065</td>
</tr>
</tbody>
</table>

### Table 4

Average Scores, MCP Reports

<table>
<thead>
<tr>
<th>Criteria</th>
<th>2009/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive summary</td>
<td>3.75</td>
</tr>
<tr>
<td>Problem identification</td>
<td>3.70</td>
</tr>
<tr>
<td>Company strategy and implications</td>
<td>3.36</td>
</tr>
<tr>
<td>External analysis: environment, industry</td>
<td>3.59</td>
</tr>
<tr>
<td>Internal analysis: organization, bus functions</td>
<td>3.44</td>
</tr>
<tr>
<td>Evaluation of alternatives</td>
<td>3.88</td>
</tr>
<tr>
<td>Recommendations: clear and implementable</td>
<td>3.97</td>
</tr>
<tr>
<td>Action plan: what, when, who</td>
<td>4.00</td>
</tr>
<tr>
<td>Financial viability</td>
<td>3.54</td>
</tr>
<tr>
<td>Social / environmental sustainability issues</td>
<td>4.56</td>
</tr>
<tr>
<td>Report quality: organization, coherence, etc.</td>
<td>3.72</td>
</tr>
</tbody>
</table>

### Table 5

Average Scores, MCP Presentations
<table>
<thead>
<tr>
<th>Criteria</th>
<th>2009/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logical order and sequencing; smooth transitions</td>
<td>3.60</td>
</tr>
<tr>
<td>Quality of slides and other visual / audio effects</td>
<td>3.75</td>
</tr>
<tr>
<td>Clear, coherent, and persuasive presentation</td>
<td>3.70</td>
</tr>
<tr>
<td>Precise and correct responses to questions</td>
<td>3.83</td>
</tr>
<tr>
<td>Effective use and distribution of time</td>
<td>3.93</td>
</tr>
</tbody>
</table>

**Figure 1**

Comparison CCTST Scores Before and After MBA

**Figure 2**

Comparison CCTST Median Scores MBA students and US Benchmarks
**Figure 3**
Comparison CCTDI Scores Before and After MBA

![Comparison CCTDI Scores Before and After MBA](image)

**Figure 4**
Rubric for the MCP capstone course (revised)

<table>
<thead>
<tr>
<th>Aspect</th>
<th>High/Pass</th>
<th>Pass</th>
<th>Fail</th>
<th>Null</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Executive Summary</td>
<td>Can state basic, clearly presented content, on report</td>
<td>Can state some, in reasonably clear and complete, contains MBA</td>
<td>Correctly assesses major points on report, but not major points on report, contains errors</td>
<td>Does not adequately or correctly summarize the content of the report, contains many errors</td>
</tr>
<tr>
<td>2. Identification of the problem, opportunity or need</td>
<td>Demonstrates clear understanding of the situation in developing and composing case, shows clear motivation using evidence</td>
<td>Demonstrates clear understanding of the situation in developing and composing case, shows clear motivation using evidence</td>
<td>Needs to be written in more detail</td>
<td>Does not adequately or correctly identify the problem, opportunity, or need</td>
</tr>
<tr>
<td>3. Strategy of the organization</td>
<td>Demonstrates clear understanding of the strategy using evidence, shows supporting assumptions and also strategy concepts to analyze it</td>
<td>Demonstrates clear understanding of the strategy using evidence, shows supporting assumptions and also strategy concepts to analyze it</td>
<td>Needs to be written in more detail</td>
<td>Needs to be written in more detail</td>
</tr>
<tr>
<td>4. Analysis</td>
<td>Demonstrates clear understanding of external environment, contains supporting evidence</td>
<td>Demonstrates clear understanding of external environment, contains supporting evidence</td>
<td>Needs to be written in more detail</td>
<td>Needs to be written in more detail</td>
</tr>
<tr>
<td>5. Conclusions:</td>
<td>Analysis of relevant internal aspects of the organization, demonstrating knowledge of functional areas, using appropriate terminology and presenting clear and supported conclusions</td>
<td>Analysis of relevant internal aspects of the organization, demonstrating knowledge of functional areas, using appropriate terminology and presenting clear and supported conclusions</td>
<td>Needs to be written in more detail</td>
<td>Needs to be written in more detail</td>
</tr>
<tr>
<td>6. Identification and evaluation of alternatives</td>
<td>Presents all possible alternatives and suggests appropriate and supports choices in evaluating each alternative using all available evidence</td>
<td>Presents all possible alternatives and suggests appropriate and supports choices in evaluating each alternative using all available evidence</td>
<td>Needs to be written in more detail</td>
<td>Needs to be written in more detail</td>
</tr>
</tbody>
</table>

Null: When project requires more or less than a minimal score
**Figure 5**

**Informing Network**