

## **Closing the Loop: Using Qualitative Assessment in the Continuous Quality Improvement of the SUCCEED Coalition**

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### Abstract

One of the primary tenets of most approaches to total quality management is the Plan, Do, Check, Act (PDCA) cycle. Under this system, teams should plan their activities, implement the plan, evaluate the implementation and make changes based on the evaluation before starting the process over. This paper aims to show how a qualitative assessment process used by the National Science Foundation sponsored SUCCEED Engineering Education Coalition can be used to support the Check stage of the PDCA cycle. Specifically, we propose a Quality Management Support Model that outlines a 10-step process of evaluation and feedback that has been successfully used by the coalition to improve its management processes. The model is described and its use demonstrated through a case study.

### I. Introduction

One of the primary tenets of most approaches to quality management is the Plan, Do, Check, Act or PDCA cycle. This cycle is depicted in Figure 1 and is often referenced as the Deming Wheel.<sup>1</sup> Under this system, teams should plan their activities, implement the plan, evaluate the implementation and make changes based on the evaluation before starting the whole process over. Losak and Scigliano<sup>2</sup> have offered that there is tremendous overlap between Total Quality Management (TQM) in a manufacturing sense and Institutional Effectiveness in higher education. Both require top down leadership, an understanding of the system, systematic data collection and data driven decisions; regular reporting, and long term effort, among other things, in pursuit of the achievement of the organization's goals. Seymour<sup>3</sup> offers a "performance improvement framework" for colleges and universities which includes direction setting, process design, feedback, enablers, and personal involvement. The first three of these must work together to improve the quality and productivity of the institution. Common to all three of these models is the evaluation of current activities and the feedback that this evaluation can provide to the institutions to improve their effectiveness.

In engineering, the Accreditation Board for Engineering and Technology (ABET) has among its "Criteria 2000" that

Each program must have an assessment process with documented results. Evidence must be given that the results are applied to the further development and improvement of the program (Criterion 3).<sup>4</sup>

Most of TQM under the Deming model is reliant on numerical data and statistical analysis to determine if a process is in or out of statistical control. However, ABET and other accreditation agencies in higher education take a broader view of the data collection and analysis methods that are appropriate for demonstrating whether a program is achieving its goals, including the use of qualitative methods. These qualitative techniques, such as focus groups, interviews, and document analysis, provide a depth of understanding that is generally not available using quantitative methods alone. They allow us to understand how well an educational organization is progressing toward meeting its goals long before longitudinal information, such as retention and graduation rates, would typically be available. These methods allow us to probe into areas and tease out problems that may exist and may help to define a problem for future quantitative study. They also allow us to understand why projects succeed or fail in certain environments. In this paper we offer a model that uses qualitative assessment techniques to support the Check stage of the PDCA model in a program with undergraduate engineering curriculum renewal as its goal. This 10-step process includes site visits, participant review, and an ongoing formal feedback process about improvements that can be made based on the collected data. The model is intended to provide a framework to others who may be in a position to evaluate a group of programs such as a coalition of institutions or a set of academic units and to show how such a formative evaluation may also be used to enhance the quality operations of the coalition and its members.

We will begin by concisely introducing the SUCCEED coalition and describing its organizational structure. We will then describe the PDCA model as it applies to SUCCEED and the model that we propose to support the Check function of the Deming Wheel. Finally, we will show how the model is applied through the use of a representative case study.

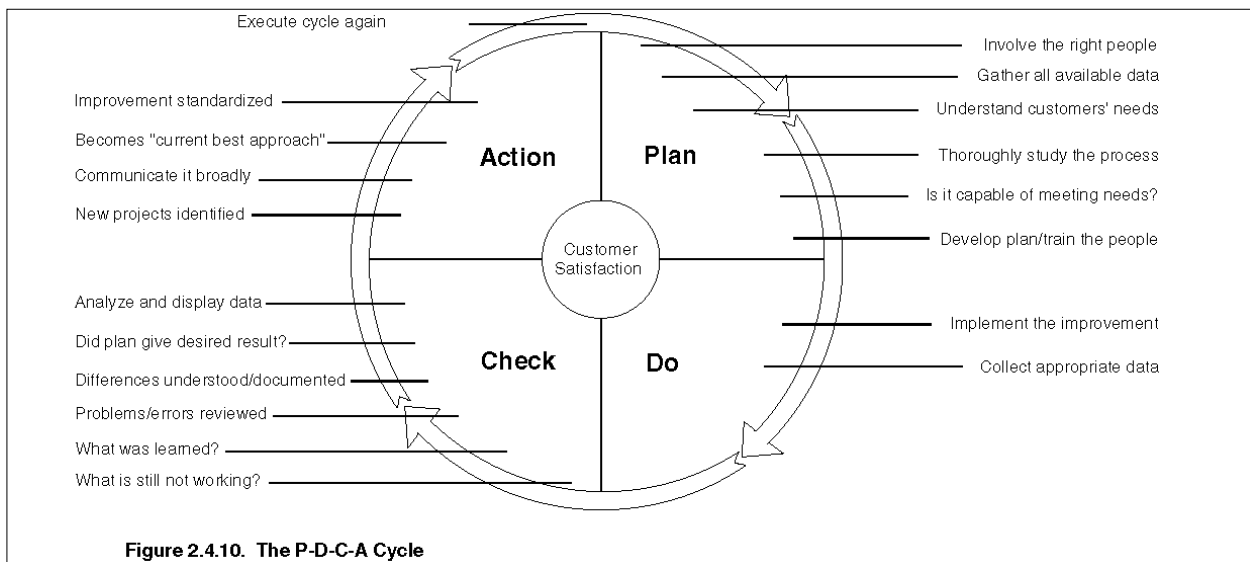


Figure 1

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## II. The SUCCEED Coalition

SUCCEED (Southeastern Universities and Colleges Coalition for Engineering Education) is one of the National Science Foundation's (NSF) Engineering Education Coalitions and consists of eight public colleges<sup>5</sup> of engineering located in the southeastern United States. Now in its seventh year of operation, SUCCEED has transformed itself from an incubator of educational innovations to an organization whose mission is to institute a sustainable version of its curriculum model on each of its member campuses. Components of this model include early introduction to engineering concepts and thought processes and their integration with other subject areas, early and multi-disciplinary design experiences, explicit success skill development, and an exposure to professional practice. In addition, the participating campuses are installing an engineering-based faculty development program, a network-based collaborative learning environment, and a continuous improvement culture.

In an effort to achieve these goals, SUCCEED has developed a matrix organizational structure that consists of Campus Implementation Teams (CITs) and Coalition Focus Teams (CFTs) as schematically shown in Figure 2. The CITs are charged with developing and implementing a strategic plan which "will produce sustainable and systemic curriculum renewal on the individual campuses."<sup>6</sup> The CFTs are charged with facilitating the implementation of the curriculum model in four primary areas - Faculty Development, Outcomes Assessment, Student Transitions (into the university and into the workplace), and Technology-Based Curriculum Delivery (TBCD). They bring together members from each campus team to share experiences and to produce innovation that can be adopted on the member campuses. Supporting both the CITs and the CFTs is the Assessment and Evaluation (A&E) team which monitors and evaluates the progress that the coalition is making toward achieving its goals. Members of the A&E team include both engineers from member campuses and evaluation professionals contracted by SUCCEED to provide an independent assessment of its activities.

### Matrix Team Approach

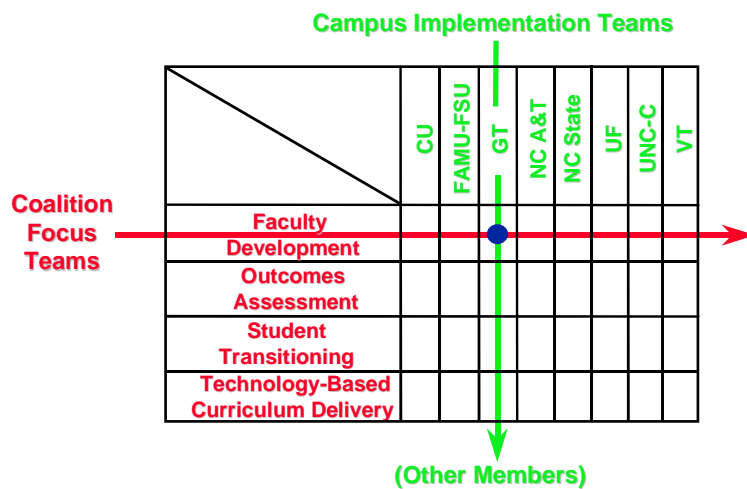


Figure 2

### III. Quality Management Support Model

The PDCA cycle shown in Figure 1, although originally conceived in a manufacturing environment, is readily applicable to the educational environment. In fact, the Malcolm Baldrige Award criteria for education lists the four stages of the “learning cycle” as:

- 1) planning, including design of processes, selection of measures, and deployment of requirements;
- 2) execution of plans;
- 3) assessment of progress, taking into account internal and external results; and
- 4) revision of plans based upon assessment findings, learning, new inputs, and new requirements.<sup>7</sup>

These standards for educational quality focus on outcomes rather than specific tools and techniques that may be used to achieve a quality outcome. What is important is that data are regularly collected and measured against a standard and that improvements are made based on the systematic analysis of the collected data.

Within SUCCEED, the components of the PDCA model can be represented as follows:

**Plan** - The vision and mission of SUCCEED are accepted by all stakeholders. Each CIT develops its strategic plan for its campus which supports the organization’s overall mission and addresses the unique needs of each campus environment. Each CFT presents its strategic plan for how each focus area will be supported across the coalition.

**Do** - Each CIT implements its plan on its campus. The CITs generally choose to focus their energies and resources on areas where there is a strategic fit with the college mission and goals within the framework of the SUCCEED curriculum model. CFTs provide support, often through workshops, to the campuses within their designated focus areas.

**Check** - The A&E team provides both quantitative and qualitative evaluation of the implementation of SUCCEED with respect to whether SUCCEED is making progress toward meeting its goals.

**Act** - Coalition-wide implementation plans as well as individual campus and focus team plans are modified to reflect the findings in the Check stage and become the new baseline. The cycle begins again.

This paper aims to show how a subsystem of the Check stage, namely the qualitative evaluation process, is used as part of the total quality management process of the SUCCEED coalition. As shown graphically in Figure 3, it can be thought of as a cog helping to turn the Deming Wheel. This is a common role for an evaluation to play in a management system. According to Patton, evaluation serves a number of purposes including:

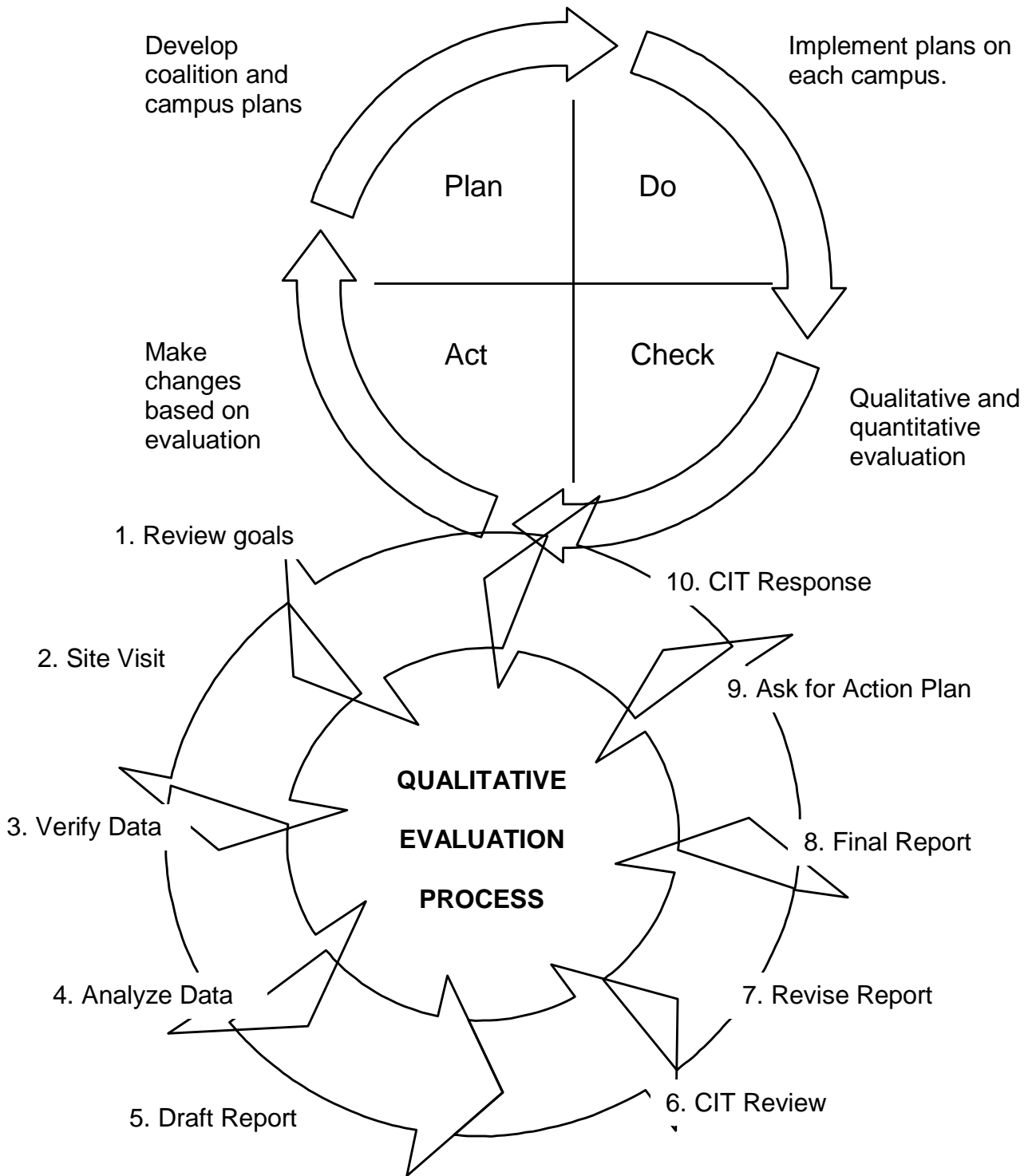
- Generating general knowledge about and principles of program effectiveness;
- Focusing management efforts;
- Creating learning organizations; and
- Stimulating critical reflection on the path to more enlightened practice.<sup>8</sup>

It is in this spirit that the qualitative evaluation of SUCCEED takes place.

The qualitative evaluation process that is used consists of the following 10 steps:

1. **Review campus goals, objectives, and milestones.**
2. **Visit each member campus** for a two to five day site visit to collect data. Data collection activities include: individual and group interviews with participants in and beneficiaries of SUCCEED as well as non-affiliated persons within the college of engineering; inspection of SUCCEED related documents such as budgets, individual project proposals, and published works on SUCCEED activities; and visits to such activities, classes, workshops, and laboratories as may be ongoing at the time of the site visit.
3. **Verify collected data** by allowing individuals to review the interviewer's notes for accuracy.
4. **Analyze data** against the benchmarks of the coalition and campus strategic plans as well as general management practices. Search for general themes within the data and evaluate progress of the CIT toward reaching coalition objectives. Support analysis through the use of triangulation, that is, using multiple data sources to verify a conclusion.
5. **Write draft report** which provides a detailed description of the activities on campus in such a way that readers are able to fully understand the environment in which the program operates and tying these activities to specific program objectives.
6. **Present draft report** to CIT leader and team members to review for errors of fact or interpretation.
7. **Revise report** as appropriate.
8. **Present final report** to coalition management.
9. Coalition management asks CIT leader for an **action plan** based on the recommendations for improvement found in the report.
10. **CIT leader responds.**

This 10-step process feeds into the Act stage of the PDCA cycle where changes are made both on campus and at the coalition level based on the report recommendations. This becomes the new baseline and input into the next year's strategic plan.



*Figure 3*  
*Quality Management Support Model*

## IV. The Model Applied

In this section we will show how the model was applied in the case of Southeastern State University (SESU), a pseudonym for one of the SUCCEED member institutions.

**Step 1 - Review campus goals and milestones.** SUCCEED uses a management tool called *TQSoft* which it has licensed from Allied Signal Corporation. This tool provides a common format for documenting plans, tasks, milestones, and accomplishments which can be readily reviewed by all members of the coalition. As part of the evaluation process, the plans as documented in *TQSoft* for SESU as well as the SUCCEED Strategic Plan were reviewed prior to the site visit.

**Step 2 - Campus site visit.** During this visit, the reviewer conducted interviews with the CIT leader, representatives on campus from the four focus areas, the dean of the college of engineering, all available department chairs, and other faculty, students, and administrators who were identified as being able to inform the reviewer about the progress and activities of SUCCEED on campus. In addition to conducting interviews, the reviewer collected budgets, college of engineering factbooks, and curriculum planning documents. There was also a SUCCEED sponsored workshop at the college that the reviewer attended.

**Step 3 - Verify collected data.** Most faculty interviewees were allowed to review the interviewer's notes for accuracy. The transcript of the notes was sent by e-mail to the interviewee who was asked to return a corrected copy or indicate that there were no corrections. In this process, some of the interviewees indicated that they were concerned about the reflection, however correct, of their negative comments in the notes. They were assured that their comments would be held in confidence and that such comments would not be attributed directly to them. It was also emphasized how important their candor was to the accuracy and usefulness of the evaluation.

**Step 4 - Analyze the data.** The collected data were analyzed in particular for clues as to the institutional impact of SUCCEED at SESU in four specific objectives identified in the SUCCEED Strategic Plan of April 1998. These four objectives are to:

1. Create a strong first year environment for students and develop a skill set for success in the workplace;
2. Establish a comprehensive engineering faculty development program;
3. Install continuous curriculum improvement processes that are driven by assessment of the quality of the graduates; and
4. Deploy a network-based collaborative learning environment on campus.<sup>9</sup>

Information gathered from the interviews and other sources was sorted into these broad categories so that a picture began to emerge as to the progress that SESU was making in these areas.

**Step 5 - Write a draft report.** This report provided a detailed description of the environment at SESU, the activities on campus in each of the focus areas and of the CIT as an entity, the focus team activities that were occurring throughout the coalition, the institutional impact of SUCCEED pursuant to the four objectives above, and conclusions and recommendations for improvement.

**Step 6 - Present draft report to CIT leader.** The CIT leader reviewed the report and made a few corrections in fact and interpretation. He also provided clarification about one particular project that had not been adequately represented in the draft.

**Step 7 - Revise report as appropriate.** All of the suggested changes were made and none violated the integrity of the original findings.

**Step 8 - Present final report to coalition management.** This is the first time that the coalition director and staff had the opportunity to review the report.

**Step 9 - Coalition management asks for action plan.** The coalition director sent a letter highlighting the recommendations to the CIT leader and asked for a specific course of action in response to the recommendations in the plan.

**Step 10 - CIT leader responds.** The CIT leader responds to the coalition director by demonstrating how SUCCEED objectives are aligned with college objectives and actions, explaining how CIT activities fit with the overall mission of SUCCEED and agreeing to implement the specific recommendations.

Changes were then made on both the campus and the coalition level. The evaluation report suggested that the CIT undertake its own assessment of its activities as the site visit only occurs every other year. The CIT leader now requires that all members of his team have a plan for formally assessing their activities. The CIT also better understood and appreciated the coalition funding process and rationale after the publication of the evaluation report. In addition, one of the primary findings of the qualitative evaluation was that the quality of the interaction between coalition headquarters and SESU needed improvement. Specific steps were taken in that direction such as the coalition director making informal visits to SESU, publicly emphasizing the partnership that exists among all members of the coalition, and demonstrating the value that SESU adds to this partnership. The planning process is now beginning for the next two years of the NSF award.

## V. Discussion

Steps one through eight took about 10 weeks to complete. The communications process between the CIT leader and the coalition management took another two to three months. Implementing the changes is an ongoing process. The entire evaluation process was seen as a positive one by all who were involved and one that dramatically improved the relationship between SESU and coalition management. By waiting until relatively late in the process (Step 8) to share the findings with higher management, the fundamental fairness of the report to SESU was enhanced and they had become partners in the evaluation process. Prior to the evaluation itself taking



place, there was some mistrust and misunderstanding between the CIT and coalition management. The evaluator was perceived to be “out to get” the CIT and find things wrong with their operations and management, and consequently cause a reduction of their funding. By following a thoughtful, deliberate, and fair process, the evaluator was seen as an ally rather than an enemy and someone who should be trusted rather than avoided. The evaluation itself was generally positive but fair so that areas identified for improvement were seen in a constructive light. The in-depth description of the campus environment and activities allowed the coalition director to better understand the unique ways in which SUCCEED was being implemented at SESU and allowed him too to accept the constructive criticism that was offered about his management. It focused management efforts and led to the more enlightened practice that Patton mentions. As a result, SESU now considers itself and is considered by others to be a full partner in SUCCEED.

The process of using the campus site visits as part of an ongoing quality improvement process is relatively new to SUCCEED. In its early years of operation, there was no defined responsibility for quality management. The qualitative assessment process in place at that time was not intended to be used for quality improvement purposes, rather it was simply meant to provide information for NSF reviews. Although that process also included campus case studies, the feedback mechanism to the CIT leaders and coalition leadership was not designed into the process. As the coalition has matured, however, the desire for continuous improvement of its operations has increased.

The model that we have developed and used successfully for this purpose is one that we believe can readily be adopted in other coalitions or to other organizations, such as a college within a larger university. SUCCEED consists of eight different colleges of engineering, each with different institutional missions and goals, but with a common mission to improve the undergraduate educational experience. A college, as a collection of departments with different disciplinary cultures and expectations, may face many of the same challenges as a coalition. There is a trend in colleges of engineering towards increased multidisciplinary education, as for example, with the capstone design experience. Furthermore, research funding patterns are favoring more collaboration across disciplines and linking research with education. This direction will require academic units to work more closely together to deliver quality education in a cost-effective manner. The communication between academic units about education issues, however, is usually minimal. We believe that periodic qualitative assessment would identify opportunities for improving interactions and promote the sharing of best practices. Also, student learning outcomes are becoming more dependent on multiple departments. A more comprehensive qualitative assessment approach applied to a college, such as that outlined in our model, could provide valuable feedback. Other examples where the model might be applied include distributed research centers, distance education curricula that involve multiple sources, and linked institutions such as community colleges in a state system. In each of these examples, multiple entities share a common educational mission, but are only minimally linked operationally. This relationship makes the assessment scheme outlined above a potential route to improvement.

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