Using Quality Function Deployment to Improve Academic Advising Processes

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Quality Function Deployment (QFD), a set of concepts and tools often used in manufacturing engineering to link consumer needs with product design, can be used to improve academic advising systems and processes. QFD promotes a structured and logical examination of students' advising needs and a rigorous examination of the relationship of these needs to the design of advising systems, processes, methods, and tools. Because its conceptual base is radically different from the disciplines underpinning advising theory, QFD can offer advising leadership useful insights and avenues for advising improvement.

Advising college students requires insights from many disciplines. Typically, professional advisors draw on knowledge from social science disciplines such as psychology and sociology or related applied professional fields in education or counseling (Creamer & Creamer). However, academic leadership responsible for improving advising processes might also draw on conceptual principles developed in statistics and engineering and applied in business, especially concepts from Quality Function Deployment (QFD) which link consumer needs and product engineering design. QFD was applied to academic advising in the College of Agricultural and Life Sciences (CALS) at the University of Wisconsin-Madison in a project to improve the advising system to better meet students' needs.

This adaptation of QFD to academic advising is an extremely rudimentary approach compared to the level of detail and sophistication employed in some manufacturing QFD applications. Yet the principles are identical. QFD imposes a conceptual rigor that links an assessment of consumer needs to the design of academic advising tools and methods. The principles of QFD may be helpful to academic advisors, even though QFD disciplinary roots and language may be somewhat foreign to those trained in the humanities, education, psychology, or related disciplines.

Principles of Quality Function Deployment

QFD is one subset of the management concepts and tools known collectively as Total Quality Management (TQM) which evolved from methods of statistical quality control. Developed by Mitsubishi and Toyota corporations, QFD is a method of product design that has been used successfully by manufacturing businesses in both Japan and the United States. Akao (1990, p. 3) defines QFD as ". . . a method for developing a design quality aimed at satisfying the consumer and then translating the consumer's demands into design targets and major quality assurance points to be used throughout the production stage." American corporations such as Ford, General Motors, and AT&T use QFD to design products that respond to multiple and complex customer demands. For example, Hauser and Clausing (1988) describe an application of QFD to an automobile door design, a process that includes dozens of different customer needs and engineering design characteristics. The design team uses various techniques to discover and rank consumer needs. For example, consumers need non-leaking car doors that are easy to open and close. The team determines the engineering characteristics of the door that influence consumer needs, for example, door weight and thickness of the door seal insulation strip. The team then determines the impact of dozens of these engineering characteristics on the consumer needs, searching for those with greatest impact on the most important needs. For example, the door's weight has by far the greatest impact on the ease of opening and closing. Interaction among the engineering characteristics must also be considered. For example, thicker insulation improves the water seal but makes the door harder to close. These considerations lead to a final design of the product, and the manufacturing system is then planned so that the product will have the attributes that will best meet consumer needs.

This conceptual paradigm from manufacturing engineering can be applied to academic advising by viewing advising as a product that can be engineered to meet particular consumer needs. The student is viewed as a consumer with particular expressed and latent advising needs. The student advising product is the result of a manufacturing system composed of many different processes, such as advising for next semester's classes, constructing a 4-year academic plan, and selecting a major or career. As with any

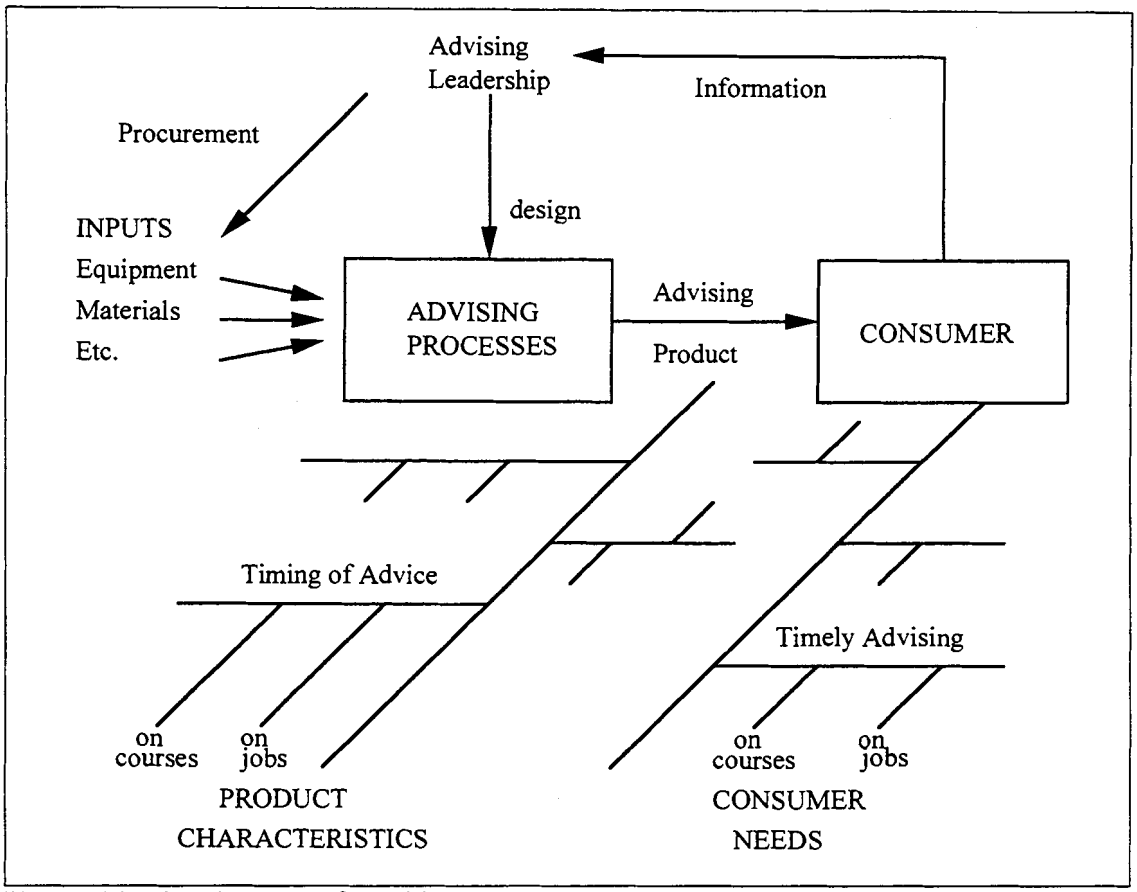

Figure 1 Manufacturing systems for advising

manufactured product, improvement in the advising product depends on changes in the system that produces advising. System improvement is possible only through changing the particular processes that produce advising for students, by changing the inputs into processes of advising manufacturing, or by changing the manner in which the processes are organized or linked together. Improvement of the academic advising system is the job of the advising leadership (those in formal advising leadership positions). The function of advising leadership is to get the system right by designing processes, securing inputs, and monitoring consumer feedback to ensure high quality and to identify improvements.

The manufacturing system for advising is depicted in Figure 1. The center box represents the collection of processes comprising the academic advising system. Each process relates to particular inputs, represented on the left of Figure 1. Some inputs may be external to the advising system, such as the structure of degree requirements. Other inputs may be used by advisors in their daily work, such as a form a student completes to add a course late in the semester or the computer uses to access student information. The advising processes produce results that have particular characteristics, depicted by the fishbone under the "advising product" heading. For example, the advising product has particular temporal characteristics, such as the availability of advisors at different times in the semester. Meanwhile, the consumer (student) has certain advising needs, depicted by the fishbone under the "consumer" box at the right of Figure 1. For example, the student may have a very high need for certain types of advising at particular times in the semester which may or may not coincide with the timing of advising availability. The degree of correspondence between the product characteristics and the consumer needs determines the consumer's view of product quality. The feedback loop in Figure 1 depicts the information flow from consumer to leadership in the organization—information that can be used to modify the manufacturing process to produce a product better suited to consumer needs.

The TQM principles of customer focus, process management, and systems analysis are applied in a

particular manner in Quality Function Deployment (Akao, 1990). QFD is typically conducted in a series of steps:

1. Determine consumer needs and rank their relative importance.
2. Identify the engineering and design product characteristics that affect the aspects of the product most closely related to consumer needs.
3. Identify any interactions among the engineering characteristics, particularly any strong complementary or conflicting relationships, and estimate the magnitude of the effect of each engineering characteristic on each consumer attribute.

From these steps, and with knowledge of costs of the engineering characteristics, the QFD team can design the product to maximize customer satisfaction by focusing on the engineering characteristics viewed most important by consumers.

In applying QFD to academic advising, the QFD team was comprised of five faculty members who are award-winning advisors (they were chosen because faculty members are both the producers of academic advising in the college and the chief retailers of advising to students) and two deans from the college office responsible for undergraduate education. The task was to design the advising product by changing advising systems and processes to better meet consumer needs. The team followed the typical steps in the QFD process:

1. Determine both expressed and latent advising needs of students.
2. Identify the characteristics of the advising system that relate to these needs (engineering characteristics).
3. Determine how these characteristics impact student needs.
4. Identify aspects of the advising product that could be reengineered to better meet the most important student needs (system design).

Determining Consumer Demands for Quality

The goal of the advising organization is to meet consumer needs, and exceed expectations, by producing a product of the highest possible quality. Since the consumer, not the producer, is the judge of quality, the challenge is to discover how the consumer defines quality, that is, to identify the needs and desires of the student with respect to the use of the advising product.

Discovering consumer needs is difficult because consumers may not understand or be able to express all their needs (Akao, 1990). Focus groups and surveys can identify those needs that the consumer can identify and express, but other latent needs may be equally important but not perceived by the consumer.

These latent needs can often be understood by intense observation of consumers using the product—observations that sometimes can be best made by the producer, in this case the experienced faculty advisor. Deming noted: "The producer is in [a] far better position than the consumer to invent new design and new service. Would anyone owning an automobile in 1905 express a desire for pneumatic tires, had you asked him what he needed?" (Deming, 1982). Thus, a combination of consumer interaction and producer reflection is most likely to identify both expressed and latent needs.

The first step in QFD is to identify consumer needs with respect to the product, usually through:

1. Direct interviews with consumers, surveys based on statistically valid sampling techniques, focus groups, close observation of consumer behavior with the product, or analysis of consumer complaints (Ohfuji, Noda, & Ogino, 1990).
2. Discussion among producers about the meaning of the expressed consumer needs and addition of latent needs that are highly relevant but not verbalized.

These consumer needs with respect to the product are often termed "consumer attributes" or "demanded quality" (Akao, 1990). These attributes are assigned scores to reflect their relative importance (Shindo, Kubota, & Toyoumi, 1990). Usually consumers assign weights or ranks of the attributes they believe are important in the product. In spite of much research on methods of establishing relative importance, ". . . no theoretical basis has yet been devised for evaluating demanded quality weights" (Shindo, Kubota, & Toyoumi, 1990, p. 29). The consumer attributes are also analyzed by the QFD team and are summarized by grouping like attributes or ideas and attaching a summary label (Akao, 1990). The team tries to understand and elaborate the essence of the need expressed by the consumer, using the consumers' words as much as possible. At the same time, latent needs can be added as appropriate. The process of identifying consumer attributes is a combination of science, informed judgment, insight, and intuition.

Methods

The University of Wisconsin-Madison advising

Table 1 Consumer Attributes of the Advising Product

Sincere Support
Not rushed along;
Care more;
Talk about problems;
Interested in best for student;
Friendship/Support;
Treats student equally;
Asked what I want to do;
Available advisor;
Confidence building;
Does not treat student of color differently.

Getting Help
Scholarship information;
Tutoring;
Financial aid information;
Whom to call about what;
Extracurricular activities associated with major;
Orientation to department and advisor;
Help with English.

Careers
Career options for major;
Career goals;
Job in department for student;
Internship information;
Care about student;

Academic Plans
Knowledge of breadth of courses;
Don't get advised into too many hard courses;
Help plan your schedule especially freshman year;
Tracking-plans "planning for timely graduation";
Choosing electives/tracks;
Class content information;
Degree requirements, "course requirements";
Prerequisites;
Alternative majors;
Transfer between majors;
Tracking—avoid conflict;
Avoid unwanted courses;
Advice on good professors;
Information on courses available only one time/year;
Help on academic procedures (e.g., file to graduate).

QFD team used focus groups and faculty observation of student advising behavior to identify the consumer attributes of the advising product. Augmented by information from statistically designed telephone surveys (see Table 1). The first question was whether advising needs might differ substantially among different student groups, particularly freshmen versus upperclassmen. A pilot focus group of students and faculty advisors revealed important freshmen concerns including "getting started in the right courses" and "understanding major requirements," while senior concerns centered on career options, graduate school, and changing majors late in an academic career.

To capture these different needs, two student focus groups were organized for freshmen and seniors representing the college's main academic programs in natural sciences, natural resources, social sciences, and plant and animal sciences. Membership in the focus groups was also based on grade-point average (GPA) to ensure variation in academic achievement. A third focus group was drawn from the minority student organization in the college. Invitations were sent to students randomly selected within the sampling frame defined by class standing, GPA, and subject matter specialization.

The Nominal Group Technique (NGT) was used in the focus groups (Delbecq & Skubick, 1975). The 2-hour session began with each student independently making a list of his or her advising needs or good/bad advising experiences. A group list was compiled by allowing each student, in turn, to add one item to the list until all items were included. The students quickly grouped items that were essentially identical, then independently assigned weighted votes (points) to the modified list. The weighted votes were aggregated and the students then discussed the meaning of the results, providing a qualitative interpretation to the quantitative results. The NGT captures input from all students rather than only those who are most verbal or assertive in a group discussion.

A second major source of information was a sample survey conducted annually by the Survey Laboratory in the Department of Sociology. The telephone survey sample included approximately 1,200–1,500 students (100–150 in CALS) with response rates over 90%. The 1994 and 1995 surveys included detailed questions on student satisfaction with advising, and verbatim responses to open-ended and follow-up questions were also available.

The focus group and survey methods provided different types of results. For example, the focus

Table 2 Engineering Characteristics of the Advising Product

Supportive Atmosphere
Help feel comfortable;
How to help students talk about problems—good technique for listening;
Tell student that advisor's job is to help student figure out best interest;
Sensitivity to cultural differences of minority students.

Accessibility
Available in crisis;
Back-up advisor when needed;
Able to take time;
Frequency of contact;
Available during key advising periods;
Understanding of electives that lead to liberal education.

Individualization
Help student adjust academic plans/major based on abilities;
Help student identity major based on personal interests.

Knowledge
Prerequisites;
Requirements of major;
How to develop a 4-year plan to tell student "how to . . .";
Skeleton 4-yr plan—advise on how to fulfill based on goals for career;
Understanding of electives that lead to liberal education;
How to pursue a general interest, not related to major, through electives;
How to discover class content information;
Content of majors closely related to advisor's department;
Know where to refer student to get financial information;
Know where to refer students to get tutorial assistance;
Know how to find out about sources of help for students;
Inform student how to take advantage of intellectual opportunities at university;
Know career options for major;
Know how to get student job in department;
Know how to connect student with internship;
Course availability.

groups identified a very high level of freshman anxiety over not knowing how to plan a sequence of courses to graduate. In contrast, the telephone survey, especially through the open-ended responses, generated a number of consumer complaints from students unable to find their faculty advisors when they needed advising. All of these information sources were used to identify the important consumer attributes required in the advising product.

The QFD team discussed and interpreted this information but did not identify any latent needs to add to the list of consumer attributes. An important issue was deciding how to incorporate the statistically valid survey results in which needs were not ranked in importance, with the qualitatively rich but statistically unrepresentative focus group results in which needs were ranked in importance. In the end, the task was made easier by the large degree of overlap in the needs identified by the two processes, and the good qualitative information in the intensity of feelings expressed in the verbatim comments to the statistical sample survey. The most important modification was that the QFD team increased the importance ranking of advisor accessibility as a result of including the telephone survey results.

The QFD team also analyzed the essence of what was being said by consumers in each item. For example, an item mentioned by seniors was "being asked what I want to do." Rather than taking this item literally, the team interpreted it more broadly to mean "interested in what is best for the individual student." After analyzing all items generated through the NGT process and survey, the QFD team clustered the items under general headings (see Table 1).

Results

Identifying Engineering Characteristics

Next, the QFD team listed the design and engineering characteristics of the products that are likely to affect one or more consumer attributes (Akao, 1990). Each of these engineering characteristics may describe a physical aspect of the product or part of the production process that affects a key consumer attribute (Hauser & Clausing; Gopalakrishnan, McIntyre, & Spraque, 1988). It is important to carefully distinguish the voice of the consumer from the voice of the engineer (Akao, 1990). A frequent problem is that the engineers (producers) impose consumer attributes under the guise of latent needs that are in fact not real needs of consumers but only inaccurate perceptions of the producer (Akao, 1990).

as honoring and valuing one's heritage can, from a different vantage point, prove harmful and debilitating (Mabry, 1995). According to the informants, many young people of color growing up in Washington do not carry the same political or racial consciousness as their parents or grandparents. Integration with white and Asian communities, in particular, combined with isolation in the Northwest away from large segregated Black communities, has provided these young people with choices not found in other parts of the country. The fact that most of the administrators and faculty members of color in this research tended to cling tenaciously to a single racial identity is indicative of the racism, oppression, and tokenism experienced in their own professional careers. Policies and programs created by these adults may, in fact, serve their needs more than those of the student population.

One of the more disturbing findings—both in my research and in the literature—revealed the resistance by first-generation college students and many students of color to seek outside assistance that could alleviate, if not prevent, personal, academic, and financial crises (Davis, 1986; Hughes, 1987; Fullilove & Treisman, 1990). Admitting one's disorientation, academic gaps, economic needs, or familial commitments is not acceptable to many working-class students, especially if they are from families that pride themselves on survival and have never been able to afford outside help (Smith, Simpson-Kirkland, Zimmern, Goldenstein, & Prichard, 1986). Ironically, it is this mentality that led many of the Access Programs at the six researched institutions to eliminate staff and cut back on student services. Administrators and staff in these programs prided themselves on having low enrollments of students of color, seeing it as proof that the minorities at their school did not fit the stereotype of affirmative action. The assumption that undergirded these decisions held that since so few students of color had come to ask for assistance there must not be a problem.

While Asian Americans are often not considered an underrepresented minority, the fact that there were no support services available for them on the majority of these campuses provoked a great deal of concern. One of the directors of student services, after discussing the problem at length, went so far as to comment, "We're going to have an uprising if we don't assist Asians pretty soon." At a different university a white staff member confided,

> Asians will not go to Blacks or Chicanos for tutoring or counseling. Instead they come here, to my office, but I am often on the road and when I am, they have no one to go to. The Asian population continues to increase. But not all our Asians are well-to-do Japanese. Some really need help.

Conclusions and Recommendations

This research serves as a springboard for a more extensive look at higher education access and success for students of color. Future work could include not only additional interviews with faculty from other institutions across the country but also a longitudinal study that addresses the changing attitudes towards minority culture-based programs over time. Another aspect of the research could be discussion with students: those considering higher education, those currently enrolled in college, and those who have either graduated or who have left prior to graduation to determine what affect, if any, minority culture-based programs had on their education and retention. One recommendation to those considering such research is that there be a collaboration with the Higher Educational Coordinating Board (HECB) to increase the impact on policy. By creating a conversation and developing support from such a governing board one could more easily provide the foundation for institutional understanding if not change.

During the year of interviewing, I became convinced that the institutions of higher education in Washington state (and I would argue most others) were confused about the direction of minority affairs programming. The interviews revealed that students of color would attend and have the opportunity for success at predominantly white institutions if all, or nearly all, of the following eight conditions were present:

- the university has a top-down policy towards diversity,
- the curriculum reflects their culture and race,
- there is a critical mass of minorities on campus,
- there are support services for minorities on campus,
- there are minority faculty and staff,
- academic support staff and faculty in general are willing to work with people of color,
- the surrounding community has people of color, and
- there is a place where people of color can gather and connect.

Yet most of the minority students surviving in these institutions were of two basic types: students

who were seeking assimilation into the predominantly white culture or those who were already assimilated.

The institutions seeking to encourage diversity rather than total assimilation perceived themselves caught in a dilemma: In order to provide a climate which promotes, respects, and broadens diversity, there must be faculty members, staff and students on college campuses who are both advocates for, and representatives of, a variety of perspectives. This research confirmed the view that the creation of a hospitable environment for minority students requires more than the addition of faces of color to the campus collage. It is as important (some felt more important) that whoever is hired, regardless of race, be supportive of change and willing to work with students from where they are academically, rather than where we wish them to be. Yet in order to attract and retain these individuals, expressions of diversity need to be in place on campus. This apparent contradiction played itself out in each of the six institutions, frustrating the respondents into despair and often apathy. The question of many administrators, faculty members, and staff is how to break the chain of little or no diversity perpetuating little or no diversity.

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The QFD team identified the engineering characteristics of advising, beginning with the more general categories then developing detailed characteristics, but always with particular reference to the consumer attributes. The general categories were supportive atmosphere (the affective aspects of advising), accessibility, knowledge, and individualization (applying knowledge selectively to fit individual circumstances). As a check on the process of identifying engineering characteristics, the team reviewed each consumer attribute to determine whether a relevant engineering characteristic was identifiable. Some engineering characteristics were identified in this manner, such as "listening technique" as a corresponding engineering characteristic for the consumer attribute "talk about problems." An important example related to the students' interest is advising for ". . . timely graduation." The QFD team identified an important engineering characteristic, the use of a "skeleton 4-year plan" to help the advisor and student prepare a 4-year plan of course work leading to the bachelor's degree. Table 2 contains the advising engineering characteristics.

Interaction of Consumer Attributes and Engineering Characteristics

The third step in QFD was to arrange the consumer attributes and engineering characteristics into a matrix and estimate the strength of the relationship between each engineering characteristic and each consumer attribute. In some cases the strength of the relationship can be quantified, but frequently the strength is estimated as strong, moderate, weak, or zero (Hofmeister, 1991). The judgment of the team members is extremely critical at this key step in the QFD process. A consumer attribute that is not affected by any engineering characteristic suggests a possible opportunity for product redesign to satisfy that consumer preference. An engineering characteristic that affects no consumer attribute needs further examination and may represent an opportunity to simplify the product or the production process. A single engineering characteristic may affect some consumer attributes in a positive manner and others negatively, or may have the same effect on several attributes.

The QFD team estimated the strength of the relationships using a 5-point scale, with +2 representing a strong positive relationship and -2 a strong negative relationship. The judgments were based on the collective advising experience of the QFD team. The results were aggregated by simply adding the scores of the individual faculty member. This simple process produced a very high degree of similarity in the estimates of individuals and a clustering of strong relationships in very few cells of the matrix. The results are presented in the rectangular matrix in Figure 2.

In manufacturing applications, the QFD team also estimates the correlation between each engineering characteristic and each other engineering characteristic. The resulting correlation matrix is usually displayed in triangular form on top of the columns containing the engineering characteristics. The result resembles a "house" with the correlation matrix corresponding to the "roof." Hence, QFD is often referred to as "The House of Quality" (see, Hauser & Clausing, 1988).

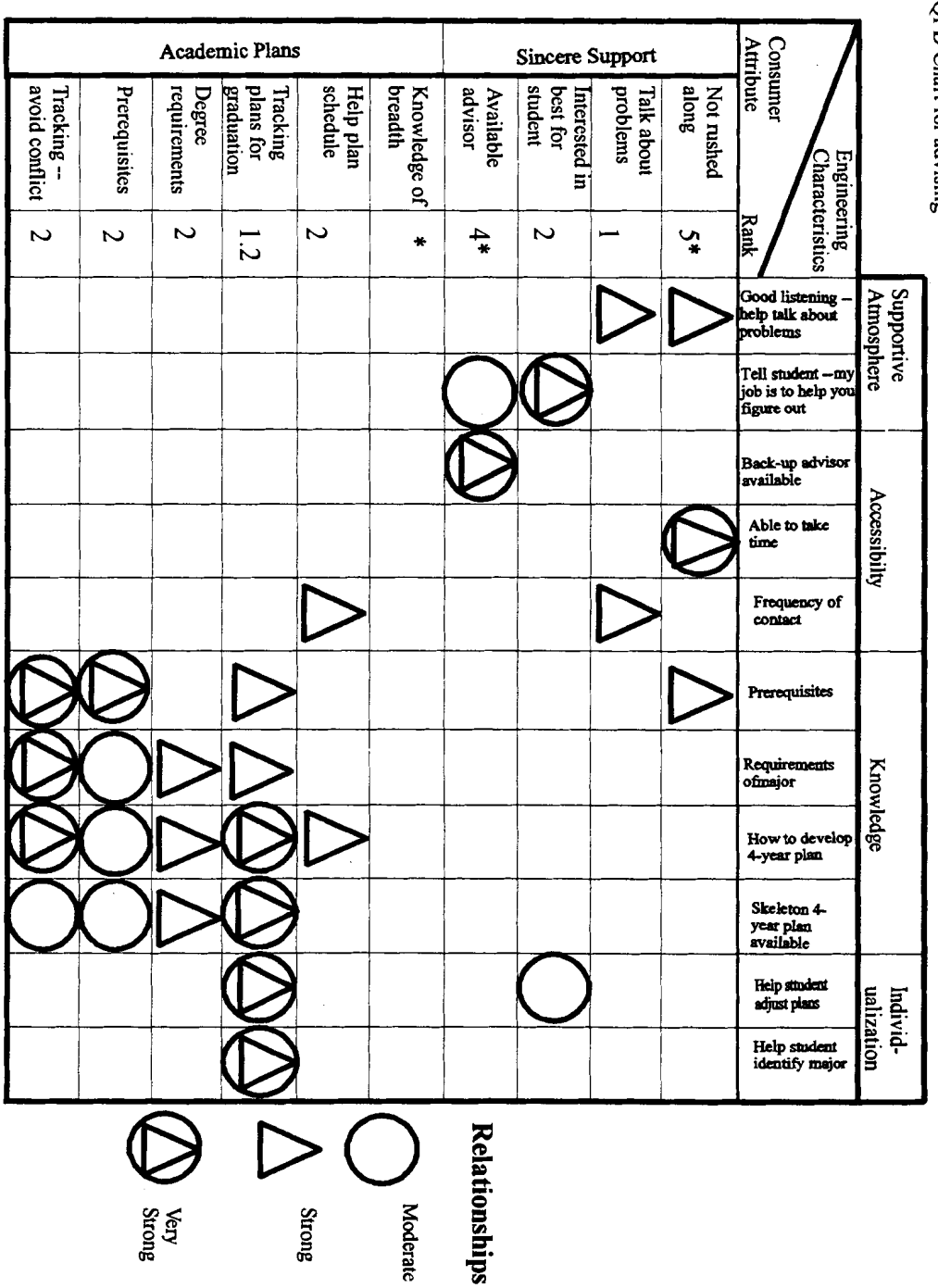
Negative interactions create the necessity for careful consideration of trade-offs in product design. Initially we assumed, incorrectly, that there were relatively few interactions among the engineering characteristics of the advising product, other than the obvious strong positive interactions among the characteristics for various types of knowledge. In retrospect we identified an important positive correlation among the engineering characteristics. The engineering characteristic of "advising tool for skeleton 4-year plan" has an important positive interaction with several of the engineering characteristics under "accessibility," particularly "able to take time," "frequency of contact," and "available during key advising periods." The positive interaction is that helping freshmen produce 4-year academic plans will reduce the number of students with very time-consuming needs for help in patching together a plan after several semesters or years. The time saved by advisors enhances accessibility. In any QFD application, it is important to carefully consider possible interactions among engineering characteristics because important synergism or conflict can be systematically identified in this manner.

Designing the Advising Product

The final step in QFD is to identify those engineering characteristics that can be modified to have the greatest impact on the most important consumer attributes, relative to the cost of the changes (Akao, 1990; Hofmeister, 1991). The QFD team identified three very simple and low-cost actions that could have a dramatic effect on the engineering characteristics of the advising product and significantly improve quality for the consumer.

4-year Plans. The most important freshman need, dwarfing all others expressed, was the desire to have a plan for graduating. The obvious way to address this need is to have skeleton academic plans indicating semester-by-semester course work that would allow the student to graduate in a timely fashion. Important caveats must be attached to these plans,

Figure 2 QFD Chart for advising



Note. * Item ranked important by QFD team based on survey.

such as notes about the importance of timing of prerequisites, suggested use of the skeleton plan as a guide rather than a mandate, the importance of introducing unique personal goals, and so forth. In discussions with academic departments, many faculty members agreed that not only would the skeleton plans help students, especially freshmen, but would also help faculty by giving them a basis for discussion in advising sessions with students. In the long run, this would save faculty time by reducing the number of problems that students create by failing to take courses at the right time or in the proper order. Each department produced one or more 4-year plans for students based on the particular degree requirements and options within the major.

Advising Hints. The set of consumer attributes grouped under "sincere support" and the set of engineering characteristics grouped under "supportive atmosphere" are not easily addressed because of the very affective and subjective nature of consumer needs and advising delivery methods. In discussions of the QFD team, many examples were used to illustrate good practices, such as "good technique for listening" or how to convey a sense of caring to students. The team realized that one way to improve the supportive atmosphere characteristics of the advising product would be to encourage more faculty members to use the methods and techniques that have proven effective for other faculty members. However, because there are undoubtedly many different ways to incorporate any given engineering characteristic (e.g., good listening technique), and since at least some faculty would not react favorably to preaching on how to be a good advisor (e.g., good listener), it was decided that identifying best practices used by faculty in advising students might be both an effective way to identify options for improvement and an effective way to encourage implementation. Thus, a set of advising hints was prepared. The first draft was simply a list of ideas from the faculty on the QFD team that was circulated to all faculty members in departmental meetings. An invitation to add to the hint list was made so that, collectively, the faculty member would prepare a document with the accumulated wisdom of many person-years of advising experience. Many faculty members showed considerable interest in the advising hints, perhaps because it was a collection of the best of their colleagues' advising tips and secrets. Work on Advising Hints will continue indefinitely as hints are applied and more faculty members make contributions.

Finding Your Advisor. Students placed great importance on "available advisor," as evidenced through the complaints in the verbatim responses in the campus-wide survey. In response, each department has developed a back-up system for academic advising. In almost all cases this back-up system consists of faculty members agreeing to fill in for each other during absences from campus or in emergency situations for students. Even though many departments already used this type of back-up system, its existence and nature was not communicated to students. In the end, access cannot be perfect because faculty members have other duties that occasionally keep them out of the office. Also, while a back-up system can provide information and transfer of knowledge, a back-up advisor will not be able to produce a supportive atmosphere as well as the regular advisor with whom the student has an established relationship. In this case, improved access probably means a decrease in the degree of supportive atmosphere as perceived by the student, another important interaction among the engineering characteristics. Finally, advising access can also be improved by making more efficient use of both student and faculty time during advising sessions. Therefore, an outline has been prepared offering suggestions for new students about how to contact their advisors and set appointments, guidelines for information the student might elicit from the advisor, and information the student should be prepared to convey to help the advisor learn about the student's academic and career interests.

Conclusions

The principles and procedures of Quality Function Deployment can be profitably applied to the improvement of academic advising. The main contribution of QFD is to force a structured, rigorous, and logical examination of the differing advising needs of different types of students, and a rigorous examination of the relationship of these needs to the design of advising systems, processes, methods, and tools. For example, treating advising as a product with various quality elements of interest to consumers is helpful because it immediately suggests that different market segments of students hold differing preferences or needs for different quality elements of the product. Such insights are not impossible without QFD, but the rigorous structure of QFD greatly increases the probability that such insights will be identified. A Chrysler Corporation executive responsible for QFD has noted that QFD ". . . doesn't contain ideas that are brand new . . . it involves activities you already do, you do some of the time, you have read about, you know that you should be doing, and a lot of plain common sense" (Dika, p. 2).

Application of QFD to academic advising produced several insights that would likely not have gained attention without the rigorous framework for analysis. The skeleton 4-year plan provides a convenient illustration. QFD led to identification of the 4-year plan as an important advising tool. Yet the idea of a skeleton 4-year plan is certainly not new and at least one CALS department had been using such plans to aid faculty in advising. However, the use of skeleton plans had not permeated any of the College's other 20 departments and the intensity of feeling expressed by the freshmen had not appeared as an important concern in the campus student satisfaction surveys.

The inclusion of faculty advisors as engineers on the QFD team was essential because these producers quickly realized that a) the high anxiety expressed by freshmen in the focus groups was typical of the many freshmen they had advised over many years, and b) this important student need could be met by a relatively simple and time-saving addition to the advising manufacturing system—by preparing a skeleton plan, adding it to the materials given to students, and using it in advising discussions. Thus, QFD was helpful in identifying improvements in the advising system that could be accomplished by product and process redesign rather than by additions of increasingly scarce staff time and financial resources. The time cost in preparing the skeleton plans was minimal—in some cases no more than 2 hours for two well-informed faculty members—yet a major student need was satisfied and a great deal of faculty advisor time will be saved in the future. Fewer students need intensive assistance to correct for past course and program deficiencies.

QFD also helps identify important relationships among the engineering characteristics of the advising system. For example, the skeleton 4-year plans will help students chart their programs more easily, which will improve the efficiency of course advising and decrease the number of problem cases that require considerable amounts of advisor time in the future. Less time pressure from the problem cases will increase the time available for other students and enhance consumer satisfaction from the "available advisor"quality element. As another example, all student groups identified "sincere support" or "personal caring" as an important advising quality element. It is clear that some faculty members excel at communicating a high level of personal caring and creating a very supportive atmosphere for the student. Ensuring high quality for the personal caring advising element is difficult with more than 150 faculty advisors. Advising leadership might be tempted to assign all students to a relatively few faculty members who are known for their personal caring. Yet using QFD would immediately force leadership to consider the impact of such a change on other engineering characteristics of the advising product and the effect of this secondary impact on other advising quality elements. Concentrating student advising to few faculty members might immediately improve the engineering characteristics of a supportive atmosphere but would also negatively affect several components of accessibility. The faculty would simply not have as much time available for each student, and scheduling appointments would become much more difficult. Obviously, none of these insights is impossible without QFD; however, QFD ensures consideration of such interactions in a structured, logical fashion.

The usefulness of QFD may be a function of the size and complexity of the university. The college has over 150 faculty advisors and more than 80 different combinations of degree and major fields, with numerous options within majors and combinations of majors. The university offers over 3,000 courses. In this complex environment, QFD may be especially helpful.

In the next application of QFD the time requirement will be greatly reduced because we know more about adapting the principles to the academic environment. The QFD team members spent approximately 10–15 hours on the project and the team leaders spent approximately 10 additional hours, stretched over a period of several months. In our opinion, the time investment was not high compared to other efforts to survey consumers and create improvements in academic advising, and the results were considerably stronger. A typical outcome of the use of QFD is to focus on a very few, but extremely important, aspects of the product that relate to the most important consumer preferences (Akao, 1990). This focus is one way to maximize the value of output from any given input of leadership and advisor time.

Although the time required can be reduced with experience, we also learned that it is important not to take shortcuts with the concepts. For example, the three main initiatives (4-year plans, advising hints, back-up systems) were undertaken prior to a systematic examination of engineering characteristics interaction because they appeared quite distinct. Upon a more structured analysis, we discovered some important but subtle interactions among the engineering characteristics. Fortunately, the interactions were in a positive direction so that they enhanced the advising quality elements for student consumers. Again, the value of QFD is that recognition of such interactions is not left to luck or inspi-

ration but is inherent in the methodical approach to product engineering design.

QFD, using a radically different disciplinary base and conceptual view of advising, offers advising leadership insight and avenues for improvement. QFD cannot displace other social science disciplines in providing an intellectual framework for student advising. However, precisely because of its radically different character, QFD and perhaps Total Quality Management in general, can help leadership improve academic advising for students. QFD offers a method for applying rigorous common sense.

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Authors' Notes

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