

in health care costs. TCH expects that new regulations from government and private sectors will require care for an increased number of patients and provide for less funding. It also anticipates major changes in the funding for education and research, an increased emphasis on managed care competition, additional support for applied research, a global budget for health care, and taxing of health care benefits. All of these factors will have a significant impact on TCH's operating budget and future success.

Given the current situation, TCH must reduce its operating budget by 4.5 percent or \$20 million and maintain its position of leadership in the health care industry. TCH management views this challenge as an opportunity to restructure costs by streamlining and improving operations, and exploring new strategies for generating revenues. The selected strategy must preserve the present high quality services. In order to achieve this objective, the DM identified the following five alternative strategies (step 1). Because of budgetary constraints, these alternatives were considered mutually exclusive.

1. *Alternative A (Implement a New Electronic Billing System)*: Replace the present antiquated claim submission system. New hardware and software costs are expected to be minimal, and employee training will be conducted by information systems personnel. This alternative is expected to reduce the work force, increase claim processing accuracy, minimize the float of accounts receivable, and automatically create all necessary reports required by government regulations.

2. *Alternative B (Centralize the Decentralized Business Offices)*: Currently, each of the hospital's medical services has a decentralized business office. The centralization of these offices should reduce direct costs, increase economies of scale, and produce more accurate information. TCH's cash flow should increase as delays in payments and billing errors are reduced.

3. *Alternative C (Create a Medical Observation Unit)*: Many patients do not require hospital admission for emergency care; however, their symptoms may need to be monitored. The DM believes that TCH can benefit by creating a medical observation unit for such patients, since insurers are less likely to deny claims for stays in observation units than hospitalization for observation.

4. *Alternative D (Implement Case Management Program)*: Under this program, patient care and services are integrated and provided by teams of professionals. Such reorganization should reduce staff turnover, employee error, average length of patient stay, and waiting time for outpatient registration. In addition, the reorganization should increase physician, staff, and patient satisfaction.

5. *Alternative E (Form a Managed Care Organization)*: Managed care is the type of care provided by Health Maintenance Organizations (HMO's) and Prospective Payment Organizations (PPO's). This program limits the patient's choice of physicians, but provides a more organized and cost efficient system of care. A managed care organization will produce new sources of hospital revenues and ultimately lower the cost of care through reduced lengths of stay and more cost efficient medical decision making.

The next step (step 2) is the identification of the relevant opportunities and threats. After a careful analysis of the situation, the DM identified 13 opportunities and 12 threats associated with these operational challenges. Given the environmental definitions described earlier, the DM categorized these factors into internal, task, and general environments. For example, a positive factor such as "a minimum of 5 percent increase in productivity" was considered to be an opportunity in the internal environment,

while a negative factor such as “reduction of inpatient services by 8 percent” was considered to be a threat in the task environment. A list and brief description of the opportunities are presented in Table 1, and the threats are presented in Table 2.

The DM then defined the environment-related weights through a series of pairwise comparisons required by AHP (step 3). Using Expert Choice software, the DM provided the pairwise comparisons presented in Table 3. Expert Choice synthesized these judgments and provided the DM with the relative weights and the inconsistency ratios (also presented in Table 3). The DM was asked to re-evaluate his judgments if the inconsistency ratio was greater than 10 percent. It is clear that the opportunities in the internal environment with a weight of .637 outweigh other opportunities and that the threats in the task environment were most important (.659).

Next (step 4), Expert Choice was used by the DM to evaluate all sets of environmental factors. For example, 10 pairwise comparisons were made between the internal opportunities (ROS, IIP, ESL, COM, and ICS) (Table 4). Next, Expert Choice used these judgments and provided the DM with the relative weights associated with each environmental factor. Again, when the inconsistency ratio was greater than 10 percent, the DM is asked to re-evaluate his judgments in the pairwise comparison matrix. One pairwise comparison matrix is needed for each set of opportunities and threats in the internal, task, and general environments. Therefore, the process of entering the judgments was repeated by the DM six times. All mathematical manipulations were performed by Expert Choice. The sorted details of the pairwise comparisons and weights for the opportunities are given in Table 4 and the same for the threats in Table 5.

Next, the DM estimated the probability of occurrence for each opportunity and threat under each potential alternative (step 5). Only a small part of this step for ‘Alternative A’ is presented for illustrative purposes. In analyzing whether or not to implement a new electronic billing system in Alternative A, it was believed that National Electronic Information Corporation (NEIC), a nationwide electronic claims collection and distribution system would be a valuable asset to the hospital. Start up costs for the equipment were deemed minimal.

The NEIC system would necessitate a change in the way employees do business. A reduction of staff (ROS) by 2 percent was believed to be 90 percent likely to occur. NEIC tremendously reduces the number of paper bound steps between the health care provider’s submission of claims and its payment. As with most operational changes, there is often some resistance on the part of individual employees. Although employee and physician resistance to change (RTC) was 40 percent likely to occur, it was expected that this resistance would be short-lived. As employees familiarize themselves with the equipment, they would realize that their workload would decrease by about 30 percent. Furthermore, the DM believed that it was 70 percent likely that this alternative would increase productivity (IIP) by a minimum of 5 percent. In addition, this system was 60 percent likely to increase employee skill level (ESL) as individuals master this new technology. Finally, it was expected that installing this new claim processing system is 40 percent likely to improve communications (COM) and 80 percent likely to improve customer service (ICS).

This analysis was continued until all opportunities and threats were examined. Similar analyses for the other alternatives were performed. A summarized listing of

**Table 1:** Environmental opportunities.**Internal Environment**

- ROS (Reduction of staff by 2 percent): Wages and benefits represent 60 percent of expenses. Therefore, a 2 percent decrease in staffing will reduce the operating budget by \$486,000.
- IIP (A minimum of 5 percent increase in productivity): The hospital productivity may be increased by streamlining (e.g., specifying procedures) and eliminating duplication.
- ESL (An above average increase in employee skill level): Skill level could be increased by combining tasks, forming identifiable work units, establishing client relationships, and vertical job loading.
- COM (Improving communications): Successful implementation of management update meetings should improve internal communication, enhancing relationships between employees, management, and physicians.
- ICS (Improving customer service): An earlier study concerning patient waiting times, courtesy of staff, comfortableness of facility, and overall employee awareness has served to identify deficiencies in customer service. Change in these areas may improve services and put the hospital in the forefront.

**Task Environment**

- HQC (Providing high quality patient care): Quality of care provided by non-medical services influences TCH's business relationship. Management believes that it is necessary to increase the quality of patient care to an above industry average level.
- PHR (Improving hospital and physician relationships): A quality management program may improve physician/hospital relationships and facilitate health care reform.
- IMS (Increasing market share by 8 percent): TCH can increase its business by 8 percent through cost cutting, and new and enhanced programs. Being a visionary while reducing cost will help TCH.
- MCB (Increasing managed care business by 10 percent): TCH may begin to negotiate with insurance companies to increase managed care business from 4 percent to 10 percent within the next two years.
- IOS (Increasing outpatient services by 6.5 percent): Economic forces will continue to push patient care to the outpatient setting. TCH may increase outpatient service by 6.5 percent within the next two years.

**General Environment**

- RGC (Responding to new governmental changes): Short and long term strategies formulated to safeguard TCH can take advantage of new government regulations.
- GFA (Increasing government financial assistance to uninsured persons): The uninsured population will eventually become insured which will increase TCH's net operating income. Currently about 15 percent of the patients serviced are not insured.
- AGL (Availing special government loans): Some of the proposed changes may be supported through funding from various government loans.

**Table 2:** Environmental threats.

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**Internal Environment**

- RTC** (Employee/physician resistance to change): TCH employees/physicians are used to a stable environment and are likely to resist changes which can stall proposed improvements.
- IEX** (Increase in educational expenses): Implementation of new programs require training and education of employees. An above average increase in educational expenses will have a negative impact on the hospital's budget.
- RDE** (Placement of displaced employees within the hospital): The probability of rehiring a laid-off employee is minimal. This may be detrimental to employee morale and performance.
- LAS** (Lack of available office space): Some changes will require trading smaller offices for larger ones. This is a problem because office space is a scarce resource.

**Task Environment**

- NPH** (Negative perception of the hospital): Implementation of certain programs may require lay-off and other cost cutting measures which could draw media attention, creating a negative image of TCH.
- RIS** (Reduction of inpatient services by 8 percent): The push toward more outpatient services should reduce inpatient services, which in turn could reduce TCH's revenue.
- SAD** (Denial of short-stay admissions): Payment for short hospital stays are being denied by third party payers. Such insurance regulations will have a negative impact on the budget.
- CSU** (Clerical staff joining the union): Staff reductions, threat of anticipated changes, etc., may induce non-union clerical staff to join the union who will resist such changes.
- ILC** (Above average increase in litigation cases): Present political climate indicates a potential increase in antitrust suits. Therefore, cost control efforts might end up in court.

**General Environment**

- TMC** (Threat of managed competition): Managed competition could impact the quality of care. Third parties will have more to say about patient care than doctors.
- RIP** (Lower reimbursement from insurance): Lower reimbursement poses a threat, because a decrease in payments and an increase in discounts will reduce the net operating income.
- RGR** (Lower reimbursement due to governmental regulations): Lower reimbursement due to new governmental regulations poses a similar threat to the net operating income.
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occurrence probabilities associated with all opportunities and threats for all alternatives is presented in Table 6. These probabilities and weights were all stored in a spreadsheet.

Next (step 6), the overall importance weights for the opportunities and threats were calculated given the initial weights and the intrinsic information provided by the subjective probabilities. This step was totally automated, and the DM was provided with only a revised set of importance weights. A spreadsheet macro was used to perform all necessary mathematical calculations. The opportunities in the

**Table 3:** Environmental pairwise comparison matrices.

	Internal	Task	General	Relative Weight
<b>Opportunities (Inconsistency Ratio = .037)</b>				
Internal	1	3	5	.637
Task	1/3	1	3	.258
General	1/5	1/3	1	.105
<b>Threats (Inconsistency Ratio = .031)</b>				
Internal	1	7	4	.079
Task	1/7	1	3	.659
General	1/4	1/3	1	.262

**Table 4:** Pairwise comparison matrices (opportunities).

<b>Internal Environment (Inconsistency Ratio = .038)</b>						
	ROS	IIP	ESL	COM	ICS	Relative Weight
ROS	1	3	4	5	7	.484
IIP	1/3	1	3	4	5	.262
ESL	1/4	1/3	1	2	4	.131
COM	1/5	1/4	1/2	1	2	.077
ICS	1/7	1/5	1/4	1/2	1	.046
<b>Task Environment (Inconsistency Ratio = .027)</b>						
	HQC	PHR	IMS	MCB	IOS	Relative Weight
HQC	1	2	4	6	8	.460
PHR	1/2	1	3	4	6	.288
IMS	1/4	1/3	1	3	4	.142
MCB	1/6	1/4	1/3	1	2	.068
IOS	1/8	1/6	1/4	1/2	1	.042
<b>General Environment (Inconsistency Ratio = .077)</b>						
	RGC	GFA	AGL	Relative Weight		
RGC	1	7	6	.760		
GFA	1/7	1	2	.144		
AGL	1/6	1/2	1	.096		