

K.T. Situation Appraisal: First Day on the Job—Trial by Fire

Sara Brown has just become manager of Brennan's Office Supply Store. The Brennan Company owns 10 such stores in the Midwest. Sara's store, which is located in the downtown area on a busy street, has an inventory of more than \$1 million and more than 20,000 square feet of floor space.

On her first day of work, Sara is inundated with problems. A very expensive, custom-ordered desk that was delivered last week suffered a number of scratches while it was being unpacked, and the stockroom manager wants to know what he should do. Sara has just discovered that the store has not yet paid the utility bills that were due at the end of last month, and she realizes that the store has been habitually late in paying its bills. The accounts receivable department tells her that it has had an abnormally high number of delinquent accounts over the past few months, and the accounting personnel want to know which action they should take. A large stack of boxes in the storeroom that were delivered last week have yet to be opened and inventoried. The impression Sara has been getting all morning from the 30 employees is that they are all unhappy and dislike working at Brennan's.

To top things off, shortly after lunch, a large delivery truck pulls up to the front of the store and double-parks, blocking traffic. The driver comes into the store and announces that he has a shipment of 20 new executive desks. Where does Sara want them placed? The employees tell Sara that this shipment was not due until next week and there isn't any place to put them right now. Outside the store, Sara can hear the horns of the angry drivers as the traffic jam grows.

What should Sara do?

| Problem | Subproblem | Timing (H, M, L) | Trend (H, M, L) | Impact (H, M, L) | Next Process (PA, DA, PPA) |
|-----------------|-----------------|------------------|-----------------|------------------|----------------------------|
| 1. Space | Unopened boxes | L | L | L | DA |
| 2. 20 new desks | Traffic jam | H | H | H | DA |
| 3. Personnel | Employee morale | M | M | H | PA |
| 4. Finances | Money owed | M | M | H | DA |
| | Money due | M | M | M | PA |
| 5. Quality | Scratched desk | L | L | M | DA/PPA |

1. While boxes on the floor may be an eyesore and awkward to step around, Sara does not have to do anything about them immediately (timing = L). The situation will not get worse as the result of their presence (trend = L), and the impact of not having the boxes opened and their contents on the shelves is low. The process to address this subproblem is decision analysis (DA): Sara has to decide who is to open the boxes and when to do it.



K.T. DECISION ANALYSIS

2. What to do about the 20 new desks has to be decided (DA) immediately (timing = H). The implications of not accepting or accepting and storing such a large order also produce a high degree of concern (impact = H). Finally, a traffic jam is beginning to form and is getting worse while Sara is deciding what to do (trend = H).
3. The employee morale issue needs to be addressed in the very near future, albeit not immediately (timing = M). It is believed that lack of care and sloppiness were factors in damaging the custom-ordered desk, so its impact is the source of a high degree of concern (impact = H). The morale, while low, could get worse; therefore the trend is cause for a moderate (M) degree of concern. Sara doesn't know why the morale is low, so she needs to carry out a problem analysis (PA) to learn more about the problem.
4. Sara needs to pay the utility bills fairly soon (timing = M) or the electrical power to the store could be shut off; that possibility is reason for a high degree of concern (impact = H). Sara needs to find out why the money due the store has not been paid (PA).
5. Nothing needs to be done with the scratched desk immediately, but Sara does need to decide what to do in the not too distant future (DA). She also needs to plan how to unpack the desks and other items more carefully (PPA).

Comparing the ratings, we see the first thing that Sara needs to do: make a decision about whether to find space for the desks in the store or send them to the company warehouse.

Decision Analysis: The Perfect Vacation

Lara and Tom Anderson are a 23-year-old couple who want to take a summer vacation and escape from their hectic schedules. The Andersons live in the suburbs of Chicago and commute 45 minutes each way on crowded trains to downtown Chicago. They are eager to get away from the hustle and bustle and experience a change of scenery. They have set aside \$2000 for the vacation, which is the maximum amount they can spend. Both love learning new things, seeing interesting sites, and eating good food, though Tom is currently on a diet. Tom likes to do outdoor sporting activities, whereas Lara likes to visit art museums and is happy to just sit outside and read. The main goal for both is to come back refreshed. The Andersons have brainstormed and identified three vacation possibilities.

Lara tells Tom about three museums she would like to visit in New York. While the airfare is cheap, the New York hotels are expensive; thus the couple would have to get a hotel outside the city and commute to stay within their budget.

Tom is agreeable to that plan—he enjoys theater and there are certainly excellent restaurants in New York—but also suggests a second alternative. If the couple went to northern Michigan, he could golf, sail, and visit Mackinac Island, which has a lot of rich history, fun restaurants, and hiking trails. Upper Michigan is also home to the Mackinac Bridge, world-class golf courses in Traverse City, and Sleeping Bear Sand Dunes, where the Andersons could hike and travel across the dunes in a dune buggy.

Now Lara shows Tom a brochure about Cancun, Mexico, where the pair could spend a week in the sun sailing and lying on the beach—all for \$895 per person (airfare, lodging, and meals are included in the same price). Cancun is not known for its food, and Tom doesn't like spicy cuisine. Lara points out that guided tours of the Mayan ruins can be found only two hours away.

Lara and Tom agree to do a K.T. decision analysis on their options. Their musts are staying within their budget, enjoying new sights, and experiencing no stress. All vacation alternatives will cost less than \$2000, so consequently all are a "go" on this criterion. Tom and Lara have never been to any of these locations, so all are a "go" for this must as well. In terms of the third must (no stress), New York is a "no go" because the Andersons would have the same stressful commute each day as they currently have in Chicago and would not come back refreshed.

Tom and Lara narrowed their wants list down to three: nice views and scenery, good food, and learning new things. The views of the clear Gulf of Mexico water and sandy beaches in Cancun are wonderful (rating = 10). The meeting of the Great Lakes (Lake Michigan and Lake Huron) and the Mackinac Bridge is a wonderful sight, as is Mackinac Island. This island doesn't allow cars, so walking, bicycles, and horses are the only modes of transportation (rating = 10).


There are excellent restaurants in northern Michigan, such as Tapawingo, which is listed in the *Zagat Guide* (rating = 8). Tom does not like spicy food, and the restaurants in Cancun—while good—are not at the same level as those found in northern Michigan (rating = 3).

Learning is the couple's most important want. In Cancun, learning about Mayan history would be quite rewarding (rating = 8). In northern Michigan, the Andersons could visit Fort Mackinac (which dates from the Revolutionary War) and Fort Michilimackinac (which dates from the French-Indian War in 1715); both are rich in history (rating = 7).

Decision Statement

Where should we go on vacation to learn new things, see new sights, eat good food, and get away from any stress?

K.T. DECISION ANALYSIS TABLE

| Musts | A. Cancun | B. New York | C. Northern Michigan |
|--------------|------------------------------|---|-----------------------------|
| Cost limit | Go | Go | Go |
| New sights | Go | Go | Go |
| No stress | Go | No Go | Go |
| Wants | |  | |
| Learn 10 | $\times 8 = 80$ | | $\times 7 = 70$ |
| Food 8 | $\times 3 = 24$ | | $\times 8 = 64$ |
| View 5 | $\times 10 = \underline{50}$ | | $\times 7 = \underline{35}$ |
| | 154 | | 169 |

The best tentative decision is for the Andersons to vacation in northern Michigan. Before Lara and Tom can make this their final choice, however, they must consider the adverse consequences of each solution that is deemed to be a "go."

Adverse Consequences

Lara and Tom now brainstorm the major things that could go wrong if they were to choose either of these solutions and then assess the probability (P: 1–10) that it could go wrong and how serious (S: 1–10) the consequences would be if that event did occur. The threat (T) to the choice of each alternative solution is then the product of these two numbers: $T = P \times S$.

Bad weather could be a factor for both of the Andersons' final choices. The probability of bad weather in northern Michigan this time of year is (2/10). Their vacation would fall during hurricane season in the Gulf Coast and the probability of a hurricane is relatively high, but the storm might not hit Cancun, so they estimate the overall probability of a hurricane hitting Cancun as (4/10). Of course, a hurricane hitting Cancun would have very serious consequences (9/10) if it were to occur. Crowds in northern Michigan could make it difficult for the Andersons to get into restaurants and museums; the probability of this problem occurring is (4/10) and its seriousness is (5/10) if it were to occur. A guide strike in Cancun would prevent the Andersons from visiting the Mayan ruins, but the probability of such an occurrence is low (1/10). If it did occur, a guide strike would be very serious (8/10).

| Alternative | Probability (P) | Severity (S) | Threat (P × S) |
|--------------------------|-----------------|--------------|----------------|
| Northern Michigan | | | |
| Bad weather | 2 | 5 | 10 |
| Crowds | 4 | 5 | 20 |
| Total | | | 30 |
| Cancun, Mexico | | | |
| Bad weather | 4 | 9 | 36 |
| Guide strike | 1 | 8 | 8 |
| Total | | | 44 |

There are insufficient adverse consequences to change the Andersons' initial decision. Their best choice is still a vacation in northern Michigan.

The following case is an industrial example using decision analysis.

Choosing a Paint Gun

A new auto manufacturing plant is to be built, and you have been asked to choose the electrostatic paint spray gun to be used on its assembly line. The industry standard gun is Paint Right. While experience has shown that Paint Right performs adequately, its manufacturer is located in Europe, which means that servicing of the paint gun is slow and difficult. The paint gun must provide a precise flow rate of paint to avoid both excessive waste from high flow rates and longer application times with low flow rates. It must also deliver a uniform size of spray droplets so that the paint is applied evenly and produces a nice finished appearance.

The desirable traits of the gun are durability, ease of service in the event of a malfunction, low cost, and familiarity to the operators. While the European company, Paint Right, currently has the largest market share, the price of its paint spray gun is significantly inflated. Two U.S. companies are eager to enter the market with their products: New Spray and Gun Ho.

Decision Statement

Choose an electrostatic paint spray gun. The paint guns available are manufactured by Paint Right, New Spray, and Gun Ho.

Course of Action

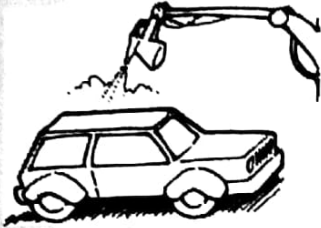
The first step is to break down the important qualities of paint guns, and to decide what you must have and what you want to have. From your experience and discussions with other paint personnel, you determine that you have two musts: (1) adequate control over the paint flow rate and (2) acceptable paint appearance. You have also identified four wants: (1) easy service, (2) low cost, (3) long-term durability, and (4) familiarity to plant personnel.

First, you need to determine whether each of the alternatives satisfy the two musts. Plant records show that Paint Right is able to meet both of these criteria. Next, laboratory experiments are performed with New Spray and Gun Ho to determine whether each will be able to meet both musts. The results show that New Spray meets the standards but Gun Ho cannot control the flow of paint at the level required. As a result, it is eliminated from consideration.

The four wants are then weighted, and ratings are assigned for each gun that satisfies the musts (as carefully as possible). The first want—ease of service—is an important issue and receives a weight of 7. Because the paint gun's parent company, Paint Right, is located in Europe, it is difficult to get rapid service, so the company's rating for this want is 2. Thus the Paint Right gun has a score of $7 \times 2 = 14$ on this want. Durability is of moderate importance and receives a weight of 6. Paint Right's gun is very durable and receives a rating of 8, giving it a score of 48 on this want. The familiarity and low cost wants are of lesser importance, so each option receives a weight of 4. Because the plant personnel are currently using the Paint Right gun, it receives a rating of 9, giving it a score of $4 \times 9 = 36$.

We continue in this manner until the entire decision analysis table is filled out.

Solution



| Musts | | Paint control | | New Spray | | Gun Ho | |
|-----------------------|--------|---------------|------------|-----------|------------|--------|-------|
| Adequate flow control | | Go | | Go | | No Go | |
| Acceptable appearance | | Go | | Go | | Go | |
| Wants | Weight | Rating | Score | Rating | Score | Rating | Score |
| Easy service | 7 | 2 | 14 | 9 | 63 | No Go | |
| Durability | 6 | 8 | 48 | 6 | 36 | | |
| Low cost | 4 | 3 | 12 | 7 | 28 | | |
| Familiarity | 4 | 9 | 36 | 2 | 8 | | |
| Total | | | 110 | | 135 | | |

After applying an Adverse Consequences Analysis, New Spray's electrostatic spray paint gun was still chosen over Paint Right's model for the new plant.

Decision Analysis Example: Choosing Your First Job

Several years ago, a graduating senior from the University of Michigan used K.T. decision analysis to help him decide which industrial job offer he should accept. John had a number of constraints that needed to be met. Specifically, his fiancée (now his wife) was also graduating in chemical engineering at the same time, and both wanted to remain reasonably close to their hometown in Michigan. In addition, as a part of a dual-career family, John needed a guarantee that the company would not transfer him. After interviewing with a number of companies, he narrowed his choices to three companies: Dow Corning, ChemaCo, and TrueOil.

The first thing John did was to identify the musts that each offer had to satisfy; these criteria are shown in the K.T. decision analysis table. Upon evaluating each company to learn whether it satisfied all the musts, he found that TrueOil did not satisfy the "no transfer" must. Consequently, John eliminated this company from further consideration. Next, he identified the wants and assigned a weight to each criterion. The remaining two companies were then evaluated against each want and a total score was obtained for each company. Dow Corning scored 696 points, and ChemaCo scored 632 points; the apparent best choice was Dow Corning.

K.T. DECISION ANALYSIS: JOB OFFER

| Objectives | | Dow Corning | | | ChemaCo | | | True Oil | | | |
|--|--------|---------------------------------------|--------|-------|----------------------------------|--------|-------|-------------------------|-------|--|--|
| Musts | | | | | | | | | | | |
| In Midwest | | Midland, Michigan | Go | | Toledo, Ohio | Go | | Detroit, Michigan | Go | | |
| Located within 40 miles of spouse's position | | Another major company also in Midland | Go | | Industrialized Northern Ohio | Go | | Major metropolitan area | Go | | |
| No-transfer policy | | Major plant in Midland | Go | | Major plant in Toledo | Go | | Must transfer | No Go | | |
| Wants | Weight | | Rating | Score | | Rating | Score | No Go | | | |
| Plant safety | 10 | Good (silicone) | 7 | 70 | Mainly oil derivatives (okay) | 5 | 50 | | | | |
| Education assistance program | 10 | Tuition aid | 8 | 80 | Tuition aid | 8 | 80 | | | | |
| Encourage advanced degree | 10 | Very positive | 9 | 90 | Positive | 8 | 80 | | | | |
| Type of position | 10 | Process engineer | 9 | 90 | Pilot plant design and operation | 10 | 100 | | | | |
| Salary and benefits | 9 | Good | 6 | 54 | Very good | 8 | 72 | | | | |
| Near hometown (Traverse City, Michigan) | 8 | 150 miles | 10 | 80 | 400 miles | 5 | 40 | | | | |
| Advancement policy | 7 | From within | 10 | 70 | From within | 10 | 70 | | | | |
| Large company | 6 | Medium size | 6 | 36 | Small size | 3 | 18 | | | | |
| Attitude of interviewer | 5 | Knowledgeable and positive | 8 | 40 | Knowledgeable and positive | 8 | 40 | | | | |
| Company image | 4 | Known | 5 | 20 | Unknown | 3 | 12 | | | | |
| Stability of industry | 4 | Silicone (very good) | 9 | 36 | Oil (excellent) | 10 | 40 | | | | |
| Return on stockholder's investment | 3 | Excellent (#2 in nation) | 10 | 30 | Excellent (#4 in nation) | 10 | 30 | | | | |
| Total | | | 696 | | | 632 | | | | | |



Before making the final decision, John needed to evaluate the adverse consequences of his first and second choices. The results of these adverse consequence analysis are shown in the following table. The adverse consequences analysis ranked both choices in the same order as before; as a result of this analysis, the apparent first choice was confirmed as the final choice.

ADVERSE CONSEQUENCES ANALYSIS: JOB OFFER

| Alternative | Probability (P) | Severity (S) | Threat (P × S) |
|------------------------------|-----------------|--------------|----------------|
| Dow Corning | | | |
| Midland is not very exciting | 6 | 3 | 18 |
| High rent | 4 | 6 | 24 |
| Total | | | 42 |
| ChemaCo | | | |
| Toledo is not very exciting | 6 | 8 | 48 |
| High rent | 5 | 6 | 30 |
| Total | | | 78 |

Both John and his wife are working at Dow Corning in Midland, Michigan. (Only the names of the other companies have been changed in this real-life example.)

K.T. Potential Problem Analysis: Marketing and Selling the New Ragin' Cajun Chicken Sandwich

Wes Thompson is the manager of a Burgermeister (not the real name of the chain) restaurant, which specializes in fast-food hamburgers. He has just been notified by the corporation that a new chicken sandwich, called the Ragin' Cajun Chicken, will be introduced into Burgermeister restaurants in two weeks. This information surprised Wes because he had never heard anything about the new sandwich from the company or from advertisements. The memo says that plans for a national advertising campaign have unfortunately been delayed until after the introduction of the sandwich.

According to the memo, next week Wes's restaurant will receive a shipment of 500 Ragin' Cajun Chicken sandwiches. These sandwiches will be shipped frozen and have a shelf life of three months in the freezer. The notification also stresses the importance of proper handling of the uncooked chicken. To prevent cross-contamination by *Salmonella* (the bacteria present in some raw chicken), specially marked tongs will be used solely to handle the uncooked chicken.

Along with the shipment of the chicken, Wes's restaurant will receive a new broiler to be used exclusively for preparation of the new sandwich. It is important that the broiler operate at least at 380 °F to ensure that the chicken will be fully cooked during its five-minute preparation time.

Wes thought that it was very important that the transition run smoothly when Ragin' Cajun Chicken sandwiches were added to the menu in two weeks. To prevent any problems, he carried out a brainstorming session using the techniques discussed in Chapter 6 and identified four potential problems (e.g., bacteria in food) and the corresponding consequences (e.g., illness) that were deemed the most logical outcomes of those problems. Next, Wes and his team brainstormed all causes (e.g., employees don't handle the raw chicken properly) that could produce each of the potential problems. Unfortunately, many causes could produce each potential problem (e.g., chicken stored too long). For each cause, Wes's team listed a preventive action (e.g., train the employees on proper food handling). Finally, the group identified a contingency action if training the employees to handle the food properly does not work. In this case, the contingency action will be a periodic inspection of the chicken and the chicken-handling procedures.

The complete PPA table is shown here.



MARKETING AND SELLING THE NEW RAGIN' CAJUN CHICKEN SANDWICH

| Potential Problem | Consequence | Possible Cause | Preventive Action | Contingent Action |
|------------------------------|--|---|-------------------------------------|---|
| People don't buy sandwich | Restaurant loses money | Customers don't know about sandwich | Make own signs for sandwich | Have cashiers suggest chicken to customers |
| | | Too expensive | Compare unit cost with competition | Run promotional specials |
| | | Food too spicy | Inform customers of mild variety | Run promotional specials |
| Bacteria in food | Illness, law-suits | Employees don't handle raw chicken properly | Train employees | Perform periodic inspections |
| | | Improper use of broiler | Train employees | Perform periodic inspections |
| | | Chicken stored too long | Set up dating system | Inspect and discard chicken if necessary |
| | | Freezer not cold enough | Perform temperature checks | Inspect and discard chicken if necessary |
| Substandard sandwich quality | Customers complain; no return business | Wrong items on sandwich | Have cashiers double-check accuracy | Provide free remade sandwiches for affected customers |
| | | Sandwich sits too long under heat lamps | Mark discard time on sandwich | Inspect sandwiches before serving |
| Substandard service time | Customers complain; no return business | Sandwich preparation takes too long | Always have chicken precooked | Have sandwiches pre-made |



Of the 10 possible causes of potential problems noted in the table, four actually occurred. Wes noticed the following problems:

- Most customers were unaware of the new menu item. Wes made signs announcing the new sandwich and asked his cashiers to suggest the chicken sandwich (i.e., "Would you care to try our new Ragin' Cajun Chicken today?"). Sales of the sandwich increased dramatically because of this in-store promotion.
- Wes held a special training session for all employees to explain how critical the proper handling and preparation of the chicken was. Afterward, Wes also performed periodic inspections and noticed that employees weren't following his instructions (e.g., use special tongs and wash your hands after handling raw chicken). After a week of inspections, all employees were following the new operating procedures. Fortunately, no cases of food poisoning were reported.



- At the training session, Wes also explained the procedure for operating the broiler. Once the Ragin' Cajun Chicken was placed on the menu, Wes observed how employees operated the new broiler. Thanks to his observation, an explosion that might have been caused by improper lighting of the broiler was avoided.
- Early on, customers made several complaints about improperly made sandwiches. This problem was solved by having cashiers double-check the accuracy of the order before serving the sandwich. This double-checking helped improve the communication between cashiers and cooks, and higher accuracy in preparation was noticed for all sandwiches.

Because Wes already had a strategy in place for handling these issues, possible disaster was averted.

Source: Developed in collaboration with Michael Szachta, University of Michigan, 1993.