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The Future of the University of Pittsburgh Medical Center: Strategic Planning with the Analytic Network Process[1]

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Abstract: This paper summarizes the research and analysis used to determine the best strategy(s) for the University of Pittsburgh Medical Center(UPMC) to implement in order to become more competitive in a managed care environment. The study employs the Analytic Network Process (ANP) feedback modeling technique to analyze the benefits, costs and risks of five major strategic options available to UPMC. The ANP tool incorporates the interdependent influences that often exist between systemic variables. The findings suggest that UPMC should concentrate most on improving patient satisfaction and thereby the number of patients. UPMC should also develop a primary care network so that the hospital complex can attract more patients through referrals from affiliates.

Introduction

The object of this analysis is to use the Analytic Network Process(ANP) to determine the best strategies that the University of Pittsburgh Medical Center(UPMC) can implement to compete more effectively in a managed care environment. The ANP involves feedback analysis described in detail in Saaty, 1996, and would take most of this paper to summarize. This paper must assume knowledge of the ANP by the reader. This analysis focuses on strategies related to the current organizational goals of UPMC and the changing healthcare environment. The research uncovered five potential strategies that UPMC can implement individually, or in combination, to yield greater market share and profitability.

The study consists of three phases. The first involves problem definition and data collection. The second involves construction of separate feedback networks for the benefits, costs and risks of the strategies and interacting elements. The third phase involves applying the knowledge gained from the research to make judgments that define the feedback influences among the factors involved in UPMC strategic planning. From these judgments, strategies were identified for UPMC to pursue to improve the market share of the hospital complex.

Evolution of Managed Care

Since the 1960s the healthcare industry has gone through tremendous change in the way care has been provided and the means by which it has been paid. Traditionally, medical care was offered by hospitals and physicians with individuals or their insurance companies covering the cost of healthcare. This traditional medical payment system is referred to as fee-for-service or FFS. Under FFS, physicians and hospitals were paid for each service rendered and clients could choose their own provider. Insurance companies covered benefits under standard indemnity plans and exerted no strong limitations on the extent of services physicians or hospitals performed, or on the amounts charged. Interestingly enough, under the traditional indemnity plans, insurance companies did not usually cover preventative medical care.

Although its popularity has significantly declined in recent years, the FFS system is still enjoyed by many consumers and physicians. Individual consumers have their choice of doctors, and doctors can prescribe a gamut of services. The FFS system has lost popularity because insurance companies have no systems in place to prevent physicians from running up the costs for the services they prescribe. In the mid-1960s, insurance premiums began to rise significantly. This trend has

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continued at exponential rates in the 1990s. Another concern is that individuals who are not covered by group health plans are responsible for their own healthcare costs. In an era of uncontrollable costs, uninsured individuals may not receive any healthcare, a concern addressed by the Clinton administration.

In an attempt to bring down the costs of covering their employees' health insurance premiums, employers began to require higher contributions from employees to cover the cost of their healthcare benefits. These contributions came in the form of deductibles and percentage co-payments. Companies, realizing such contributions were not going to substantially control the rising cost of coverage, began using Health Maintenance Organizations (HMOs) to provide healthcare to their employees. Employers continue to press insurers to find more cost effective alternatives in providing healthcare to employees.

Health providers are turning to recruitment methods that target healthier employees while at the same time avoiding employees and retirees on disability programs or in long term nursing care facilities. Along with the cost-cutting measures used by many HMOs come questions regarding the potential tradeoffs that exist between managed care methods and the quality level of healthcare provided. In 1994, for example, a California business group published consumer satisfaction rating. Seventeen healthcare providers were graded from C- to A+ on services including doctor treatment and disease counseling. Most of the providers received B's and C's. Employees are given access to the ratings in choosing a provider. (*New York Times*, May 31 1995) "Health Maintenance Organizations never say they have the best heart transplant doctors in the country" (New York Times, May 31, 1995) In any event, employers and their insurance companies are pressuring healthcare providers to offer cost effective care without cutting quality corners.

Managed Care: A Definition

In 1993, the skyrocketing price of healthcare came to the forefront of legislative discussions in the US Although no formal changes were made to the laws surrounding healthcare in the US, reform of the healthcare system had already begun as a result competitive forces.

One of the forces that is increasingly helping to control escalating healthcare costs while maintaining the high expectations of healthcare delivery in the US is managed care. Managed care is an organized system which combines the delivery and financing of healthcare. Listed below are some of the major characteristics of a managed care system:

- *Each patient must have a primary care physician or a "gatekeeper."* A gatekeeper oversees the patient's entire compendium of medical problems or risk factors, maintains a long-term relationship with the patient, and is clinically competent to know when to refer a patient to a specialist.
- *Focus on preventative care not curative care.* Since the costs of curative/specialty care are so great, managed care emphasizes the prevention of health problems and provides financial incentives to hospitals and physicians to implement this concept. The financial incentives are carried out through the way payments are made to hospitals and physicians.
- *Payments to hospitals and physicians.* Eventually, managed care companies will pay providers a fixed payment per patient per month in exchange for efficient delivery of healthcare to all patients enrolled with the managed care company. Therefore, the provider retains the difference between the amount of fixed payments received from the managed care company and the cost of providing healthcare services. The effect of this payment methodology is to give incentives to hospitals and physicians to keep patients healthy by focusing on preventative care.
- *Review of physicians' and hospitals' medical decisions.* A review board, established by the managed care company, will examine physicians' and hospitals' medical decisions to ensure they are consistent with the goals of managed care as discussed above.

It is likely that in the near future, almost every consumer of healthcare will be a member of a managed care plan. For this reason, hospitals in the Pittsburgh area must quickly determine how they are going to prosper in this new environment. Through discussions with Roger Hunt, Senior Vice President of the Northwestern Health care Network (a network of ten Chicago hospitals), Beaufort Longest, Health Administration Professor at the University of Pittsburgh, and Norman Hummon, Organizational Sociologist at the University of Pittsburgh, we defined five major strategies that are implemented have been implemented in other university hospitals in the US The strategies are all oriented towards making university hospitals more competitive in the managed care environment. Brief descriptions of each strategy are listed as follows:

1) Internal Cost Reduction/Efficiency Improvement. This can be accomplished by reducing the number of administrators, managers, and/or staff. It can also be done by eliminating services or closing facilities. But the problem is that hospitals must find a way to cut overhead and at the same time become more efficient and deliver high quality care. Those that are able to accomplish this task will have the advantage of gaining contracts with managed care companies and in negotiating rates of payment.

2) Develop a Primary Care Network. The greater the number of primary care physicians that a hospital contracts or affiliates with, the greater the number of referrals it can receive. Since primary care physicians will act as gatekeepers, this will be the only way to get a large number of patients in your hospital.

3) Improve Outcomes. Although it is in the early stages of development, hospitals are beginning to measure how effective they are in delivering care. An example of a measurement of an outcome could be: the average number of times a patient needs follow-up care after surgery. The better the outcomes of a hospital, the more likely an insurance company is to develop a contract with that hospital.

4) Re-negotiate insurance contracts to a capitated arrangement. Recalling the definition of capitation, the insurance company will pay a fixed payment per patient per month to the provider. If a hospital has embraced the managed care concept of preventative care, then pro-actively seeking capitation arrangements with insurers allows them to capitalize on their delivery methods and gain a competitive advantage.

5) Teach Primary Care not Specialty Care. Historically, university/teaching hospitals have focused their academic efforts on specialty care. However, as managed care shifts the focus of healthcare toward primary care, teaching hospitals must react by changing their teaching methods. Also, teaching hospitals hire a large amount of their residents to their full-time staff. If teaching hospitals teach primary care, they will be able to hire primary care physicians and help attain the objective developing a primary care network.

University of Pittsburgh Medical Center

UPMC is composed of research and teaching based facilities: Presbyterian Hospital, Montefiore Hospital, Western Psychiatric Institute and Clinic, the Pittsburgh Cancer Institute, Falk Clinic, the Eye and Ear Institute, and the Schools of Health Sciences. UPMC has traditionally focused on curative care rather than preventative care. Alternately, the managed care environment, which is rapidly becoming the dominant form of healthcare in this country, stresses preventative care and tries to keep specialty services and higher cost procedures to a minimum. UPMC now faces the problem of determining the best strategy to cut costs and attract more patients in order to increase revenues.

Teaching hospitals across the United States have traditionally been funded by federal moneys. But current political pressures threaten the financial stability of teaching hospitals. Under the Republican budget cuts, funding for teaching hospitals could fall between 30% and 60%. Private insurers and managed care groups are forcing down healthcare rates and refusing to pay for training and research that does not directly benefit plan enrollees. (*New York Times*, May 15 1995)

A July 1993 survey in *US News & World Report* ranked the University of Pittsburgh Medical Center among the best in the following specialties: AIDS, cancer, cardiology, endocrinology, geriatrics, neurology, orthopedics, otolaryngology, and rheumatology. The magazine also cited that more than 100 UPMC specialists were listed among the best doctors in America. In 1993, UPMC had approximately 32,000 medical/surgical admissions. Of these, 48% came from outside of Allegheny County, where UPMC is located. About 15% came from out of the state.

The UPMC organ transplant program is the world's largest and busiest. One transplant is performed every 12 hours. The medical center performs the most liver and lung transplants, and implants more artificial hearts than any other institution in the United States. Approximately 60% of all inpatients (with the exception of intensive care units) are surveyed upon discharge. In addition, all patients in the following areas are surveyed: Emergency Department, Same Day Surgery, Intensive Care Units, and Ambulatory Care. On a five point scale from excellent to poor, the majority of areas within UPMC receive a "4", or "very good" rating (The Best Hospitals in America, 1993).

The University of Pittsburgh Medical Center is involved in 1,299 research projects totaling more than $599 million. Through research at the McGowan Center for Artificial Heart and Lung

Research, patients with end-stage heart disease are implanted with temporary heart assist devices as a bridge to the heart. UPMC patients are admitted either through physician's referrals, preferred provider organizations, the Emergency Department, or through Falk Clinic, the UPMC's outpatient facility. Patients without a physician will have one from the hospital staff assigned to them.

According to HCIA, Inc., a company that offers the data base of the national hospitals, included financial information(See Exhibit 1). We analyzed the financial status of UPMC by the data provided by HCIA. Indicators from 1 to 10 were ranked on the basis of the decile that the indicator fell into when compared with all hospitals in its state. A rank of "1" designates the top decile and presents the most favorable position for a hospital.

In Exhibit 1, the column of efficiency is measured by case mix- and wage-adjusted expense per equivalent discharge from the acute care unit of each hospital. Equivalent discharges are computed as total hospital discharges multiplied by an outpatient adjustment factor; this factor is calculated as the ratio of gross patient revenue to inpatient revenue. Profitability is measured by computing each hospital's total profit margin. Total profit margin is calculated as the difference between "total revenue" and "total expense," divided by "total revenue."

Exhibit 1. *Financial Comparison:*

Hospitals	Outpatient Revenue%	Operating Revenue	Profitability	Efficiency
Allegheny General Hospital	16	389.2	4	9
Children's Hospital of Pittsburgh	28	166.5	6	1
Forbes Health System	25	127.0	9	5
Harmarville Rehabilitation	12	38.6	6	1
Jefferson Hospital	28	125.8	8	8
Magee-Womens Hospital	23	139.9	5	5
Mercy Psychiatric Institute	14	198.8	5	8
Montefiore University Hospital	**23**	**204.6**	**7**	**10**
North Hill Passavant Hospital	35	73.2	6	4
Presbyterian University Hospital	**16**	**421.3**	**7**	**10**
Shadyside Hospital	13	205.7	6	9
The South Side Hospital	29	41.2	2	7
St. Clair Memorial Hospital	28	86.9	7	7
St. Francis Medical Center	16	183.0	6	9
St. Margaret Memorial Hospital	27	86.5	4	9
The Western Pennsylvania Hospital	18	217.3	6	9
Western Psychiatric Institute & Clinic	**7**	**171.0**	**8**	**1**

Source: HCIA, Profiles of U. S. Hospitals, c1994

From Exhibit 1, we find that the three hospitals of UPMC, Montefiore, Presbyterian, and Western Psychiatric Institute & Clinic, ranked 10, 10 , 1 respectively under efficiency and 7, 7, 8 under profitability when compared with other hospitals in Pennsylvania. The bottom ranks for Montefiore and Presbyterian under profitability and the low scores of all three hospitals under efficiency are indicative of the disadvantageous position of UPMC in the managed care environment.

Data Collection and Interpretation

Because the ANP gives the best results when a system is thoroughly represented, it is necessary to gather as much relevant data as possible so as to provide a realistic representation of the networks under observation. We determined that it was important to gather a large amount of data on hospital strategies from which we could select a few of the most realistic strategies for UPMC to adopt. From these strategies and our information sources, we then established the other clusters and elements that composed our networks.

To establish the interacting factors and clusters for the feedback networks, we reviewed a variety of articles from major medical journals including: Hospitals and Health Services Administration, Modern Health Care, Hospitals, Health Care Manage Review, Healthcare Financial Management, and Hospitals and Health Networks. We looked specifically for articles that pertained to university hospitals and strategic management. We were able to find articles that pertained to each of

our strategies. From these articles, we identified the major factors that would both affect and be affected by the strategies. From these factors we identified those that were relevant to UPMC's case.

Problem Structure

Our approach is to use 3 models which maximize the distinct sub-goals of benefits, costs and risks. The sub-goal of our Benefits model is to maximize the benefits to the UPMC by answering the question, what yields the greatest benefit?. The sub-goal of our Costs model is to evaluate which factors have the highest costs or pains. The sub-goal of our Risks model is to evaluate which factors have the greatest risk. The three are then synthesized at the end of the analysis to attain a benefits/(costs x risks) ratio for the overall value of each strategy. This comprehensive approach is necessary in order to successfully model the complexity of the given problem. Below is a diagram of our overall model structure (see Figure 1).

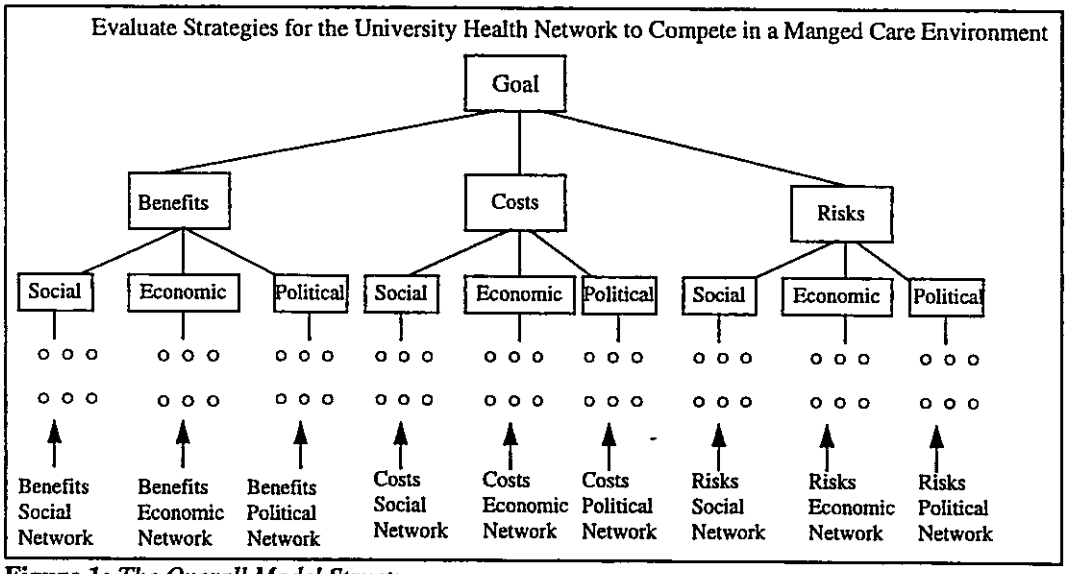

Figure 1: *The Overall Model Structure*

Control Criteria and Nine Feedback Networks

In the ANP a control hierarchy is necessary in order to make meaningful comparisons among network factors. The Economic, Political and Social control criteria provide a frame of reference within which the judgments are made. Each of the 3 models are evaluated under each of the 3 control criteria so that there are a total of nine feedback networks in which judgments must be made. These control criteria are general enough to encompass the wide range of factors influencing the success of the UPMC in a managed care environment. Under each control criterion, there is distinct supermatrix of impacts referred to as a network. To derive priorities for the control criteria, we pairwise compared them with respect to their importance under each of the sub-goals of benefits, costs, and risks. Based on the goal of successful competition in an increasingly managed healthcare environment, the economic factors were assumed to be the most important. The judgments are fairly consistent across the 3 models may be approximately summarized as follows for benefits, costs, and risks:

- the economic factors are very strongly more important than the social factors;
- the economic factors are strongly more important than the political factors;
- and the political factors are strongly more important than the social factors.

The priorities of the control criteria are shown for the three models in Table 1.

Table 1. *Priorities for the control criteria in the Benefits, Costs, and Risks models.*

	Benefits	*Costs*	*Risks*
Economic	0.6986	0.7417	0.7194
Political	0.2370	0.2185	0.1510
Social	0.0643	0.0668	0.0576

These weights are essential for computing the overall priorities of the strategies. The networks under the Economic criterion will have the most impact for all 3 models, followed by the Political networks, and the Social networks will contribute the least to the final priorities. In our opinion, to be more competitive and attract more clients, the UPMC will focus on the economic impacts of the alternative strategies. Although the social networks are modeled to show the extensive paths of social impact, the weights of these influences are less significant with respect to the goal being studied in this analysis. These priorities suggest that the overall rankings of strategies are influenced by the economic factors an average of 3.7 times more than the political factors and 11.5 times more than the social factors. Sensitivity of the results is explored at the level of the control criteria, by asking the question, "If our framework changes and the social and political factors gain in importance, how will the ranking of the alternatives change?".

Networks

Each of the models has a network of clusters underneath the control criteria so that the there are a total of nine networks (the 3 models times the 3 control criteria). The networks are similar in structure but are not identical. The connections between the clusters and their component elements are unique and express the important direct influences between elements. Indirect influences are captured by the overall flow of weight through the network. These unique connections and flow patterns give rise to what can be called a "profile" for each network. The clusters represented in the networks include: the important actors inside the UPMC, the alternative strategies, the consumers of healthcare, the variety of services, the quality of the UPMC functions, public relations, and internal stakeholders (see Table 2).

In the section below, we describe in detail the Economic Benefits, Costs and Risks networks and the results from each. Each section shows pictures of the cluster connections and the elements of the clusters, and explains the important connections and results for the given networks. Due to space limitations, the details of the analysis for the three Social and three Political networks are omitted and only the results are given.

Table 2. *List of Clusters and Elements. All the clusters do not appear in all 9 of the networks.*

Cluster Names	*Cluster Elements*
Clients	Businesses - employers who offer some type of health coverage plan to their employees.
	Consumers - individuals who purchase health coverage independently.
	Insurers - companies that sell health insurance plans and pay for insured medical costs.
Competition	Competitors - the other hospitals and medical centers, health maintenance organizations, and preferred provider organizations in Pittsburgh that directly compete with the UPMC.
Convenience	Time - general time involved in receiving care including time required for scheduling, travel to appointment, and wait times.
	Safety - the safety of the location for healthcare.
Internal Stakeholders	Physicians - the medical doctors working for the UPMC.
	Administrators - the planners, managers, and decision makers of the UPMC.
	Alliances - organizations outside of the UPMC (insurers, hospitals, physicians networks, etc.) who have strategic alliances with some aspect of the UPMC.
	Staff - the non-physician, non-administrator sector of the UPMC employees.
Public Relations	Public Relations - actions taken to improve the UPMC's public image through television, newspaper, and radio advertisement.
Quality	Specialty - the quality of the non-general health services.
	Diversity - the range of health services offered by the UPMC.
	Care - the quality of the general health services.
	Research - the quality of research performed at the UPMC.
Strategies	Improve and Measure Outcomes - measure how effective they are in delivering care and improving the outcomes to increase the attractiveness of the services.
	Capitation - negotiate insurance contracts to accept a fixed payment per patient per month.
	Develop a Primary Network - increase the number of primary care physicians affiliated with the UPMC to increase referrals and open primary care centers in the greater community.
	Internal Cost Reduction - general reduction in cost overhead through downsizing of facilities and employees and reduction of higher cost diagnostic procedures while maintaining or improving the current quality of care.
	Teach Primary Care - shift the focus of their teaching hospitals from curative specialty care to preventative primary care.
Variety of Services	Internal Medicine and Surgery - curative care including specialty services, procedures, and overnight hospitalization.
	Cancer Treatment - cancer treatment care.
	Outpatient Care - preventative care and shorter term medical treatment.

Clusters, Elements, Links and Judgments for the Economic Network Models

Clusters are collections of what are considered here to be relatively homogeneous elements. The elements are grouped based on some characteristics that they have in common such as being criteria that belong to a specific parent node in a hierarchy. Elements within each cluster are linked to elements in other clusters based on the influence between them. Clusters are linked to one another based on whether or not any elements within them are linked. If there are arrows in both directions between clusters, there is feedback influence occurring. The loop from one cluster to itself as shown by the white semi-circles indicates that there is influence between the elements within a specific cluster. The lines between the clusters in the macro view (shown below in Figure 1) indicate that some or all elements within an influenced cluster are compared for their importance with respect to some or all elements in the influencing cluster. If a cluster has a line with an arrow pointing to another cluster, it means that the latter influences the former. The pairwise comparisons for elements are performed using pairs of elements in the influencing clusters by asking, "What is the relative importance of the influencing elements on the element being influenced?" The pairwise comparison for clusters are performed by asking, "What is the relative importance of cluster A over cluster B with respect to the control criterion (in this case economic benefits)?"

The weights in the system are determined for the control criteria, clusters, and elements. First, each set of control criteria are weighted by pairwise comparison with respect to the overall goal of the model. Clusters are weighted by pairwise comparing every clusters impacts on every other cluster with respect to the control criterion in their network. Elements in each cluster are weighted by pairwise comparing them with respect elements which they are linked within their own cluster (inner dependence) or between clusters (outer dependence). Weights are composed from the top down by multiplying the weights of the control criteria times the weights of the clusters times the weights of the elements. Figure 2 gives a micro or expanded view of the clusters and their elements for the Economic Benefits network.

Once all of the weights have been determined for the control criteria clusters and elements in all of the networks, it is necessary to compute the benefits/(costs times risks) for the alternatives.

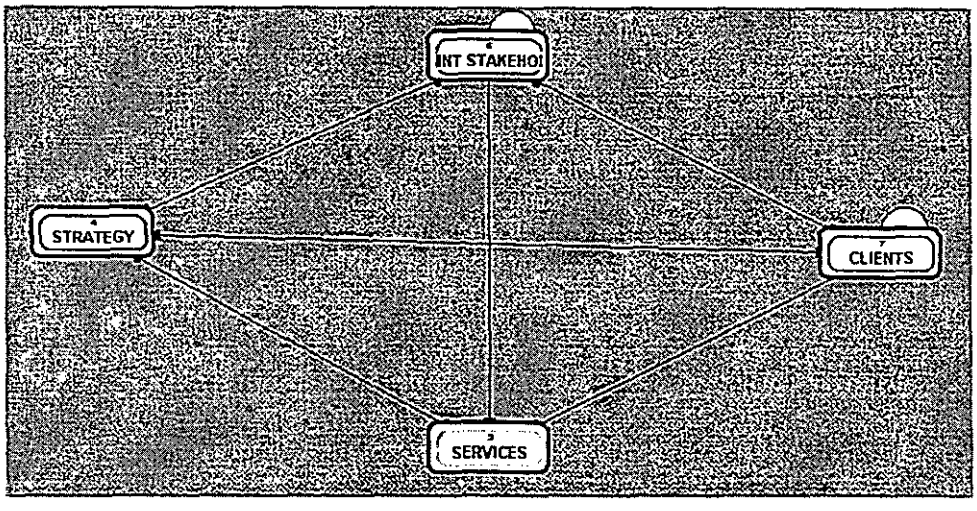

Figure 1: *Macro View of the Clusters of the Economic Benefits Network.*

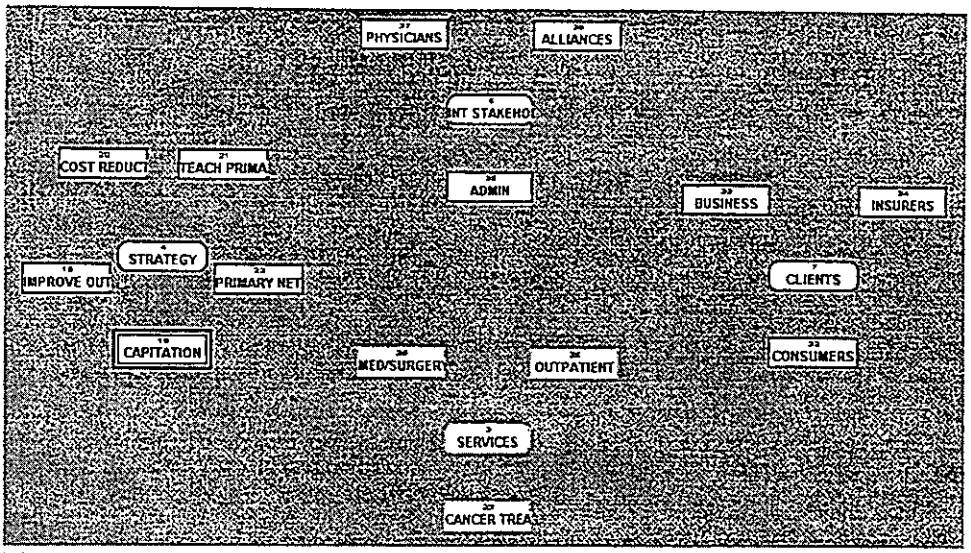

Figure 2: *Micro View of Clusters and Their Elements for the Economic Benefits Network.*

When viewing the Network from an economic perspective (economic perspectives adapted from interviews with Geary, DDI Consulting & Santana), strategies are influenced directly by internal stakeholders and insurers. An example of insurer influence to healthcare strategy formulation and economic benefits involves Desert Hospital in Riverside County. Hospital executives at Desert realized that they could be active in converting to managed care or wait until HMO's roll into town and tell them what to do. Desert decided to developed a primary care network strategy in response to potential insurer (HMO) demands. (*Hospital Magazine, 1991*)

Indirectly, business and end consumers influence the selection of strategy through demands for more cost effective services offered through the insurers they contract with. Alternatively, Strategies influence internal stakeholders and the type and level of services provided. For instance the strategy of developing a primary care network will shift the focus of services away from highly specialized care to preventative care. (Hunt, Northwestern Healthcare Network, Chicago) Additionally, selecting and implementing a Primary Care Network strategy will increase the number of referrals to the medical center, in turn boosting revenues.

Our comparison of strategies within the Economic Benefits network determined that developing a Primary Care Network carried the most weight. There is no disputing that economic considerations are the major consideration to healthcare providers in formulating strategies. Developing a Primary Care Network strategy responds to business and insurer demands for Managed Care and potentially "locks in" revenue for the medical center.

Economic Benefits Results

With respect to economic benefits, developing a Primary Care Network carried 34% of the local weight. Capitation came in second with 31% of the local weight. Successfully developing a primary care network will allow a healthcare provider the ability to pursue capitation arrangements with insurers (Hunt, Northwestern Healthcare Network, Chicago). Cost Reduction carried 18% of the local weight. Teaching Primary Care and Improving Measurement Outcomes both carried 8% local weights. Table 3 shows the local priorities for the Strategies under the Economic Benefits control criterion as well as the contribution to their global priorities.

Table 3: *Economic Benefits Results*

Strategy	Local Priority Under Economic Benefits Criterion (0.6987)	Economic Contribution to the Global Priority for the Benefits Model = (Local Priority * 0.6987)
Primary Network	0.3432	0.2398
Capitation	0.3081	0.2153
Cost Reduction	0.1826	0.1276
Teach Primary Care	0.0846	0.0591
Improve Outcomes	0.0816	0.0570

Economic Costs Clusters, Links, and Judgments

The Economic Costs network is composed of the following clusters: Strategies, Internal Stakeholders, Services, and Clients. We did not include a Competition cluster because it is difficult to estimate how UPMC's competitors' decisions will affect the medical center in economic terms. We did not include a Quality Cluster since it is uncertain whether quality will be improved or harmed based on the strategy(s) selected. The links and level of influence between clusters and individual elements are similar to those described in the Economic Benefits network in terms of Clients, Internal Stakeholders, and Strategies. The macro view is shown in Figure 3 and the micro view is shown in Figure 4.

Our comparisons of the strategies determined that Capitation had the most weight in this Network. This result is consistent with the fact that insurance companies and the business community's demand for more cost effective health plans is putting pressure on hospital management to incorporate standardized procedures to monitor the service provided and the amounts of reimbursement insurers will provide. Capitation poses the biggest economic obstacle to UPMC as the stakeholders ponder how they will stay profitable in the face of strong insurer demands. The managed care environment forces healthcare providers to cut costs, otherwise sacrifice profits, by restricting the amount of reimbursement insurance companies will pay. (*Self, May 1995*)

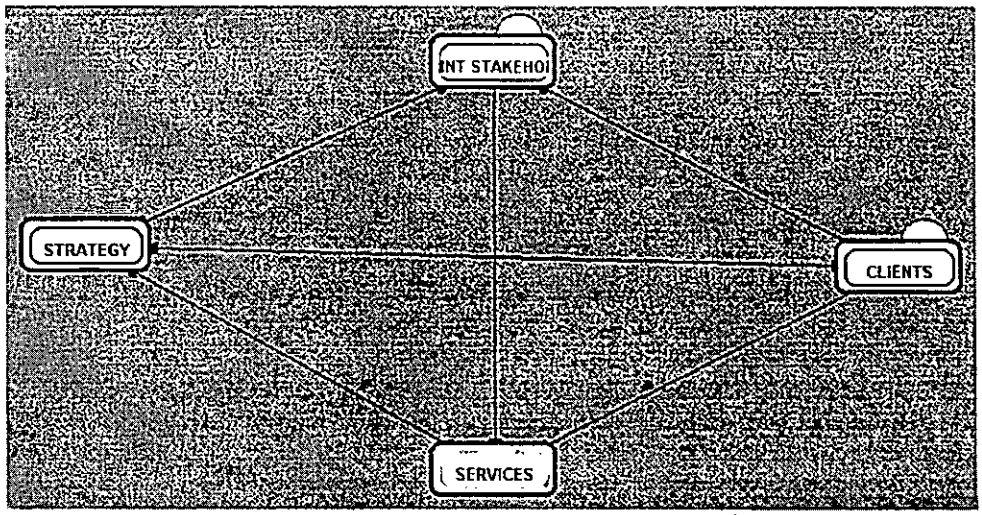

Figure 3: *Macro View of the Clusters of the Economic Costs Network*

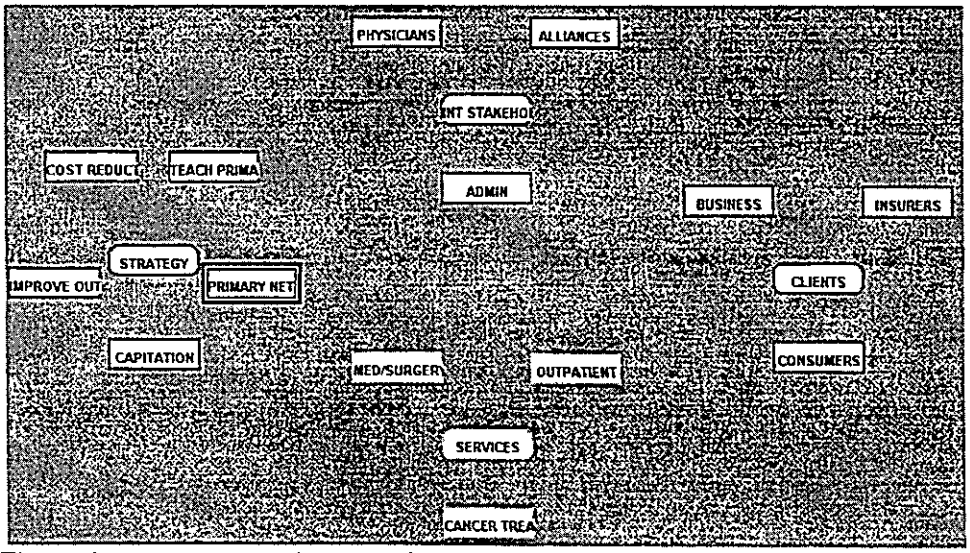

Figure 4: *Micro View of Clusters and Their Elements for the Economic Costs Network.*

Economic Costs Results

Table 4 shows the local priorities for the Strategies under the Economic Costs control criterion as well as the Economic contribution to their global priorities in the costs model.

Table 4: *Economic Costs Results*

Strategy	Local Priority Under Economic Costs Control Criterion (0.7417)	Economic Contribution to the Global Priority for the Costs Model = (Local Priority * 0.7417)
Primary Network	0.3119	0.2313
Capitation	0.3856	0.2860
Cost Reduction	0.0624	0.0462
Teach Primary Care	0.1107	0.0821
Improve Outcomes	0.1296	0.0961

With respect to Economic Costs, Capitation was found to carry 24% more weight than developing a Primary Care Network. Capitation and Primary Care Network carried local weights of 38.56% and 31.19% respectively. Improving Measurement Outcomes and Teaching Primary Care strategies carried local weights of 12.96 % and 11.07% respectively. The final strategy, Cost Reduction, carried a local weight of 6.24%. Cost reduction proved to be the lowest in relevance due to its internal focus as a strategy and not having as much impact from external influences.

Economic Risks Clusters, Links, and Judgments

The Economic Risks network consists of six clusters: strategies, internal stakeholders, clients, competition, quality, and services. The strategy cluster is linked to the remaining five clusters, which in turn, link back to the strategy cluster. This network contains more clusters and links than the other two economic models because of the degree of uncertainty surrounding the effects of implementing the different strategies. The additional links in this network were: competition and quality of care delivered. The macro view is shown in Figure 5 and the micro view is shown in Figure 6.

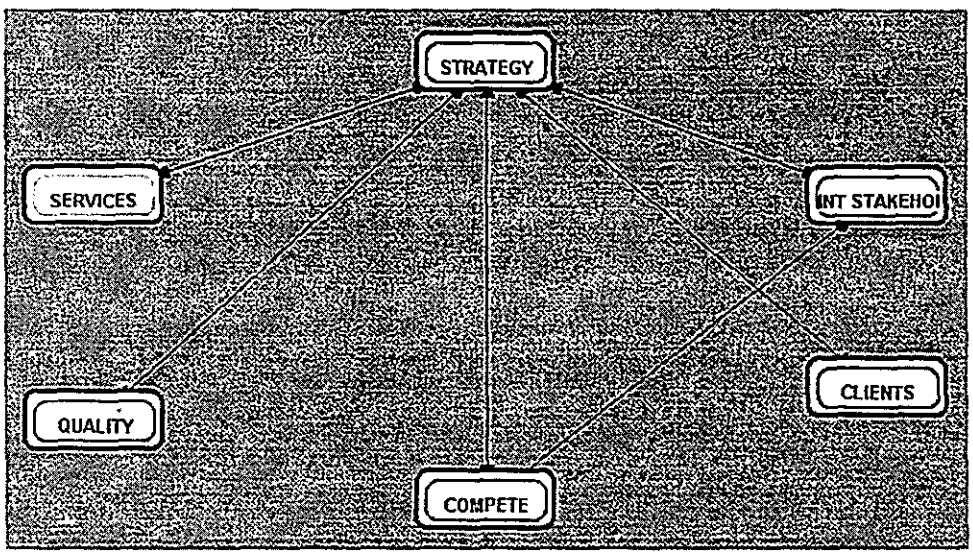

Figure 5: *Macro View of the Cluster Connections of the Economic Risks Network.*

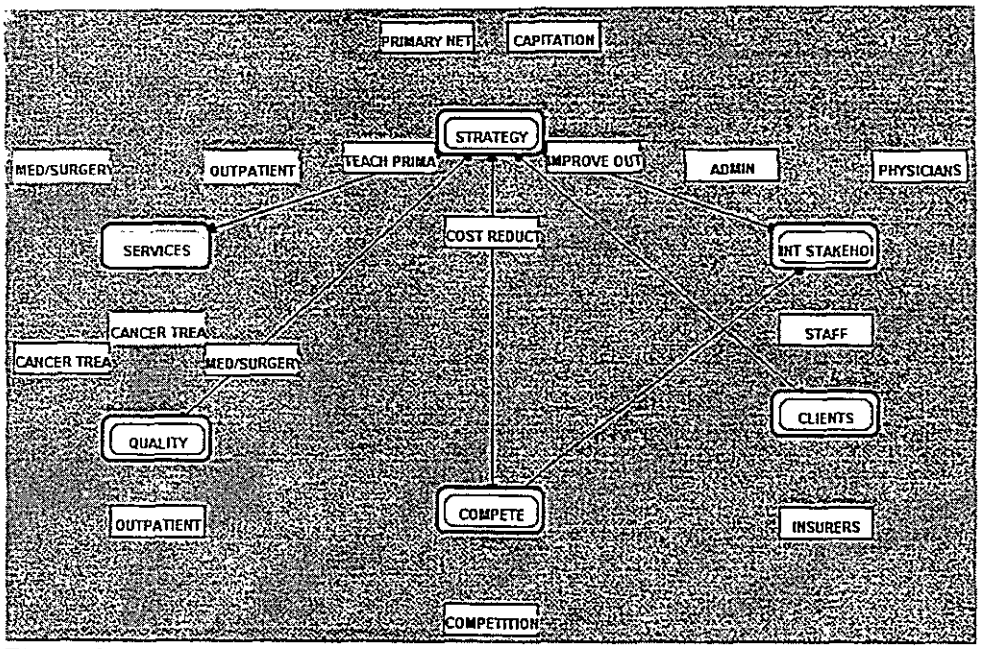

Figure 6: *Micro View of Clusters and Their Elements for the Economic Risks Network*

Since managed care is in the infant stages in Pittsburgh, UPMC and its competitors will be implementing various strategies at various points in time during the next few years. Due to the uncertainty of competitors' decisions, we believe that the competition cluster should be placed under the risks criterion and not under benefits or costs. We also placed quality of care under risks and not benefits or costs. Although UPMC must become more efficient in the managed care environment, it is uncertain whether they can maintain the same level of quality with fewer resources.

Economic Risks Results

Table 5 shows the local priorities for the Strategies under the Economic Risks control criterion as well as the contribution to their global priorities.

Table 5: *Economic Risks Results.*

Strategy	Local Priority Under Economic Risks Criterion (0.7194)	Economic Contribution to the Global Priority for the Risks Model = (Local Priority * 0.7194)
Primary Network	0.1161	0.0835
Capitation	0.4466	0.3213
Cost Reduction	0.2318	0.1668
Teach Primary Care	0.1157	0.0832
Improve Outcomes	0.0898	0.0646

The two largest risk local priority weights were: Capitation with 45% of the total priority and Cost Reduction with 23% of the total priority. Primary Network, Teaching Primary Care, and Improve Outcomes contained the following weights: 12%, 12%, and 8% respectively. Since the capitation concept has not yet been fully embraced by the Pittsburgh market, its impact is uncertain. It follows that this strategy has the highest weight as an economic risk. Although cost reduction will have economic benefits in the short run, it is uncertain whether UPMC can effectively compete with less resources. For this reason, it follows that a cost reduction strategy would have the second highest weight as an economic risk.

Economic Models Overall Results

Table 6 gives the three economic results for the strategies. We found that the strategy, Improve Outcomes, has a low level of benefits, but its costs and risks are so low that it becomes the best alternative when considering economic criteria.

Table 6: *Overall Results for the Economic Benefits, Costs and Risks Networks.*

Strategy	Economic benefits Priority	Economic costs Priority	Economic risks Priority	BCR Ratio for the Economic Criterion
Primary Network	0.2398	0.2313	0.0835	12.416
Capitation	0.2153	0.2860	0.3213	2.342
Cost Reduction	0.1276	0.0462	0.1668	16.558
Teach Primary Care	0.0591	0.0821	0.0832	8.652
Improve Outcomes	0.0570	0.0961	0.0646	9.182

The Political and Social network clusters, connections and priorities were determine in the same manner as described in detail for the Economic networks. Table 7 gives the overall political results. Again, Improve Outcomes appears to come out the highest. It is closely followed by Teach Primary Care and Cost Reduction.

Table 7: *Overall Political Results*

Strategy	Political Benefits Priority	Political Costs Priority	Political Risks Priority	BCR Ratio for the Political Criterion
Primary Network	0.0713	0.0606	0.0564	20.861
Capitation	0.0307	0.0342	0.0135	66.493
Cost Reduction	0.1053	0.0770	0.0207	66.064
Teach Primary Care	0.0160	0.0238	0.0388	17.327
Improve Outcomes	0.0137	0.0231	0.0216	27.457

Overall Social Results

Table 8 gives the overall results for the social network models. The best strategy relative to the social criterion is once again Improve Outcomes. It is closely followed by Primary Network. From the three Social networks, we determined that Improve Outcomes had the highest benefit and the lowest cost and risk. Capitation and Cost Reduction had low social benefits and high social costs and risks. The low priorities of Capitation and Cost Reduction are not surprising considering that these two strategies are clearly less oriented towards providing social benefits to the Clients or the Stakeholders.

Table 8: *Overall Social Networks Results*

Strategy	Social Risks Priority	Social Costs Priority	Social Risks Priority	BCR Ratio for the Social Criterion
Primary Network	0.0152	0.0006	0.0070	3619.1
Capitation	0.0055	0.0196	0.0166	16.904
Cost Reduction	0.0049	0.0300	0.0232	7.0402
Teach Primary Care	0.0100	0.0072	0.0059	235.40
Improve Outcomes	0.0287	0.0038	0.0049	1541.4

Final Results

Table 9 gives the overall benefits, costs, and risk results as well as the B/(C*R) ratio. The three sets of derived priorities are combined by dividing the benefits by the costs and the risks for the

alternative strategies to arrive at a single ratio number which expresses the overall utility of the strategies. This combination is meaningful because the derived priorities are ratio scales and the product and quotient of ratio scales is a ratio scale (Saaty, Fundamentals of Decision Making, p. 164).

We found that Improve Outcomes was the overall best alternative for UPMC to pursue. It is not extremely beneficial, but its costs and risks are low making it very attractive. Primary Network, Cost Reduction, and Teach Primary Care are all very close to one another in their priorities as strategies. Their priorities are similar because they overlap in the manner in which they are implemented. If UPMC is to pursue the Primary Network strategy, it must also reduce costs and teach primary care to its doctors and staff. Capitation was found to be an unattractive alternative at this point in time. Although its benefits are the second highest of the strategies, its costs and risks are very high which make it a strategy that should be pursued only if all else fails.

Table 9: *Overall Benefits/(Costs*Risks) Results*

Strategy	Benefits Global Priority	Costs Global Priority	Risks Global Priority	Benefits/(Costs* Risks)
Primary Network	0.3263	0.2925	0.1469	7.5939
Capitation	0.2515	0.3398	0.3514	2.1062
Cost Reduction	0.2378	0.1532	0.2107	7.3669
Teach Primary Care	0.0851	0.1131	0.1279	5.8829
Improve Outcomes	0.0994	0.1230	0.0911	8.8708

Sensitivity Analysis

When we increased the priority of the Social control criterion in carrying out sensitivity analysis, the BCR ratio for the Improve Outcomes strategy became even more dominant due to its relatively strong social benefits and low social risks and costs (see Tables 10 & 11). We performed a second sensitivity analysis where the relative importance of the Economic criterion was decreased below the other two criteria. In this analysis, Improve Outcomes received a similar boost in its overall BCR ratio. It is interesting to note that the both the top and bottom ranked strategies maintained their rank across the three analysis scenarios. However, the middle three strategies (Primary Network, Cost Reduction, and Teach Primary Care) underwent rank reversal. The Primary Network strategy dropped from second place in the initial results to fourth in the two subsequent analyses; this is due its high Economic BCR ratio and low Political BCR ratio. The results of the sensitivity analyses suggest that UPMC ought to poll all of its top decision makers on the importance of the control criteria; this step would insure the results are consistent with their organizational values.

Table 10 - *Overall Priorities of the Control Criteria for Three Analysis Scenarios*

Control Criteria	Overall Priorities	Priorities Adjusted for Increased Social Importance	Priorities Adjusted for Decreased Economic Importance
Economic	0.7309	0.5470	0.1094
Social	0.0639	0.3445	0.3090
Political	0.2053	0.1085	0.5815

Table 11 - *Benefits/(Costs*Risks) Ratios for the Three Analysis Scenarios*

Strategy	Benefits/(Costs *Risks)	BCR for Increased Social Importance	BCR for Decreased Economic Importance
Improve Outcomes	8.8708	17.2075	15.8346
Primary Network	7.5939	6.5195	4.3378
Cost Reduction	7.3669	6.8327	5.2058
Teach Primary Care	5.8829	7.7599	4.9601
Capitation	2.1062	1.3324	2.4378

Conclusion

The results of our analysis indicate that the strategy with the highest utility for UPMC is to Improve Outcomes. Developing a Primary Care Network strategy ranked second. Our recommendation for implementation is that UPMC develop action steps to (1) establish outcome measurement processes throughout their provider services, and (2) formally develop a primary care network in southwestern Pennsylvania.

We realize that the two selected strategies require extensive research and development on the part of the Medical Center. The first strategy, Improving Outcomes, provides the potential for the University to measure itself along all three control criteria used in this analysis. For example, hospital administration and surgical procedure outcomes could be measured along budgetary and quality baselines. Publishing outcomes measurements and subsequent improvement of services and procedures can be used to notify the public, internal stakeholders, and clients of the progress UPMC is making in becoming more effective in providing healthcare.

Developing a primary care network is a formidable task. UPMC has already begun establishing satellite facilities outside its main medical centers. Therefore, infrastructure exists in the direction of networks. Additionally, UPMC's alliance with Blue Cross and Blue Shield provides support and expertise when it begins planning for a primary care system that focuses on preventative treatments. Blue Cross and Blue Shield has already chosen UPMC as a preferred provider in its patient referral network. This fact alone, pushes UPMC further into competitive managed care position. (*Pittsburgh Post Gazette*, June 3 1995)

This team will provide a copy of our model and results to a UPMC administrator before the end of June, 1995. At this meeting we will discuss how this model and accompanying analysis can be used to advance UPMC's decision making process.

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