APPENDICES

Appendix A: Basis for Service Lines in Organizational Theory

A fundamental issue for large, multi-product or multi-service organizations is how to group jobs and responsibilities into an organizational structure. Although there are industry-specific variations in the terminology used to characterize the alternatives, organizations in both manufacturing and service industries face the same fundamental issue: whether to group individual jobs based chiefly on the function that individuals perform (i.e., the inputs of the organization) or on the product/service they provide (i.e., the outputs of the organization) (Szilagy and Wallace, 1983). In health care, organizing around the inputs to the care process yields a structure of departments, each consisting of individuals in the same discipline or profession. Organizing around a hospital's outputs creates service lines consisting of people in different disciplines and professions who have a common purpose of producing a comprehensive set of clinical services (e.g., heart care, cancer care). Before directly examining these alternative forms of organization in health care, it is important to understand the general theory of organization design.

A discipline/professional structure[4] groups jobs according to professional discipline or area of labor specialization. This is the traditional way to organize jobs. In manufacturing industries the disciplines or specialties correspond to the functions of research, design, manufacturing, marketing and sales. In health care, there are many more distinct disciplines and professions, such as nursing, social work, physical therapy, and pharmacy. Theoretically, the primary advantage of a discipline/professional structure is that it permits economies of scale through the pooling of resources within each department (Jennergren, 1981). It also allows individuals performing the same job to learn from one another for better productivity and greater professional identity and professional development (Charns and Tewksbury, 1993).

For multi-product organizations in manufacturing, a discipline/professional structure has substantial limitations. In particular, individuals whose combined efforts are required to produce any given product (e.g., those from manufacturing and sales) are separated organizationally, which can impede their ability to coordinate work efforts. Each department develops a focus on the function it performs and the inputs it provides to the organization without having a perspective on the totality of any product or service produced or the external consumers of those products or services. Also, discipline/professional structures present great information processing demands (Galbraith, 1973) for top managers, whose performance may be hampered by the vast amount of operating data they need to track and monitor.

The product/service line divisional structure offers a distinct alternative to the discipline/professional departmental design. Product line management has its roots in the manufacturing sector. After World War II, many U.S. manufacturing firms began to grow in size by diversifying into multiple lines of business (Fligstein, 1985; Hall, 1978; Williamson, 1975). Because traditional centralized structures based upon discipline/professional departments often proved inappropriate for managing this diversity, many firms reorganized job positions along separate lines of business. This entails the creation of distinct divisions for each particular product/service or set of related products/services. For example, General Electric created distinct divisions for each of its diverse areas of business activity, such as consumer products, industrial equipment, and capital equipment financing. Each division consisted of all of the professions and disciplines needed to develop, manufacture and sell the division's products.

In theory, the product/service line divisional design promotes effective working relationships and allows for greater role flexibility across disciplines and professions. Moreover, in a product/service line divisional structure, decision making typically is decentralized to the divisions, which reduces information-processing demands on top managers at the corporate level.

However, the product/service line divisional design has its own limitations. The most problematic is the loss of economies of scale due to greater difficulty in sharing staff and other resources among divisions. In addition, this structure fragments the organization among product/service lines, introducing competition and barriers to collaboration and coordination among the different divisions. This limitation is most critical when the work of the different divisions is highly interdependent, such as when they serve the same customers.

[4] This is commonly called "functional organizational structure" in the organizational literature. The more descriptive term "discipline/professional structure" was chosen for clarity in this report.

Theoretically the discipline/professional departmental structure and the product/service line divisional structure represent mutually exclusive alternative ways of organizing. However, Lawrence and Lorsch (1967) noted that organizations often require the attributes of both forms. They further noted that the need for integration of the disciplines and professions increases as the uncertainty of the organization's work increases. They observed that organizations used a variety of mechanisms to integrate the efforts of their diverse discipline/professional departments.

Galbraith (1972) built on the work of Lawrence and Lorsch (1967) to delineate further a variety of intermediate organizational structures that combined the features of the pure discipline/professional and product/service line forms. Galbraith (1972) conducted his work in the aerospace industry, which was characterized by a high level of uncertainty. Effective organizational performance required both state of the art contributions from experts in diverse disciplines and professions (inputs), and coordination of those contributions for optimal product design, manufacturing and sales (outputs). For example, Galbraith (1972) noted that in design of the Boeing 747 aircraft, complex tradeoffs were needed among the designers of different components, many of whom were working at the frontier of knowledge with new materials, design concepts, and manufacturing methods. These decisions could not be made independently of one another, nor independently of the needs and desires of the marketplace. Thus, to address the organizational requirements of maintaining specialization of each discipline and profession while attaining the required level of integration, organizations successively implemented intermediate structures.

Galbraith (1972) characterized these structures in terms of their increasing capacity to provide integration among the diverse disciplines and professions: liaison roles and integrators, integrating departments, task forces, teams and a formal matrix structure. Each structure provides to a different degree a mechanism for coordinating among established functional departments to accomplish product-related goals. For example, product teams comprised of staff from different discipline/professional departments can work together to design, produce, and market a product or family of products. Thus, both Lawrence and Lorsch (1967) and Galbraith (1972) noted that the design choices of discipline/professional departments and product/service line divisions were not the only alternatives, and that features of these organizational models could be combined.

Appendix B: Evaluation Methodology

VISN-level service lines

The development and analysis of case study data is very useful in understanding phenomena, such as service lines, that exist at multiple levels of analysis (Yin, 1994). This method is also appropriate for initial investigations because it can produce comprehensive descriptions of phenomena that were not previously well understood. The collection of case study data is driven by a structured protocol that specifies the topics and likely sources of information for the constructs of interest.

Thus, site visits were planned around interviewing key informants in each VISN who, by virtue of their positions, would be most likely to have the required information. These key informants typically included the network director, chief medical officer, chief information officer, chief financial officer, and any network-level service line directors or task force chairs. In 1997 site visits were conducted at all 22 VISNs. Interviews were conducted using a semi-structured interview guide [Appendix C] to ensure consistency with regard to scope and comparability for the interview topic domains. The interview guide focused on service line development and organization, other integrative efforts, and the change process in general. Specifically, questions concerned the development of network-level service lines (if any), how they were structured, service line directors' control over budget, service line activities, and perceived positive and negative effects. In addition, interviewees were asked about the utilization of other approaches to network integration, and how changes had progressed and been managed in the VISN.

Consistent with good interviewing practice, interviews were conducted by two members of the research team, one conducting the interview, with the other taking notes into an interview data entry document on a laptop computer. The presence of two interviewers provided a useful quality check, as both reviewed the interview notes for completeness and accuracy. When complete, interview notes were placed in a database program (Access), making it possible to search the database for interview responses that pertained to certain variables (e.g., service line budgets) or to certain networks. Thus, responses from multiple interviewees could be comparatively analyzed relative to specific interview areas or could be grouped for analysis by respondent role or discipline.

During the interviews, respondents often referenced documents such as strategic plans, organizational charts, and executive leadership committee agendas and minutes. Whenever possible, the interviewers obtained copies of these documents so that the data available for each VISN included not only interview notes, but also a variety of archival documents.

Site visits also included visits to two or three facilities within each VISN. These visits were designed to further our understanding of the interaction, if any, between facility-level and VISN-level service line development. Interviewees at the selected facilities included facility directors, associate directors, chiefs of staff, chiefs of nursing, and service line managers. Theoretical sampling guided the selection of the facilities for these visits. The principles of theoretical sampling suggest that variation in the sample can be obtained by purposive selection of cases that, based on theory, would be predicted to differ on the variable(s) of interest. Thus, within each VISN, facilities were chosen that were expected, based on characteristics such as size, location, and teaching status, to have different experiences with service lines.

During the fourth quarter of FY1998, follow-up site visits were conducted in a sampling of eleven VISNs. Sites selected for the 1998 visits were those in which much service line activity had been reported during the 1997 site visits plus a sample of the remaining VISNs. The interviews were conducted using a slightly modified version of the 1997 interview guide. Follow-up visits were also conducted in 1999. Sites selected in 1999 were those that continued to report high levels of service line development as well as those that had not been visited in 1998.

In addition, VISNs that had not been visited in 1998 or 1999 were interviewed by telephone to collect basic information about the clinical foci and organizational forms of current and planned VISN-level service lines. This enabled the research team to maintain the broad picture of what was developing in each VISN while also collecting detailed descriptive data from the selected VISNs.

Variables and analysis

The analysis of the interview data occurred in several steps. Short case studies of each VISN were developed, incorporating multiple perspectives from the interviews, as well as data from other sources pertaining to each VISN (e.g., VERA status, performance measures). In these case studies, emphasis was placed on not only describing how the organizational form of the VISN was developing, but also in representing the logic that appeared to underlie these developments. Data were also compared across VISNs, initially in summary tables that indicated the reported service line developments by each VISN. Generalized themes, such as the effect of reorganization on the professions, were also identified, through the process of constant comparative coding (Glaser and Strauss, 1967). Each theme, once identified, was looked for in subsequent coding, and also was used in subsequent re-coding of previously coded data. Data that suggested important areas to focus on in subsequent data collection were also highlighted as an input to other research steps, such as survey development.

An additional analysis of the interview data concerned the frequencies of positive and negative attributions about service line effects made by interview respondents in the ten VISNs visited in 1999. Two raters independently read each interview and coded positive and negative comments made by respondents about nine specific areas of possible service line impact that had emerged in the initial thematic coding described above. These nine areas were: guideline implementation, uniformity of care, care coordination, cost and utilization, access and enrollment, communication, reduced competition, enhanced attention to professional issues, and staff motivation. For example, if the interviewee said "transfers of patients between facilities is easier to accomplish," the care coordination category was coded positive. Additional positive comments by any individual interviewee did not increase the value of a category. Coding of negative attributes was treated similarly. Negative comments did not cancel out positive ones. Thus, for each interview, each category was coded in two ways: a positive comment was or was not made, and a negative comment was or was not made. Discrepancies between the two coders were resolved through coding conferences. For each interviewee the total number of categories having positive responses was tallied, and the total number of categories having negative responses was also tallied. The average numbers of positively coded categories and negatively coded categories were calculated for each VISN by averaging the number of positive and negative tallies from the set of interviews from that VISN.

Facility-level service lines

Our initial information on service lines at the facility level was derived from the facility interviews conducted during the site visits described above. Given that the site visit data represented only a sampling of facilities, our next step was to collect systematic data on service lines in all facilities. Since site visit data revealed that more service lines were in primary care and mental health than any other clinical area, we focused our efforts and analysis on those two clinical areas. While there were also many service lines in extended care/geriatrics, they were less prevalent than primary care and mental health and there was not agreement on appropriate outcome measures for them.

A telephone survey instrument, designed for administration to facility directors or their designees, was developed and pilot-tested in a sample of facilities. Facility directors were asked to report any service lines in operation at their facilities, and in cases where mental health and/or primary care service lines existed, to refer the interviewer to the corresponding service line manager for further specific information about the service line. One difficulty noted in the pilot administration was in establishing telephone contact with survey respondents; this turned out to be extremely labor-intensive. Data from the pilot surveys were compared with information obtained in 1997 facility site visits as a quality check. There were many mismatches in reports about whether or not service lines existed in a particular clinical area. Through subsequent inquiry, clarification of these mismatches revealed that the pilot survey data were consistently faulty.

From this, we learned that reliable responses could not be obtained if managers were simply asked to identify "service lines." The reason for the lack of reliability is that the term "service line" is not used consistently, and an organizational arrangement that some individuals would identify as a service line, others would not. In particular,

some individuals did not consider the appointment of service line managers, task forces or teams to be service lines; for them, only service line divisions were true "service lines."

However, we were interested in investigating the whole range of service line forms theorized on the Charns and Tewksbury (1993) continuum. Therefore, as shown on the first page of Appendix D, we defined and used the term "interdisciplinary organizational arrangements (IOAs)" in our survey in order to avoid the particular connotations of the term "service line." After limited pilot testing of this new form, which was designed as a mail-out, fax-back survey in order to maximize participation, the new survey was implemented.

Survey implementation

Between October and December of 1998, the survey (Appendix D) was sent to the directors of all 144 VHA facilities, along with instructions to fax the survey back to the investigators. Non-respondents were called and asked to return their surveys. 143 of the 144 surveys were returned. Three sites were removed from the sample because they were atypical or were outliers. Thus, 140 sites were available for analysis. Structural characteristics of facilities differed in terms of size, teaching status and facility type.

From the facility survey, we were able to collect detailed information regarding mental health and primary care service lines, respectively. As shown in Appendix D section 3, respondents were asked, "Is there a manager resposible for the primary care interdisciplinary organizational arrangement (PCIOA)?" and "Is there a team (i.e., dyad, triad, or quadrad) or committee responsible for management of the PCIOA?" A dichotomous variable was created, with 1 indicating existence of a service line[5] if respondents indicated a primary care IOA in section 1 and said in section 3 that they had either a manager or a team or committee responsible for the service line; otherwise it was coded 0. An analogous process was used to code the mental health IOA data.

To determine the classification in terms of the Charns and Tewksbury (1993) continuum of a mental health or primary care IOA in a particular site, we asked respondents to identify who was responsible for evaluations of key staff in the service line (See Appendix D). These staff were physicians, nurses, social workers, psychologists (in mental health) and clerical staff (medical administration service). From the literature, we anticipated that the reporting relationships and thus the evaluations would be consistent among the different personnel in a service line and that the information on evaluations could be mapped to the continuum as follows:

Evaluation	**Charns & Tewksbury Continuum Value**
Discipline responsible without input from service line	2 - 4 service line manager through task force
Discipline responsible with input from service line	5 - 6 reorganize departments through team
Discipline and service line jointly responsible	7 matrix
Service line responsible with input from discipline	8 modified service line division
Service line responsible without input from discipline	9 service line division

[5] Throughout this document, the term service line is used to denote any interdisciplinary organizational entity focused on a specific area, ranging from temporary task forces to divisions with line and budget authority. Although this is broader than the VHA definition of service lines, it is consistent with the other term we have used, interdisciplinary organizational arrangement (IOA), and is also consistent with common usage of the term outside VHA. The term IOA appears in this report only in the discussion of survey items and responses in which this specific language was used.

Since the sample size of 140 sites limited the number of variables that could be entered into the analysis, continuum scores were aggregated into three service line groups in addition to no service line:

2-4 Service line manager/task force (Hereafter referred to as "task force")

5-7 Team/matrix (Referred to as "team")

8-9 Divisions

These were represented by three dichotomous variables, with the reference group being no service line.

We also used dichotomous variables to indicate the relative duration of each service line. Respondents were asked to give the date when the original service line manager (if there was one) was appointed and the date when a team/committee (if there was one) was first convened (See questions 17 and 19 in Appendix D). The earlier of these two dates was used as the start date for the service line.

Although the data from the facility survey were compiled in December, 1998, we were interested in relationships between service lines and outcomes from FY98. Therefore, if a service line had not been commenced by October 1, 1997, corresponding to the beginning of FY98, it was not considered to be a service line for purposes of our analysis. As a result, all service lines analyzed in this project had been implemented at least by the beginning of FY98 and 7 months prior to the index patient visit for the patient satisfaction data (see following section). In addition, because the duration of the service line might also influence the effect on outcomes, service lines were further categorized as "longer duration" (LD) or "shorter duration" (SD). LD service lines were those that had been implemented prior to May 1, 1996. This date corresponded to 24 months prior to the index patient visit for the patient satisfaction data, and 17 months prior to October 1, 1997. SD service lines were those implemented on or after May 1, 1996 and before October 1, 1997.

Finally, we also asked who controls the service line personnel budget (For example, see question 23 in Appendix D). For each service line this was coded as a dichotomous variable, with 1 indicating that the service line manager controls the personnel budget and 0 otherwise.

Survey data analysis

Organizational data were initially analyzed to construct the service line continuum scores. Of the initial 110 sites that were identified as having primary care service lines in December 1998, 37 sites had implemented their service lines since October 1, 1997. These were re-coded as having no service line. Of the remaining 73 sites, responses to evaluation of personnel for the four different disciplines were completely consistent in only 20 sites. In some cases, only one discipline differed from the others by a single point. In other cases two or more disciplines had responses as different as 1 (evaluation done by discipline only with no input from service line) to 5 (evaluation done by service line with no input from discipline). We developed a set of decision rules to determine the continuum score from the four evaluation items (See Appendix E). When there was a discrepancy among the scores that we could not resolve in any theoretically consistent manner, we coded the continuum value as "mixed." This was reflected in an additional dichotomous variable coded as 1 for mixed and 0 otherwise. A similar categorization process was used for the sites reporting mental health service lines.

Relationship between facility-level service lines and outcomes

In addition to describing and quantifying the development of service lines at the facility level, one of our main goals in this study was to determine whether service line management is more successful in achieving the goals of VHA than are other management strategies.

Development of measures

The assumption that underlies our evaluation of the effect of service lines is that the goal of the VA health care system is to improve patient care and outcomes. Thus, if service lines are in fact more successful in achieving VHA's goals, facilities that have implemented service lines should have better patient-centered outcomes than do facilities without service lines. Thus, to assess the effect of service lines, we should judge them based on outcome measures that reflect VA health care system goals. We believe that the general VA goal of improving patient care is translated into specific, measurable outcomes by the network directors' performance standards. Thus, to develop outcome measures, we examined all performance standards for correspondence with two criteria we deemed necessary for this study. First, for feasibility of repeated evaluation over time, outcome measures should be available in administrative databases. Second, there should be clear mechanisms by which the organizational structure of service lines would affect these measures. Outcomes that would not be affected by service line implementation would not be good measures by which to judge service line performance.

For both mental health and primary care service lines, evaluation outcome measures were chosen that were related to the performance standards, were accessible through administrative databases, and could be affected by the implementation of service lines. The outcome measures selected for analysis are listed below. "NDPS" indicates those measures that are Network Directors' Performance Standards. All other measures used are derived from concepts embedded in the NDPS. For example, both discharge rate and multi-stay rate are linked to overall bed days of care.

Primary Care and Mental Health Service Line Outcome Measures

Primary Care Service Lines	Mental Health Service Lines
1. primary care enrollment (NDPS)	1. total acute bed-day rate (NDPS)
2. acute bed-days of care (NDPS)	2. acute psychiatric bed-day rate
3. proportion of users with at least one hospitalization	3. proportion hospitalizations without prior primary care visit within 30 days
4. discharge rate	4. proportion hospitalizations without primary care visit within 30 days after discharge
5. multi-stay rate	5. 30 day readmission rate
6. ambulatory care sensitive condition hospitalization rate	6. urgent care visit rate
7. specialty visit rate	
8. urgent care visit rate	
9. urgent care visits per total visits	
10. customer service standards (NDPS) - includes 8 measures of patient satisfaction	

Data on outcome measures #1 through #9 for primary care services lines and #1 through #6 for mental health services lines are available at the facility level through administrative databases housed in Austin, Texas. Databases used in the analysis included the Outpatient Clinic File (OPC), and the Patient Treatment File (PTF) for inpatient data.

For the primary care outcome measures, a cohort of all unique users of VA health care services during fiscal years 1997 and 1998 was constructed. Users were excluded if they did not reside in the 48 contiguous states or Puerto Rico. No inpatient VA facilities are available in Alaska or Hawaii, and thus there are no measures of inpatient use by veterans for these facilities. In addition, all non-veterans were also excluded.

For the mental health outcome measures, we defined a cohort of all unique users of VA mental health services for fiscal years 1997 and 1998 using the above criteria, with the additional requirement that the veteran had used VA mental health services. Thus, to be included in the cohort, users must have had at least one hospitalization that included a stay in a psychiatric bed section, or 3 or more outpatient clinic visits to a psychiatric clinic.

Data for outcome measure # 10 for primary care service lines were obtained from the annual survey of veterans conducted by the VA National Performance Data Feedback Center (NPDFC). The NPDFC ambulatory care satisfaction questionnaire is a paper-and-pencil self-report instrument designed for mail administration and is an adaptation of an instrument developed by researchers at the Picker Institute (Cleary, Edgman-Levitan, Roberts, Moloney, McMullen, Walker and Delbanco, 1991) and widely used in the private sector. The questionnaire consists of 70 multiple-choice items plus an open-ended comment solicitation. These items represent 10 dimensions of ambulatory care: access, emotional support, [attention to patient] preferences, information/education, continuity of care, visit coordination, overall coordination, courtesy, specialist care, and pharmacy. The last two dimensions were not used because they were new survey areas in 1998 and thus no change could be computed, and also because they are not conceptually related to the existence of a primary care service line.

Scale construction, selection criteria, sample sizes and methods of distribution of the customer satisfaction survey are reported in Appendix F. An overall response rate of 70% was attained. The patient satisfaction measure could only be used to assess primary care service lines, as the patients surveyed had not necessarily made any use of mental health services.

Analysis

We used multivariate regression analysis to assess whether facilities with service lines had greater improvements in these outcome measures than did facilities without service lines. The dependent variable in each regression model was the change in a facility-level outcome measure between FY97 and FY98. We chose to use the change in outcome measures for a few reasons. First, many of the network directors' performance standards are written in terms of improvements in the standards (e.g. increase in primary care enrollment). In addition, using the change over time in outcomes allows us to control for the fact that different facilities had previously obtained different levels of achievement in these outcomes. Using change measures, we can control for starting levels, and thus better determine the effect of service lines. In all, 23 outcome measures were analyzed: 17 to assess effects of primary care service lines and 6 to assess effects of mental health service lines.

Regression analyses were done for each outcome variable using two different sets of explanatory variables. Explanatory variables included both service line presence and characteristics. The first analysis simply compared the change in outcome measures in facilities with and facilities without a service line. The second analysis explored the effect of service line characteristics and duration on the outcome variables measured. From the survey (see preceding section, "Survey implementation," for categorization of service lines to continuum scores), each facility service line was categorized as a task force, a team, a division, or mixed. In addition, each service line was categorized as short duration (SD) or long duration (LD). Thus, for the second analysis of each outcome variable, facilities were categorized as having no service line or having one of 8 types of service lines (4 categories of service line form x 2 categories of duration). Theory predicts that organizational units which control their own budget may have better performance and cohesion than units that do not have budget control. Thus, in this analysis, a variable indicating whether the service line manager controls the personnel budget was also included.

Previous research has shown that various organizational characteristics affect VA medical centers' performance on patient outcome measures. Since we want to isolate the effects of service lines, a number of control variables were also included in the regression analyses. The data for these variables were obtained from internal VA databases. Control variables included structural data regarding hospital characteristics of size, teaching status, hospital type, geographic location and VISN financial change. Size was coded in terms of number of inpatient beds. Facilities were regarded as being a teaching facility if the hospital was a member of the council of teaching hospitals. Hospital type indicated whether the facility was a general hospital, psychiatric hospital and/or residential facility. The geographic locations of facilities were indicated by variables for the northeast, mid-west, south and west regions. Recent financial changes were captured by variables indicating whether the VISN in which a facility was located had gained or lost 5% of VERA (Veterans Equitable Resource Allocation System) allocation between FY97 and FY98. Finally, the following patient characteristics were included as facility level averages: age, gender, race (white vs. non-white), SF12 physical component score, and SF12 mental component score.

All regression models were tested for heteroskedasticity using White's test, and White heteroskedastic-consistent standard errors and covariance were calculated where necessary.