# Integration and the performance of healthcare networks: do integration strategies enhance efficiency, profitability, and image?

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## Abstract

**Purpose:** This study examines the integration effects on efficiency and financial viability of the top 100 integrated healthcare networks (IHNs) in the United States.

**Theory:** A contingency- strategic theory is used to identify the relationship of IHNs' performance to their structural and operational characteristics and integration strategies.

**Methods:** The lists of the top 100 IHNs ranked in two years, 1998 and 1999, by the SMG Marketing Group were merged to create a database for the study. Multiple indicators were used to examine the relationship between IHNs' characteristics and their performance in efficiency and financial viability. A path analytical model was developed and validated by the Mplus statistical program. Factors influencing the top 100 IHNs' images, represented by attaining ranking among the top 100 in two consecutive years, were analysed.

**Results and conclusion:** No positive associations were found between integration and network performance in efficiency or profits. Longitudinal data are needed to investigate the effect of integration on healthcare networks' financial performance.

## Keywords

**integrated healthcare networks, organisational performance, clinical efficiency, financial performance**

## Introduction

In recent years the changes in the environmental climate have led to a redefined mission for medical care organisations. From economic, political, and social perspectives, the ecology of health services organisations has evolved from that of fragmented independent entities into functionally integrated organisations. Health care studies have drawn on economic and organisational theories to discuss the potential benefits of integrated organisations [1–3]. Among the presumed benefits are better quality of care, better services, more accessibility, enhancing products, strengthened customer relationships, more efficient operations, and reduced unit costs.

Recent major trends in health care systems have been, first, to provide all elements of the care continuum from health insurance, outpatient and inpatient services to long-term health maintenance, and second, to develop system-wide integration of administration, clinical care, information technology, and financing. Those have not only tried to integrate multiple organisations through partnerships, but have also integrated internal functions—a step that is encouraged as an integrated healthcare delivery system tries to show its unique values as an advantage over competitors.

Even as this trend has proliferated, a consistent and universally agreed-upon definition of integrated care delivery system has been lacking. The concept of an integrated care system is an ideal. In March 1998, the SMG Marketing Group [4] defined an integrated healthcare network as "an organisation, which, through ownership or formal agreements, aligns health care facilities in order to deliver integrated healthcare services by improving quality and reducing costs to a defined geographic area''. Using their IHN rating system, the SMG Marketing Group identified 100 integrated healthcare networks (IHNs) as America's most integrated systems in terms of hospital utilisation,

contractual capabilities, financial position, physicians, services and access, and system-wide integration. The list was published in *Hospitals and Health Networks* [4]. Evaluation of IHNs has continued during the past three years. In addition to the six dimensions first used as evaluation criteria, the category of outpatient utilisation has been included to emphasise an integrated system's level of integration and ability to offer a full continuum of care. Of the 100 leading integrated healthcare networks listed in 1998, about 65% are repeated in the 1999 list and 47% in 2000. Those systems ranked as highly integrated are proud to be providing a full range of patient care and are committed to continuing their integration [5, 6].

However, one must ask whether such efforts to integrate through external partnerships and also to integrate internal functions yield demonstrable benefits to medical providers as well as to patients. An example that raises this question is the Detroit-based Henry Ford Health System, which now owns a managed-care plan, hospice programs, and ambulatory care networks at more than 70 sites, and has an internally integrated structural design that includes centralised decision making, care integration, integrated information technology, and integrated purchasing. This system ranked 24th on the list of America's most integrated healthcare networks in 1998; it rose to the rank of 3rd on the list for 1999, and is recognised as a successful integrated system. However, the financial records show that it lost $43.8 million in 1998, as compared to a net income of $38 million in 1997. Moreover, by 1999 the Henry Ford Health System has announced that it would cut its work force by 425 employees [5].

Using structural equation modelling, this study undertakes to demonstrate whether or not IHNs' efforts to provide a full continuum of care, to co-ordinate care through case management and disease management programs, and to achieve information integration at the system level have improved their efficiency and profitability when their structural and operational characteristics are simultaneously considered. In addition, the factors affecting the likelihood of being ranked among the top 100 IHNs in two consecutive years (1998 and 1999) are investigated.

## Related research

Scott [6] and Luke and Begun [7] state that health care managers choose services and design systems to maximise effectiveness and efficiency. They also state that the organisation's strategy should be consistent with both external environmental demands and the organisation's core capabilities and competencies.

To what extent different strategies affect organisational performance is not well understood.

Lin and Wan [8] classified the strategic directions of an IHN into three categories, as suggested by Hofer and Schendel [9] in their analysis of organisational strategies: 1) an IHN's corporate strategy, enlarging the network size; 2) business strategy, venturing into non-hospital services; and 3) functional strategy, integrating information systems and financial arrangements for co-operative purchases. A missing piece of functional integration is clinical integration, which is a prerequisite of a fully integrated delivery system. To date, efforts have been made to deliver co-ordinated care through case management and disease management. However, a truly integrated delivery system should optimise its functions by performing structural (administrative and managerial), clinical, informatic, and financial integration [10].

Shortell and his associates [11, 12] conducted a Health System Integration Study of twelve integrated delivery systems. Intensive site visit interviews were conducted in each system. The authors found a moderate level of integration overall, particularly in culture, financial planning, and strategic planning. The levels of physician-system integration and clinical integration, however, were low. Information system and non-clinical support activities were seen to have the least integration. From Spearman-rank correlation analysis, significant associations were reported among structural integration, physician-system integration and clinical integration. The study also found a positive relationship between perceived integration and perceived effectiveness. From their findings, Shortell and his associates argue that there are eight major barriers to greater levels of integration: 1) failure to understand to the new core business, 2) inability to overcome the hospital paradigm, 3) inability to convince the ''cash cow'' to accept system strategy, 4) inability of the board to understand the new health care environment, 5) ambiguous roles and responsibilities, 6) inability to ''manage'' Managed Care, 7) inability to execute the strategy, and 8) lack of strategic alignment.

Bazzoli and her associates [13] examined the relationship between organisational structure and financial performance in 1047 health network hospitals and in 1112 health system hospitals. They found that hospitals in health systems with single ownerships generally had better financial performance than hospitals in contractually based health networks. Among health network hospitals, those belonging to highly centralised networks had better financial performance than those belonging to more decentralised networks. However, of the three types, health system hospitals in moderately centralised systems performed best—i.e.
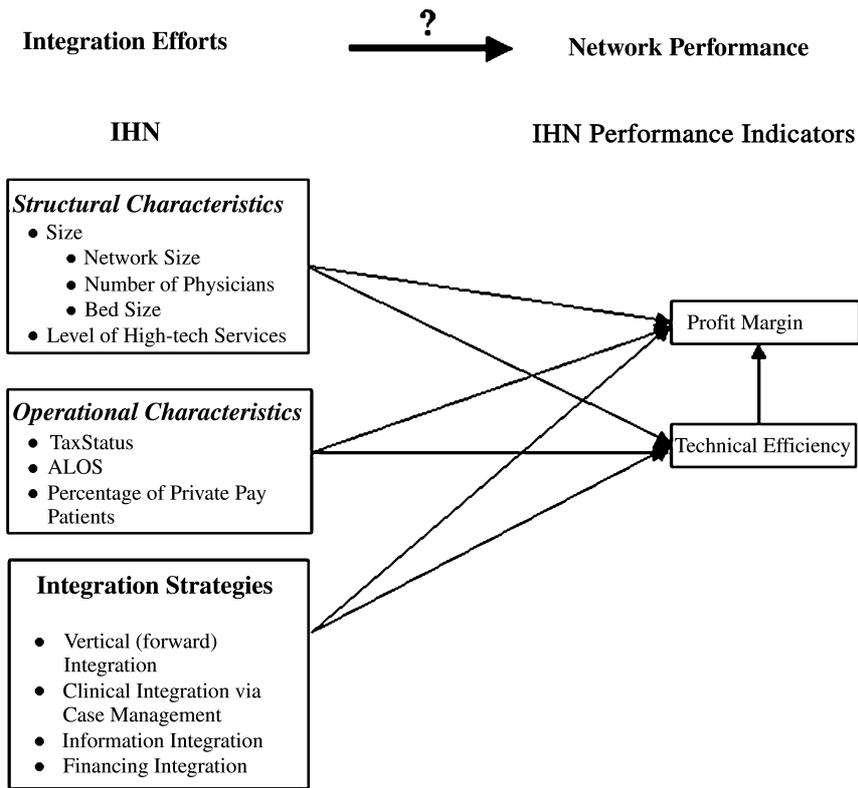
**Figure 1**. A conceptual framework of IHNs' integration strategies and performance.

better than those in highly centralised systems. Hospitals in networks or systems with little differentiation or centralisation had the poorest financial performance.

Figure 1 shows a conceptual model for assessing the effect of IHNs' integration on performance with respect to efficiency and financial viability. The predictor variables of IHNs' performance are categorised into structural characteristics, operational characteristics, and integration strategies. This formulation enables us to examine the net influence of integration strategies on efficiency and profitability when the effects of INHs' characteristics on performance indicators are statistically controlled.

## Methods

The study analysed the 100 integrated healthcare networks that were listed in *Hospitals and Health Networks* as America's 100 most integrated health systems [4] in terms of hospital utilisation, contractual capabilities, services and access, physicians, financial positions, and system-wide integration. An IHN's organisational structure is characterised by its network size, number of affiliated physicians, acute care bed size, and the level of high-tech services provided (see Table 1 for the variable definitions). The operational

characteristics refer to tax status (for-profit vs. not-for-profit), the average length of stay in acute care hospitals, and the percentage of private patients admitted to hospitals. Integration strategy refers to an IHN's efforts to provide a continuum of care (e.g. forward integration), expand services to cover both inpatient services and non-hospital based services, emphasise the co-ordinated care with case and disease management, and implement information technology and systems. Because all of the IHNs studied had already established administrative and financial integration, these two integration strategies are not included in the present analysis.

Two performance indicators are used: 1) the efficiency score computed by the weighted input and output ratio, derived from Data Envelopment Analysis (DEA); and 2) profit margin computed by the ratio of net income to net operating revenue. DEA is a linear programming procedure designed specifically to measure relative efficiency in situations where there are multiple inputs and outputs [14]. The DEA method draws a production possibilities curve or data envelope from a combination of unit inputs and outputs. This curve is also called the efficient frontier. The IHN located on the frontier is considered technically efficient and has an efficiency (Iota) score of one. The variable return to scale model is used to compute

**Table 1.** Definitions of the study variables

| Variables | Definition |
|---|---|
| **IHN's characteristics:** | |
| (**Exogenous variables**) | |
| **Size** (latent variable): | |
| **Network Size** | The total number of facilities within an IHN. |
| Number of physicians | The total number of affiliated physicians within an IHN. |
| Bed size | The total number of acute care hospital beds within an IHN. |
| **Tax status** | Profit status of an IHN, code "0"=for-profit, "1"=not-for-profit. |
| **High-tech services** | The average number of high-tech services of a hospital in an IHN, adjusted by the square root of member hospital size. Fourteen specialised services are counted: breast care screening/mammograms, cardiac catheterisation laboratory, extracorporeal shock-wave lithotripter, HIV-ADIS services, oncology services, open-heart surgery, radiation therapy, computed-tomography scanner, diagnostic radioisotope facility, magnetic resonance imaging, positron emission tomography, single photon emission, ultrasound, and transplant services. |
| **ALOS** | ALOS: The ratio of total short-term, acute care patient days to total short-term, acute care admissions, severity-adjusted using the Medicare case mix index. |
| **Integration strategies:** | |
| **Vertical integration** (**forward**) | The number of non-hospital-based, medical service facilities in an IHN, such as nursing home, home health care, outpatient surgical centre, diagnostic imaging centre, hospice, etc. |
| **Clinical integration** via case management and disease management | Whether an IHN has integrated disease management, integrated case management, both, or neither: Score 2=both integrated disease management and case management. Score 1=either integrated disease management or case management. Score 0=none. |
| **Information integration** | Whether an IHN has an integrated information system or is working toward the integration of its information systems: Code 2=integrated. Code 1=working toward integration. Code 0=no action. |
| **IHN performance:** (**endogenous variables**) | |
| **Technical efficiency score** | IOTA score: input variables (bed size, number of outpatient surgical centres, and total facilities), and output variables (number of outpatient surgeries, number of inpatient surgeries, and number of medical patients admitted). |
| **Profit margin** | The ratio of net income to net operating revenue. |
| **Image** (**reputation**) | Ranked as the top 100 IHN in two consecutive years, 1998 & 1999. |

the efficiency score, because it assumes that IHNs have little control over outputs—the number of patients. Input variables include acute bed size, number of outpatient surgical centres, and total number of facilities in the network. Output variables include the number of inpatient surgeries, the number of outpatient surgeries, and the number of medical patients admitted.

Financial performance has multiple dimensions such as capital structure, liquidity, fixed asset efficiency, and profitability. For this study, the only available data are for profitability. Ideally, profitability should be based on multiple indicators such as the return on total assets, return on investment, and total margin ratios. As shown by Zeller et al. [15], high intercorrelations (ranging from 0.70 to 0.95) exist among these

**Table 2.** Descriptive statistics of the study variables (n = 100)

| Variables | | Mean | Std. Deviation |
|---|---|---|---|
| Bed size | | 2175.650 | 1645.446 |
| Network size | | 49.650 | 39.652 |
| Number of physicians | | 3121.392 | 2239.580 |
| Average length of stay | | 5.421 | 1.124 |
| High-tech services | | 19.509 | 6.779 |
| Ratio of Medicare and Medicaid patients to the total patients served | | 50.788 | 11.262 |
| Forward integration | | 3.520 | 0.643 |
| | | Frequency | Percentage |
| Disease/case management | None | 44 | 44 |
| | Either | 26 | 26 |
| | Both | 30 | 30 |
| Information integration | No action | 11 | 11 |
| | Working to integrate | 57 | 57 |
| | Integrated | 32 | 32 |
| Tax status | Profit | 13 | 13 |
| | Not-for-profit | 87 | 87 |

profit ratios. An IHN's financial performance is calculated by the annual profit margin, the ratio of net income to net operating revenue.

Multiple indicators are used in the study's structural equation modelling to analyse the net influence of integration strategies on two performance indicators (efficiency and profit margin) while the effects of IHNs' structural and operational characteristics are simultaneously controlled. An IHN's size is conceived as a theoretical, latent construct that consists of three inter-related variables: network size, bed size, and number of affiliated physicians in the IHN. Two structural equations were formulated to be tested, as follows:

1. Efficiency (Iota) score = f (size, high-tech services, ALOS, % private paid patients, disease/case management, information integration).
2. Profit margin = f (size, high-tech services, ALOS, % private patients, tax status, forward integration, disease/case management, information integration, Iota score).

The Mplus software program developed by Muthën and Muthen [16] is used to test the model fit. Mplus is a statistical modelling program that provides researchers with a flexible multivariate analysis tool to analyse both categorical and continuous variables. The image or reputation of an IHN is represented by the likelihood of being ranked twice in two consecutive years, 1998 and 1999, among the top 100 IHNs. This dichotomised variable is analysed by multiple logistic regression with predictor variables such as network size, bed size, number of high-tech services, for-profit status, ALOS, forward integration, disease/case management, information integration, and efficiency score. In the analysis, only statistically significant results (p < 0.05) will be discussed.

**Table 3.**

| Variable | Performance indicators | | | | | |
|---|---|---|---|---|---|---|
| | Technical efficiency | | | Profit margin | | |
| | Est.[†] | S.E.[‡] | S. Est.[#] | Est.[†] | S.E.[‡] | S. Est.[#] |
| Structural characteristics | | | | | | |
| Size | 0.009 | 0.013 | 0.061 | −0.004 | 0.071 | −0.005 |
| High-tech services | 0.000 | 0.000 | 0.032 | −0.405 | 0.269 | −0.417 |
| Operational characteristics | | | | | | |
| Average lengths of stay | −2.837* | 0.647 | −0.410 | −13.344 | 101.590 | −0.010 |
| Percentage of private pay patients | 0.000 | 0.000 | −0.037 | −0.014 | 0.018 | −0.057 |
| Tax status | | | | 0.925* | 0.093 | 0.691 |
| Integration strategies | | | | | | |
| Forward integration | | | | −2.994* | 1.425 | −0.158 |
| Disease/case management | −0.010 | 0.005 | −0.177 | 0.469 | 0.576 | 0.062 |
| Information integration | −2.984* | 0.622 | −0.432 | −0.183 | 0.740 | −0.018 |
| Technical efficiency | − | − | − | 9.198 | 14.105 | 0.050 |
| $R^2$ | | 0.246 | | | 0.561 | |

**Table 4.** Logistic regression analysis of the IHN's reputation: the likelihood of being ranked among the SMG top 100 IHNs in two consecutive years, 1998 & 1999

| Variable | Regression Coefficient | Standard Error | Wald Test |
|---|---|---|---|
| Intercept | 0.532* | 0.207 | 6.602 |
| Total facilities | 0.044* | 0.016 | 8.072 |
| Bed size | −0.108* | 0.045 | 5.746 |
| Number of high-tech services | 0.283* | 0.093 | 9.263 |
| For-Profit | 1.569 | 0.857 | 3.354 |
| ALOS | 0.469 | 0.334 | 1.974 |
| Forward integration | 0.695 | 0.485 | 2.052 |
| Disease and case management | 0.879* | 0.372 | 5.584 |
| Information integration | 0.099 | 0.432 | 1.104 |
| Efficiency Score (Iota) | 0.611 | 1.987 | 0.094 |
| -2 Log-likelihood | 89.038 | | |
| Nagelkerke $R^2$ | 0.475 | | |
| $X^2$ (p-value) | 42.754 (0.0000) | | |
| Association of predicted probabilities and observed responses: Correct classification rate | 81% | | |

\* Significant at $p < 0.05$.
\*\* Significant at $p < 0.01$.

# Results

Table 2 presents the descriptive statistics of the study variables. The average network size (subunits or facilities) for the top 100 IHNs is 49.7. The average acute care bed size is 2175. Forty-four of the 100 IHNs had no case management or disease management programs. Only 32 IHNs had developed information integration. Thirteen were for-profit networks.

Table 3 shows the results of analysis of the predictor variables for IHNs' performance in 1998. The efficiency score was influenced by only two variables at the 0.05 level of statistical significance. Average length of stay and information integration were negatively related to efficiency. Other predictor variables had no statistical relationship with efficiency. The total variance explained by six predictor variables is 24.6%.

Profit margin was related to two predictor variables, tax status and forward integration. For-profit IHNs yielded more profit margin than did non-profit networks. IHNs with forward integration, i.e. venturing into multiple non-hospital-based services such as sub-acute care and long-term care, tended to have poorer profit margins than did those with no forward integration. Nine predictors combined account for 56.1% of the total variance in profit margin.

Table 4 summarises the results of logistic regression analysis of factors influencing the IHN's reputation or image as shown by ranking on the top 100 IHN lists in both 1998 and 1999. Network size (the total number of facilities structured under one unified IHN), number of high-tech services offered, and implementation of co-ordinated care through case management and disease management programs are the three statistically significant predictors of the likelihood of being ranked twice as the best IHNs. Bed size is inversely related to the IHN's reputation. The accuracy rate of predicting an IHN's reputation or image is 81%. The overall model fit is reasonable with chi-square value of 42.754 ($p < 0.000$).

# Conclusion

In the short run, an IHN's integration efforts did not significantly benefit its performance in efficiency or profit margin. Information integration tends to be costly and has yet to improve production efficiency in the clinical arena. Forward integration through diversification into non-acute care hospital services has attenuated the bottom lines of IHNs. These findings are consistent with the literature cited. Organisational strategies such as offering high-tech services, building a bigger network, reducing acute bed size, and implementing co-ordinated care programs improve the odds of being ranked twice in the SMG group's roll of the top 100 IHNs. Those activities all appear to be IHN image-enhancing or reputation-building strategies. These findings may cast some doubt on the appropriateness of the evaluation or assessment criteria used to rank IHNs' performance. Carefully designed criteria are necessary if scientific validation of the best performers (in terms of efficiency and profit) in the integrated care delivery systems or networks is to be achieved.

It is argued that network managers must identify "the costs and benefits associated both with implementing a multiplicity of health care offering strategies and with each type of co-operation-building program before a comprehensive plan can be formulated and achieved" [17]. One goal of an integrated healthcare network is

to benefit patients by providing a continuum of care; however, that effort is not compensated by the improved cost and process efficiency of medical services or by higher profits. Facing the increasing expenditures of health services in the United States and the demands for a continuum of patient care, health care executives should assess to what extent the increased benefit to patients in terms of quality of care, health outcomes, and patient satisfaction that are achieved through an IHN's integration can outweigh the added costs of integration. Future study should examine the quality-efficiency trade-off to help medical providers and policy makers decide whether or not integrated efforts are worthwhile [10]. Furthermore, the assessment of IHNs' performance should be carefully undertaken by the use of longitudinal or panel data so that both short-term and long-term effects of the integration of healthcare systems can be examined.

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