

1. **What are the key business, health care and IT drivers creating discontinuities for the use of IT in health care?**
2. **What architecture will dominate new health care applications by the year 2000?**
3. **What underlying technologies will be required to build flexible, integrable applications?**
4. **What must health care organizations do to receive value from IT investments?**
5. How must the role of the successful IS organization change in a managed care environment? What steps must be taken for a smooth migration?
6. What skills and resources must health care IS organizations acquire to be valued contributors in the late 1990s? How and where can those skills best be acquired?
7. How will business process improvement approaches (e.g., BPR, CQI, benchmarking) impact the use of IT throughout the organization and the IS role?
8. How can health care organizations best balance legacy, transitional and new technologies and applications?
9. Which IT vendors will dominate in health care and which will struggle in the late 1990s?

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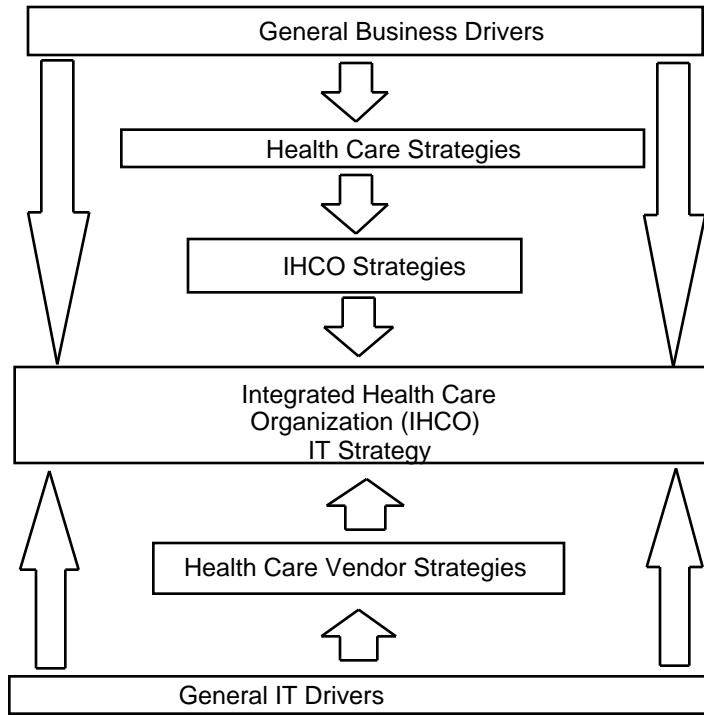
Both the health care and the IT industries are changing at unprecedented rates. The Health Care View (HCV) service helps clients bridge the gap between these two rapidly changing areas by offering strategic and tactical advice for the application and management of IT in health care organizations. Key areas covered include:

- Strategic health care IT/application vendors and technologies (e.g., CPR, CHINs, CDR)
- Underlying/enabling technologies (e.g., middleware, electronic commerce)
- IT management issue
  - IT value
  - IS organizational role, structure
  - IT skills and resources
- External forces impacting the use of IT in health care

The audience for the HCV service is primarily U.S.-based health care organizations. Much of the research is also relevant to health care organizations in other countries since their health care systems are converging on a common goal of cost-effective, high-quality, widely accessible health care.



**What are the key business, health care and IT drivers creating discontinuities for the use of IT in health care?**

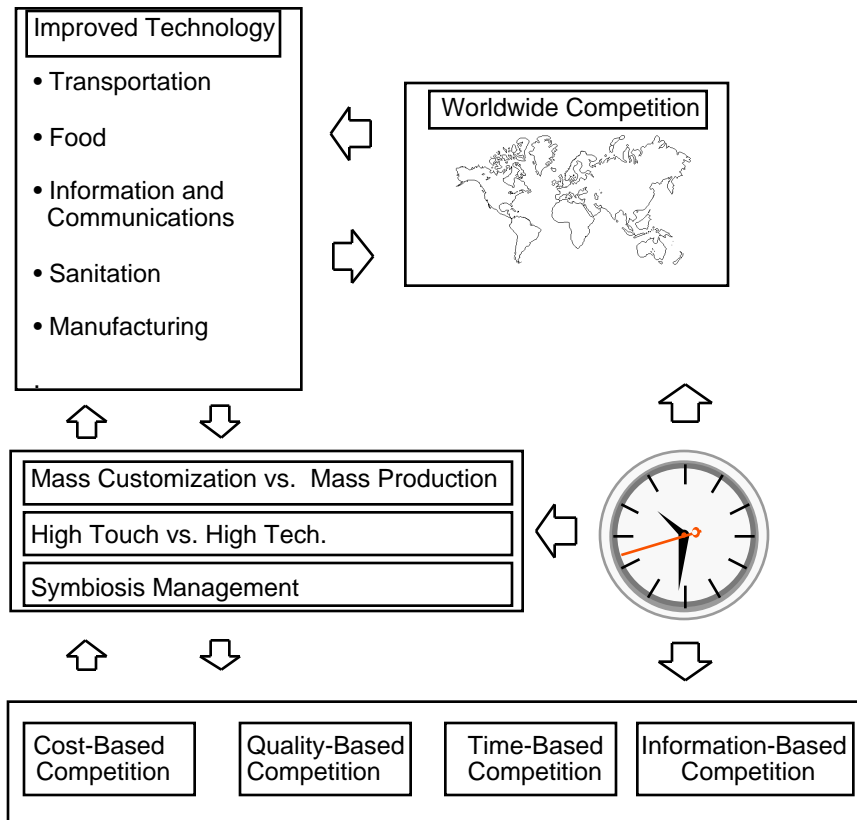


Source: Gartner Group

The business and technology drivers affecting HCITVs' or HCITOs' IT strategies are both dynamic and complex. The chart above shows some of the interactions of general business drivers, health care strategies and enterprise strategies. All of these environmental factors affect the business and IT strategies of an IHCO. Health care is undergoing major and fundamental changes to its delivery and financing mechanisms at the same time that IT is changing at the fastest pace in its history. The health care environment is so dynamic that health care CEOs must develop annual plans on a multiscenario basis. General business drivers such as cost, time, quality, and information become major drivers of health care. These drivers are then transmitted through to specific HCOs and become key drivers of health care IT strategies. How can a HCITV or HCITO forecast the impact of these drivers on their products or application portfolios? Will products and applications fall by the wayside as business drivers reshape health care and its information requirements? What strategies will help HCITVs and HCITOs succeed in this dynamic world? Can HCITVs and HCITOs develop valid five-year strategies in this environment?



**General business drivers indirectly affect health care organizations and influence health care IT strategies.**



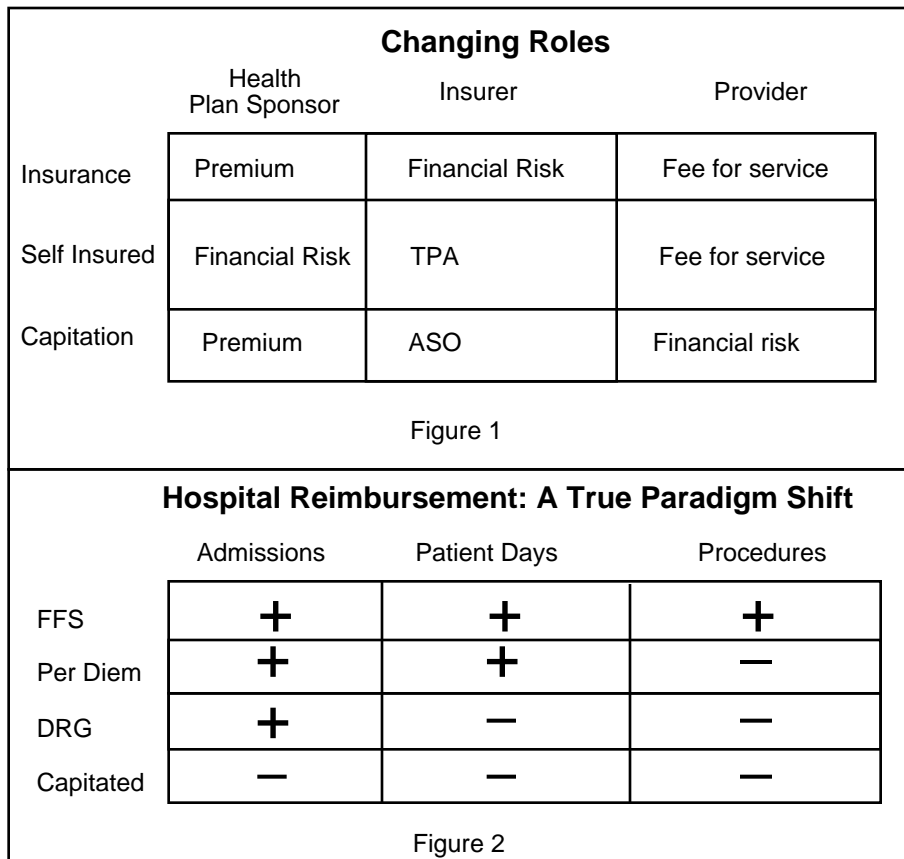
Source: Gartner Group

**Key Issue: What are the key business, health care and IT drivers creating discontinuities for the use of IT in health care?**

World wide competition, driven by dramatic improvements in a variety of technologies, has had a major effect on health care. Domestic HCOs may not compete directly in international markets, but their customers do. Health care is a major cost for domestic manufacturers competing in the world market. American automobile manufacturers pay as much for health care as they do for steel. Health care has increased from 29 percent of American businesses' after-tax profits in 1980 to 60 percent in 1990. With more than \$1 trillion in annual expenditures, health care is larger than the information technology and defense industries combined. To compete in a world market, businesses must control these costs. This driver impacts the changes we see in health care today much more than any legislation or threat of legislation. Cost drivers alone cannot dominate health care. Quality and access are major drivers and HCOs are constantly being driven to prove and improve these areas. The rate of change in technology improvement has been transmitted to all drivers. HCOs are looking to HCITOs and HCITVs to provide the information technology necessary to succeed in this complex world.



**To meet rapidly changing business requirements, health care organizations are expanding into new roles with radically different CSFs.**



Source: Gartner Group

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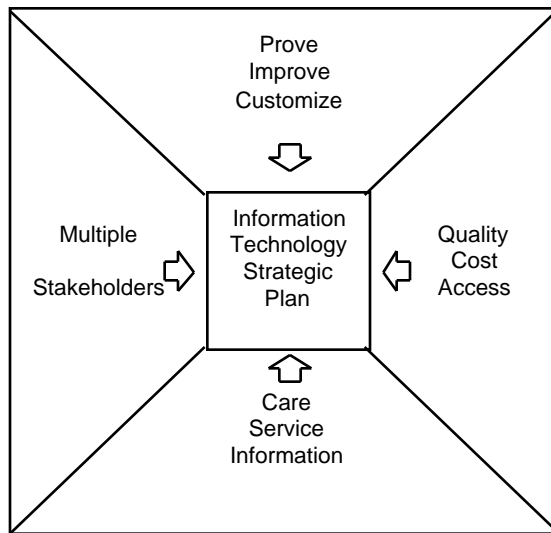
Changing and complex business drivers are effecting every area of the health care system. The traditional roles of health plan sponsor, health insurer, and provider are changing dramatically as financial risk shifts from point to point in an effort to control costs. Provider organizations are becoming more interested in managed care as capitation shifts financial risk to them and insurers become involved in quality of care and access issues as they restrict members to certain providers. The complexity of the equation becomes more apparent when we realize that shifts are never complete and HCOs are involved in a variety of risk models at one time. Changing business drivers have effected the very concept of goodness in health care delivery (Figure 1). Increasing admissions, patient days, and procedures represented “goodness” in a business sense in a fee-for-service world (Figure 2). In a fully capitated world, they represent “badness” in the business sense. The systems acquired or built for the world of fee-for-service do not place the emphasis on the measures required for the world of capitation and the mixed world of capitation, fee-for-service, DRGs, and per diems that is facing most health care provider organizations.



Successful health care IT organizations will base their strategies on accurate, business-driver-based forecasts (0.1 probability).

Successful health care IT organizations will assume the affects of changing business drivers are too complex to forecast and will develop a strategy of planned reaction to change (0.1 probability).

Successful health care IT organizations will base their strategy on the forecasting of “broad arrows” and the development of a highly flexible, adaptive, IT environment (0.8 probability).



Source: Gartner Group

**Key Issue: What are the key business, health care and IT drivers creating discontinuities for the use of IT in health care?**

Total reliance on forecasting is a high risk path for both HCITVs and HCITOs. The health care environment is far too complex and changing too rapidly to accurately forecast requirements at the level of detail necessary to develop and use inflexible applications. Successful HCITOs and HCITVs must develop or acquire flexible, adaptive, applications architectures to address the realities of today’s health care environment.

However, forecasting “broad arrow” trends is both possible and critical to HCITV and HCITO strategies. The chart above describes major “broad arrow” trends that have a direct impact on health care information technology decisions. Successful HCITOs and HCITVs will align their applications development strategies with these broad directions. While HCITOs and HCITVs cannot forecast specific requirements, applications that contribute to the improvement and/or measurement of quality, cost and access of care, service, and information are well positioned. Strategies based on these broad arrow forecasts and a flexible application architecture will position the HCITO or HCITV to compete in a changing market.



What architecture will dominate new health care applications by the year 2000?

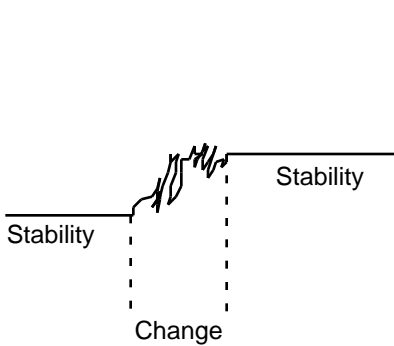


Figure 1

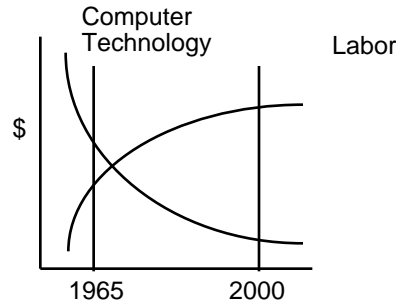


Figure 2

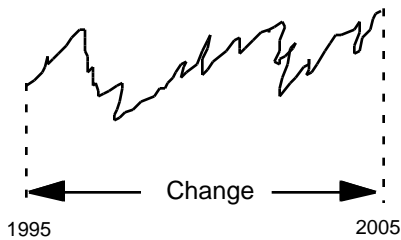


Figure 3

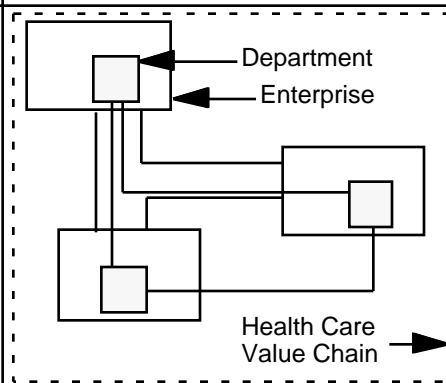


Figure 4

Source: Gartner Group

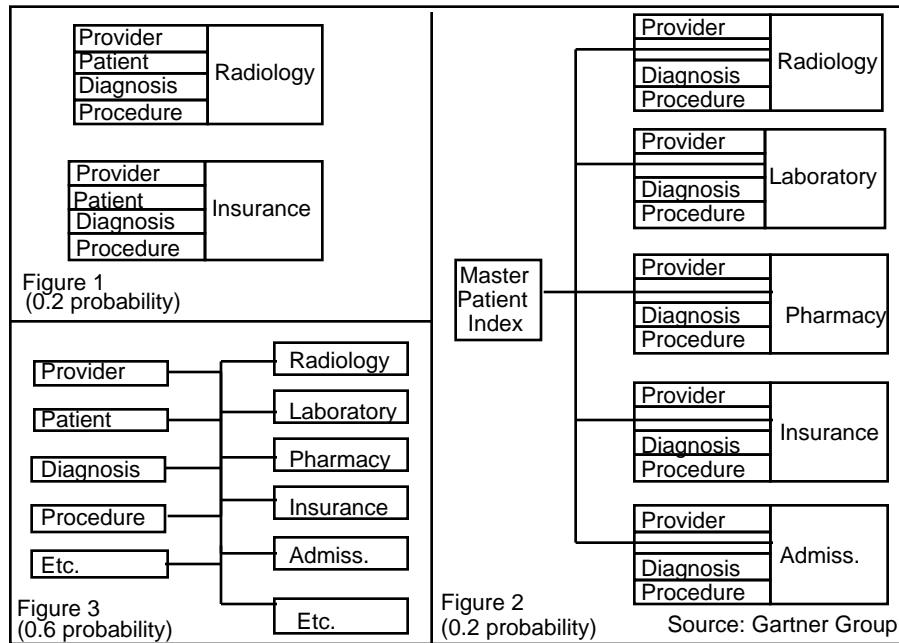
Traditional health care application architectures were developed when change was a short period of transition between two, much longer, periods of relative stability (Figure 1) and computer technology was an expensive alternative to labor (Figure 2). This environment fostered the emergence of a design paradigm that conserves precious technology resources at the expense of less costly labor and time. This paradigm is reflected in both the labor-intensive and time-consuming processes of application design, development, and maintenance and in the inflexible applications that are the products of those processes. Today, health care is in a period of continuous change that will extend well past the year 2000 (Figure 3) and computer technology is an inexpensive alternative to costly labor and time resources (Figure 2). If health care organizations are to maximize the value of their human resources, they must leverage them with technology. The scope of applications has changed from departmental to enterprise and now beyond enterprise boundaries to the health care value chain (Figure 4). This change in scope increases the complexity of health care applications and “raises the bar” for HCITOs and HCITVs. Will existing applications architectures support this new environment with its new definitions of change, cost, and scope or will HCITOs and HCITVs be driven to develop new applications architectures to address these needs?



**Traditional department-centric (hospitals) and product-centric (insurance) applications architectures will still dominate new health care applications in the year 2000 (0.2 probability).**

**Patient- or member-centric applications architectures will dominate new health care applications by the year 2000 (0.2 probability).**

**Polycentric applications architectures will dominate new health care applications by the year 2000 (0.6 probability).**



**Key Issue: What architecture will dominate new health care applications by the year 2000?**

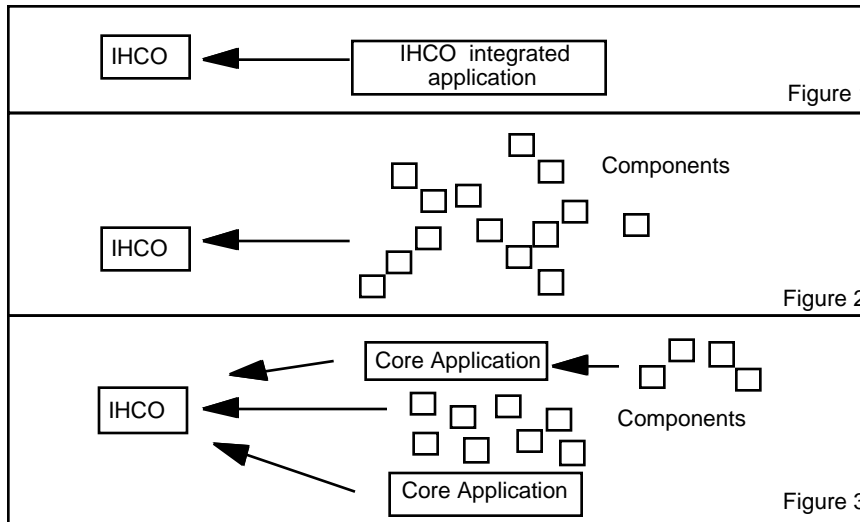
Department- or product-centric applications architectures (Figure 1) create data redundancy, data synchronization, inquiry, analysis and reporting problems for both HCITOs and HCITVs. The cost of managing these issues is a major drain on health care IT investment dollars. Patient-centric applications architectures (Figure 2) and the concept of an enterprise master patient index are rapidly being accepted as a component of both the IHCO and the community health information network. This acceptance is being driven by demand for a computer-based patient record and the integration of clinical, managed care and insurance functions. We feel that patient-centric applications architectures are major steps in the right direction, but the eventual winning applications architecture will be polycentric (Figure 3). This approach provides the applications foundation for computer-based patient record (patient-centric), provider profiling (provider-centric), disease management (diagnosis-centric), cost accounting (procedure-centric) and other increasingly critical IHCO management activities.



By the year 2000, the majority of IHCO applications will be large, tightly integrated, single vendor, total health care solutions (0.1 probability).

By the year 2000, the majority of health care applications will be small integrable components (0.1 probability).

By the year 2000, health care applications will consist of large integrated applications and small integrable components (0.8 probability).



Source: Gartner Group

**Key Issue: What architectures will dominate new health care applications by the year 2000?**

Driven by a need to develop more flexible and information-intense applications, HCITOs and HCITVs will move to small, discrete, reusable and disposable components. This architecture provides an environment conducive to rapid application design, development and maintenance. However, HCITOs and HCITVs have major investments in large, tightly integrated applications. While component architectures are more compatible with directions indicated by general business and health care drivers, the investment in legacy applications will survive the year 2000. Successful HCITVs will recognize they are playing into a multivendor environment and will build their applications to be components of a multivendor total solution. Successful HCITOs will consider flexibility in applications acquisition and development decisions and continue to improve integration skills within their organizations. As component architectures become more common, the winners may be HCITVs that become integrators of their applications, the applications of other vendors, and newly marketed, off-the-shelf components. IHCOs will look to these “integration/applications” HCITVs to provide integrated solutions from integrable applications.





**HCOs that do not balance application functionality and flexibility will experience increasingly higher costs and the inability to meet changing business requirements (0.8 probability).**

Reader Notes

Data Sharing

- Real-time direct access
- Real-time indirect access
- Import/export capabilities

Messaging API

- Standards support (HL7, X12, etc.)
- Robust API (Supports RPCs or ORBs)

Presentation Flexibility

- User-centric
- Customizable
- Consistent with environment
- Platform Independent (desktop, mobile, etc.)

Application Logic

- Flexible
- Enhanceable
- Upgradable
- Development environment provided
- Tool fit with environment

Platform

- Vendor independence (open)
- Fit with environment/architecture

Network Ready

- Network-based data inquiry supported
- Fit with environment/architecture

Security

- Compatible, flexible

Source: Gartner Group

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**Key Issue: What architectures will dominate new health care applications by the year 2000?**

Successful HCITOs will develop an applications acquisition strategy as a basis for acquisition decisions. This strategy must be derived from, and be consistent with, the IHCO's overall IT vision. The essence of this strategy must be reflected in acquisition analysis guidelines that provide a framework for requirements analysis and application analysis. Successful application acquisition projects require a level of analysis similar to that required for applications development. The IHCO's applications acquisition analyst must thoroughly understand the clinical, administrative, or financial requirements driving the product acquisition; the functionality of the target application product; the technology environment of the IHCO; and the technology environment of the application. The acquisition analyst must also understand the skills mix of the IHCO and its support workload. The acquisition criteria listed above provide a starter set of criteria to build a successful applications acquisition strategy.



**What underlying technologies will be required to build flexible, integrable applications?**

	Hardware-centric Computing Model	Department-centric Computing Model	User-centric Computing Model
Focus	Optimizing hardware	Optimizing dept. performance	Optimizing user productivity
Scope	Enterprise	Department	Inter-enterprise (value chain)
Hardware resources	Expensive components	Moderately expensive components	Inexpensive components
Human Resources	Inexpensive	Expensive	Expensive
# of key vendors	Few	Many	Many
# of OSs, databases, networks	Few	Many	Many
User Interface (UI)	Non-programmable terminal (NPT)	Multiple NPTs	Intelligent workstation
# of system connections from UI	1	1 per system	Many
Resource binding	Static	Static	Dynamic (run-time)
Benefits	Simple, manageable	Good departmental functionality	Inexpensive components, flexible
Downsides	Expensive, inflexible	Disparate systems, unfriendly, potentially high TCO	Complex, hard to manage, potentially high TCO
Importance of underlying technology	Somewhat important	Important	Critical

Source: Gartner Group

Because business requirements and IT are changing, the computing model has changed. In the historical *hardware-centric model*, enterprises organized all of their computing resources around the central processor. Configurations were homogeneous: one operating system, one or two data managers, one TP monitor, and one or two programming languages. Although this hardware-centric model was conceptually simple, computing was costly, untailorable by the end user and slow to respond to new business requirements.

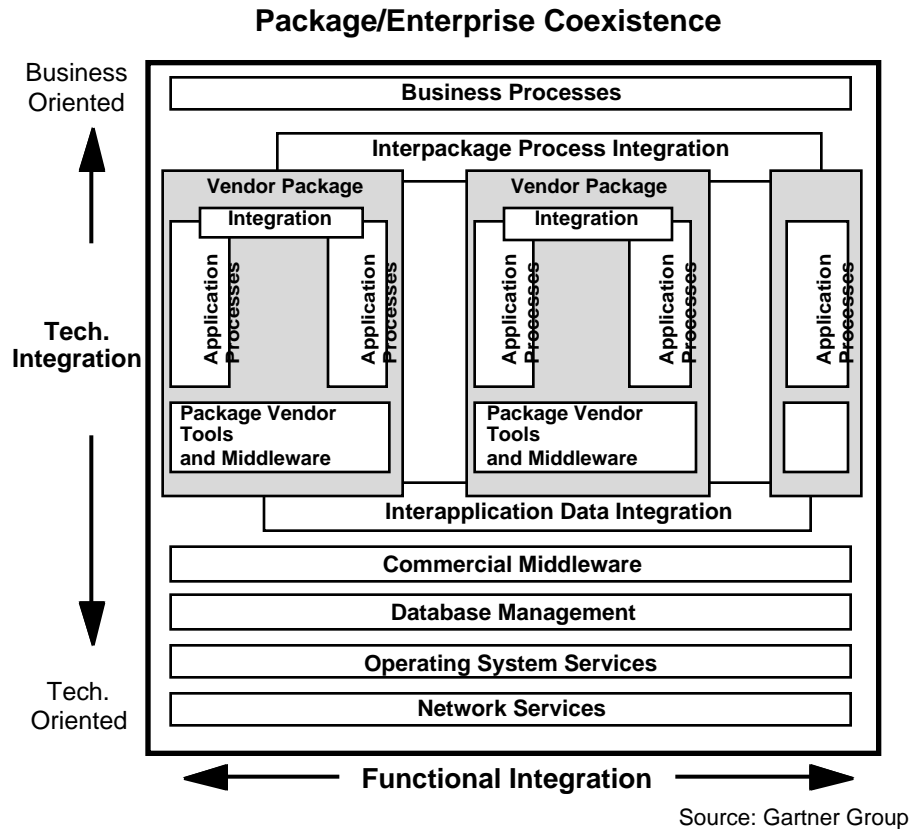
To meet functionality and cost requirements, many HCOs moved to a *department-centric model* by purchasing or building applications for midrange, LAN and PC platforms. While this approach brought best-of-breed functionality, it also brought multiple platforms and databases to maintain, multiple unfriendly user interfaces to the occasional user (e.g., physicians, case reviewers) and limited, stovepipe functionality.

Because of rapidly changing business requirements, increasing HR costs and rapidly decreasing IT costs, the model is changing again to a *user-centric model*, optimizing user productivity and power. This need for perceived simplicity by the user has greatly increased the complexity for the IT professionals and placed much greater importance on the underlying technologies needed to implement systems that at least appear to be integrated.



Large, complex HCOs will continue to depend upon packages, thus requiring multiple types of proprietary and commercial middleware to meet application integration requirements (0.8 probability).

Reader Notes



**Key Issue: What underlying technologies will be required to build flexible, integrable, applications?**

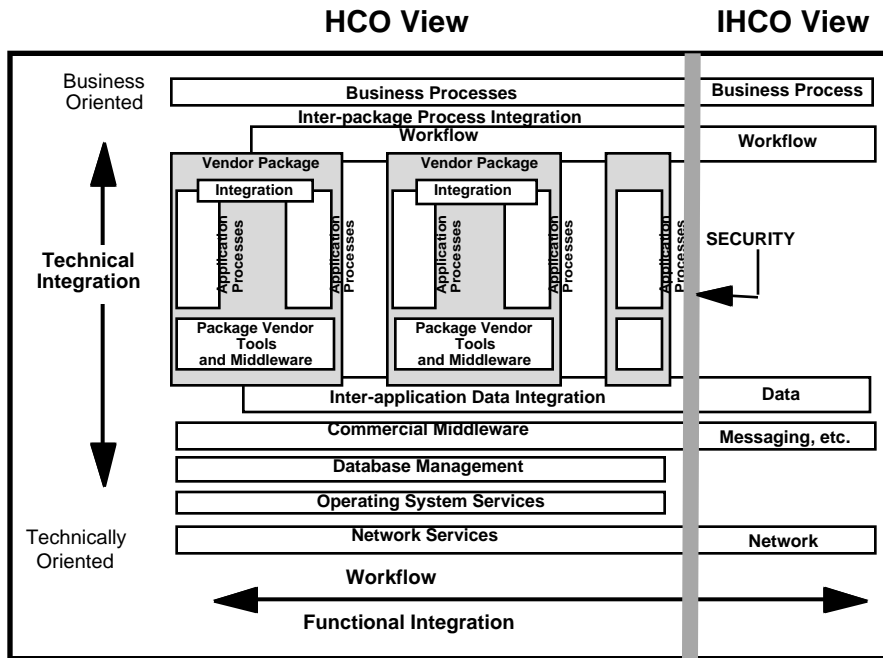
Generally, all run-time system software layered between the application program and the operating system is *middleware* (e.g., a DBMS). However, most middleware discussions concentrate on *cooperative middleware*. We define cooperative middleware as *network-aware system software, layered between an application, the operating system and the network transport layers, whose purpose is to facilitate some aspect of cooperative processing.*

The purpose of middleware is to bring order to the chaos of distributed, heterogeneous environments. The role of middleware is to make it easier to build applications by implementing useful services related to interoperability not found in the operating systems or in the basic communication protocol stacks. Middleware's importance is widely appreciated, but success with middleware remains a difficult issue. Vendors and other middleware proponents speak glowingly of (but have not fully delivered) location transparency, anything-to-anything interoperability, "plug and play," open standards and software "Lego" blocks. Even so, HCOs must develop skills in the various types of middleware technologies to begin to realize the benefits of flexible, interoperable applications.



HCOs will not be able to dictate interenterprise technologies used. Two to three major changes in technologies will be employed in the next five years as technological sophistication and relationships evolve (0.8 probability).

Marketplace View of the IHCO



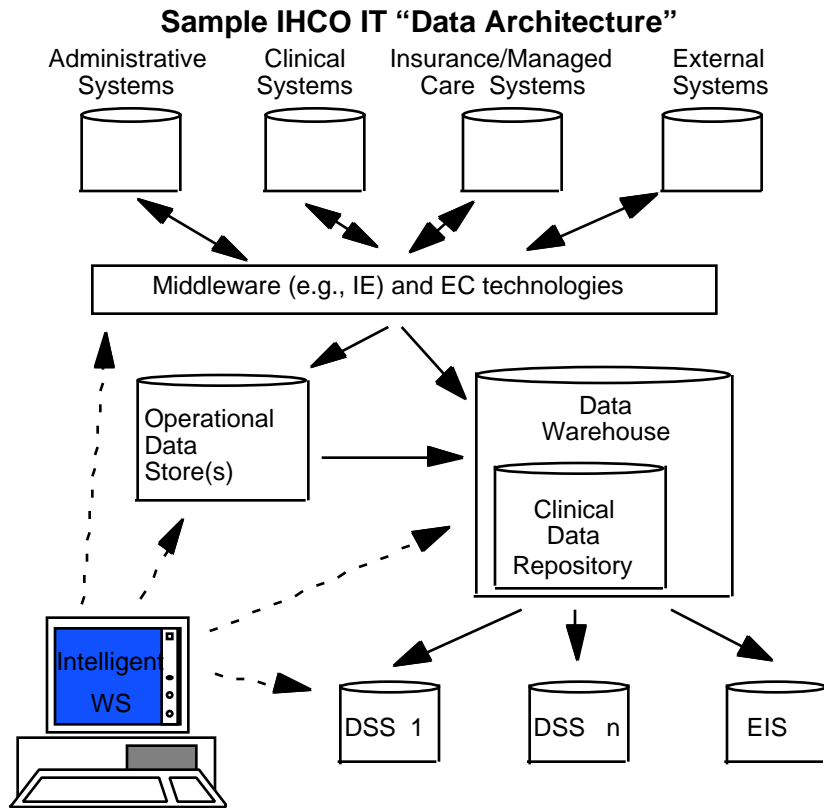
Source: Gartner Group

**Key Issue: What underlying technologies will be required to build flexible, integrable applications?**

There are three levels of integration requirements: interapplication integration (i.e., how the components of the application work together), intra-enterprise application integration (i.e., how the different applications within the same enterprise work together) and interenterprise application integration (i.e., how applications work with other enterprises' applications.) Proprietary and commercial middleware will dominate interapplication and intra-enterprise integration, while both middleware and EC technologies will be used for interenterprise communications. For interenterprise communications, the nature of the business relationships will, in part, drive the possibilities. Short-term market exchange relationships are primarily transaction-based and can be supported with EDI or simple E-mail, for example. Value-added relationships might also be supported by electronic forms or mail-enabled applications. Strategic partnerships (implying a longer-term relationship) could also be supported by technologies such as workflow, applications integration and shared databases, relying more on middleware technologies than EC technologies.



Despite the efforts of HCOs, vendors, coalitions and standards-making bodies, data consistency and quality problems will continue to increase. (0.8 probability)



Source: Gartner Group

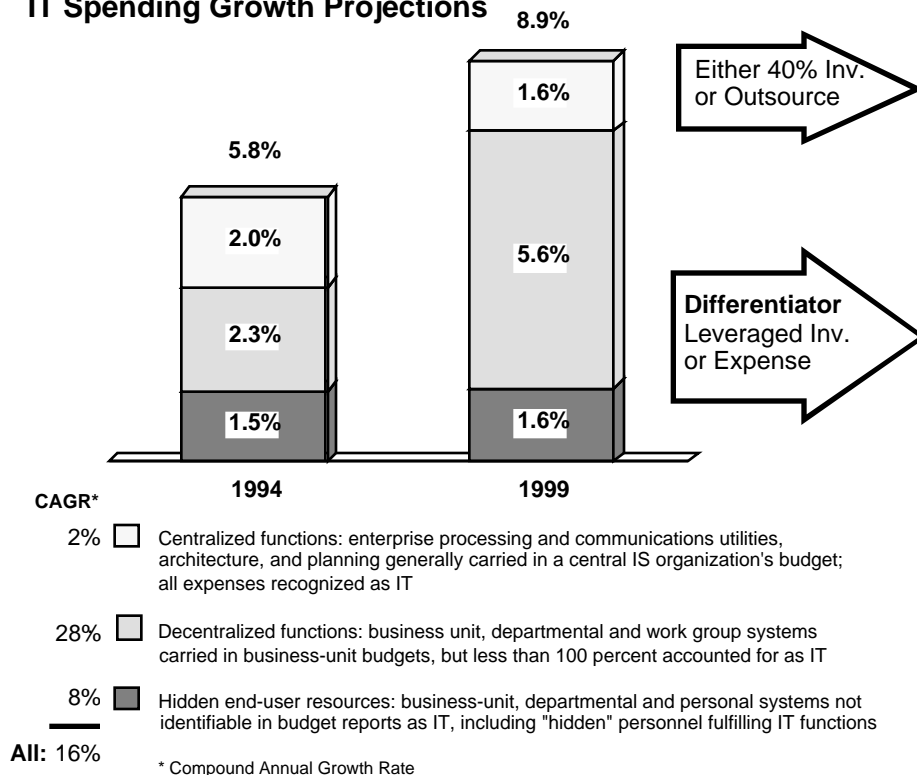
**Key Issue: What underlying technologies will be required to build flexible, integrable applications?**

Most HCOs have redundant and inconsistent data scattered across multiple disparate operational and decision support platforms. A number of standards and technologies are coming together to help with these data consistency and quality issues in health care: HL7, X12 and EDIFACT standards; interface engines; clinical data repositories; and data warehouses. Some vendors purport that by having an IE feed a CDR, all of an HCOs data is now integrated and the data quality and consistency issues magically vanish. This greatly oversimplifies the situation for most HCOs.

In the above example, data originating in the transaction-based systems (including external systems) is fed to the consolidated operational data store(s), where it is subsequently sent to the data warehouse. From there, it could be loaded into specialized DSSs or EISs. From an intelligent workstation, a user may need to access the DSS(s), the data warehouse, the operational data store(s) or the transaction-based systems (including external systems.) Data management, middleware and electronic commerce technologies will all be critical in this environment.



**IT Spending Growth Projections**



Most HCOs have historically spent less than similarly information-intensive organizations in other industries. While the above spending growth chart is not industry-specific, similar spending increases are predicted for HCOs. For example, a recent study by Frost and Sullivan also projects a 16 percent CAGR for hospital-based IS spending. Also, the HIMSS 1995 survey projected IT spending increases of greater than 50 percent by 29 percent of the respondents, greater than 40 percent by an additional 10 percent of the respondents, and greater than 30 percent by an additional 19 percent of the respondents.

While IT spending projections are widely available, projecting the value returned on those investments is much more difficult. In the rapidly changing and unstable health care environment, business executives are increasingly unable to build five-year plans, making detailed five-year IT plans with projected benefits meaningless.

While there are risks associated with investing in IT, the risks of not investing will be even greater. If value is defined as the relative worth or importance, then the potential value of IT is greater than in the past. IT will be used to improve operations and increase product and service quality, not just to capture charges and pay claims.



Examine IT spending and investments in enabling key business initiatives and/or relationships.

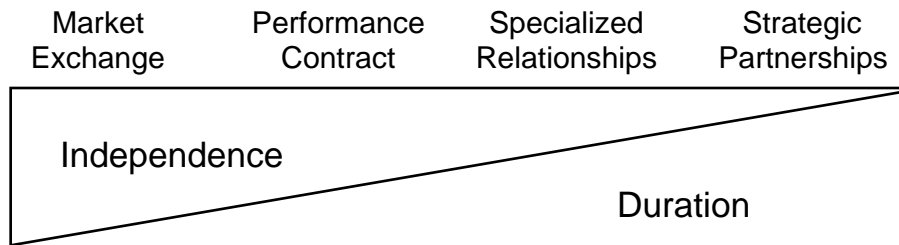
Reader Notes

**IT Spending Analysis**

	Investment	Expense	IT Unrealized Potential
Business Area 1			High
Business Area 2			Medium
Business Area n			Low
Infrastructure			High

Source: Gartner Group

**Portfolio of Relationships Analysis**



Source: John Henderson, Boston University

**Key Issue: What must HCOs do to receive value from IT investments?**

The value of IT must be determined to a large part by its ability to enable and drive business initiatives. IS organizations can take the following steps to better understand the spending side of the value equation: 1) Classify spending into *investments* (linked to key business initiatives) or *expenses* (maintenance, routine enhancements, operation and support); and 2) further categorize IT spending by business area or business unit. This helps in understanding how much is being spent to support the business the way it is or was and how much is being invested to enable or drive key business initiatives.

The types of relationships a health care organization has with its suppliers and customers affects the range of alternatives for using IT to support the relationships. In a fee-for-service indemnity environment, relationships tended to be toward the left part of the scale with minimal support requirements from IT. In a managed care environment, relationships may span all four types. Some health care IS organizations are developing scenarios regarding IT alternatives for the various types of business relationships.



**To achieve IT value, successful HCOs will define critical success factors and actively monitor key performance indicators (0.7 probability).**

**IT Value CSFs for Business Executives:**

1. Understand the basic capabilities of IT (similar to having a basic understanding of finance).
2. Take responsibility. Clearly communicate the role for IT in the organization. Actions must be consistent with words.
3. Consider the implications of business decisions on IT. Get the appropriate IT professionals involved early in the process.
4. Actively participate in the development (and evolution) of an IT plan and governance structure (possibly including an IT sub-committee of the board.)
5. Take ownership of projects. There are no IT projects, just business projects with an IT component. IS can help with the project process but the business unit must assume responsibility for the overall project results.
6. Recognize that changes in the business strategy and structure mean changes in the IT strategy and structure.

**IT Value CSFs for IT Professionals:**

1. Understand the basics of the business and how it is changing.
2. Take responsibility. Educate business executives; lead the quest for IT value; formalize a technology transfer process.
3. Consider the business implications of IT decisions.
4. Lead the development (and evolution) of an IT plan and governance structure.
5. Run the IS organization like a business (even if it is not).

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**Key Issue: What must HCOs do to receive value from IT investments?**

Business executives must focus more on IT and IT professionals must focus more on how to apply IT to add business value. IT professionals must know “what keeps business executives up at night.” The IT professional must keep both business and IT skills current to do this. The IS organization must be run like a business. It should strive for customer satisfaction and assume there are competitors aggressively seeking those same customers. The HCO typically has aggressive competitors and so does the IS organization (e.g., outsourcers). The IS organization must continually seek value generation through:

- 1) asset and service management;
- 2) enterprisewide initiatives and planning; and
- 3) development of an appropriately robust infrastructure.

In short, the IS organization must continually ask, “What business are we in and what business should we be in?”





HCOs can assume that the forces driving change in health care will end. IT will evolve back to a centralized, monolithic model and can be managed the way it was in its glory days of the early '80s (0.05 probability).



HCOs can assume that change will continue but will be incremental and predictable. Efforts to reform health care will subside, as will the rate of change of IT. The way IT is used by successful HCOs in five years will be only incrementally different from the way it was used in the past (0.25 probability).



HCOs can assume that change will be unpredictable and the rate of change will accelerate. As with other critical resources, the way IT is utilized must continually be re-evaluated (0.7 probability).



Source: Gartner Group

### Key Issue: What must HCOs do to receive value from IT investments?

The successful HCO will continually be redefining its business and its business relationships over the next five years. IS organizations that are not able to react or, more likely, proactively anticipate what they must be doing will increasingly be candidates for outsourcing. While most health care professionals do not believe that the first SPA is likely, some still *behave* as if it were true. IS organizations must recognize that there will be different expectations, different CSFs, different metrics for success and different roles.

This is not to say that IT alone can be successful driving change. For HCOs to receive value from IT, the following are also needed:

- a compelling reason to change (e.g., financial incentives, strong peer pressure)
- a focus on change management and a change management process
- new skills both inside and outside the IS organization
- new ways of looking at IT and its use



- The business and health care climates will continue to change, increasing the level of information intensity and changing the metrics for IT success in HCOs.
- Because of the rapidly changing business and health care environments, applications need to be both functional and flexible.
- In an environment of distributed, heterogeneous systems, infrastructure investments for underlying technologies take on more importance by shielding the applications from as much technical complexity as possible.
- Most HCOs will be increasing spending levels for IT. IT professionals must actively lead the HCO in seeking value from its IT investments. Business executives must play a major role in realizing IT value.

