

**Economics of Competitive Strategy**  
**Spring 2002**

**EMC<sup>2</sup>**  
where information lives



**Analysis and Recommendations Regarding**  
**EMC's Strategic Evolution**

Douglas Alder  
Brian Cahak  
Henry Siller  
Chris Lloyd

## **Executive Summary**

As the enterprise storage market matures and products increasingly meet customer needs, the market is expected to shift from integrated, proprietary systems to modular “best of breed” solutions. In a modular enterprise storage market, the value and profits are anticipated to move from integrated systems towards software, high-value hardware components, and services. While segments of the storage market are clearly at different points in their life cycle, the maturation of the broader storage market appears imminent.

In order to successfully navigate this market transition, EMC needs to continue developing high-performance, integrated solutions for the emerging segments of the market while building modular capabilities and products that will compete effectively in the maturing segments. Adding these new capabilities requires strategic changes to its operations, organization, and incentives. First, in the *more mature markets*, EMC should shift focus away from storage systems and instead focus on building a modular software development infrastructure to compete with the likes of Veritas. Second, EMC needs to build the preeminent enterprise storage professional services organization focused on meeting customers’ design and integration needs, irrespective of the hardware or architecture employed. In order to efficiently implement this strategy, EMC needs to change its organizational structure and incentive program. Finally, EMC must rationalize its cost structure to prepare for attack from low-cost, lean manufacturers and to provide the cash necessary to build its software and consulting competencies.

## **Company Overview**

### **Background**

Founded in 1979 by Richard Egan and Roger Marino as a supplier of add-on memory boards, the Hopkinton, Massachusetts based EMC took off in 1989 when the company revised its strategy to address the growing reliance on large amounts of electronic data. In 1990, EMC introduced its Symmetrix product line, becoming the first company to provide information storage systems based on arrays of small, commodity hard disk drives (RAID) for the mainframe market. From there, EMC created the first “platform-independent” storage system, capable of simultaneously supporting several computer operating systems. EMC operates domestically in Massachusetts and North Carolina and internationally in Ireland, Israel, Japan and France. The company employs more than 23,600 people worldwide.

### **Corporate Organization**

EMC competes in the following segments: information storage products, which include information storage systems and information storage software, and information storage services. The Symmetrix line of enterprise storage systems serves the high end of the information storage market. The Celerra File Server is a high-end Network Attached Storage (NAS) system for enterprise-class file serving. Revenue from information storage represented approximately 61%, 70% and 68% of revenues in 2001, 2000 and 1999, respectively.

EMC offers software that provides information management, sharing and protection capabilities. These capabilities include backup/restore, disaster recovery, business continuance, data

migration and data movement. Revenues from information storage software represented approximately 22%, 16% and 12% of revenues in 2001, 2000 and 1999, respectively.

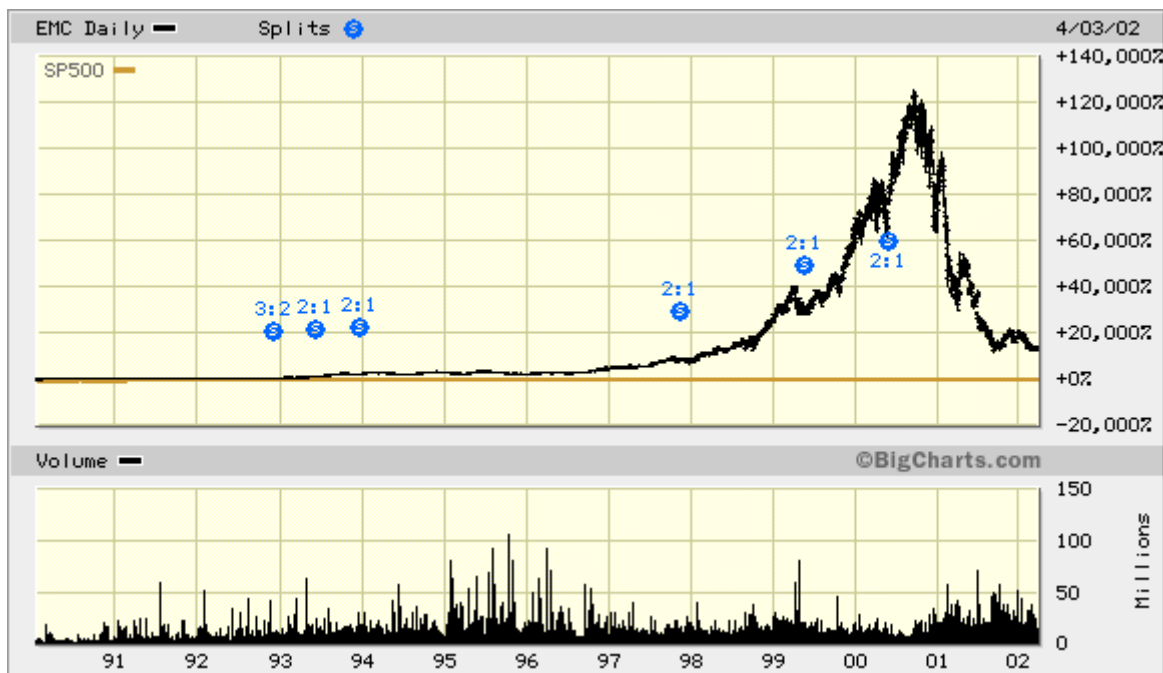
EMC's Global Services organization provides information technology services, including consulting, installation, training, day-to-day support, parts delivery and system upgrades. This organization purports to tie together all of EMC's service functions, including customer service, professional service and technical training service. Revenue from information storage services represented approximately 14%, 7% and 5% of revenues in 2001, 2000 and 1999, respectively.

EMC focuses primarily on three major markets, which include Global 2000 companies, the mid-tier market and service providers. EMC markets its products through multiple distribution channels, including a direct sales force and selected distributors, systems integrators, resellers and original equipment manufacturers.

**Market Position and Shareholder Return**

From its inception EMC has achieved enviable success both in terms of operating performance and stock appreciation. Operationally, the company has become one of the leaders in every market in which it competes. For example, in the Storage Area Network (SAN) and NAS markets, the two largest general hardware markets, EMC has achieved 38.9 and 48.6 percent markets share, respectively. The primary software competitors and their market shares in 2001 are: EMC (31%), Veritas (22%), IBM (22%), and Computer Associates (19%). The company has also created more shareholder value in the 1990's than the vast majority of Fortune 500 companies. As shown in **Figure 1** below, even with the recent decline in price, long-term EMC shareholders have received impressive returns relative to the S&P 500.

**Figure 1: EMC Stock Performance Relative to the S&P 500 Index**



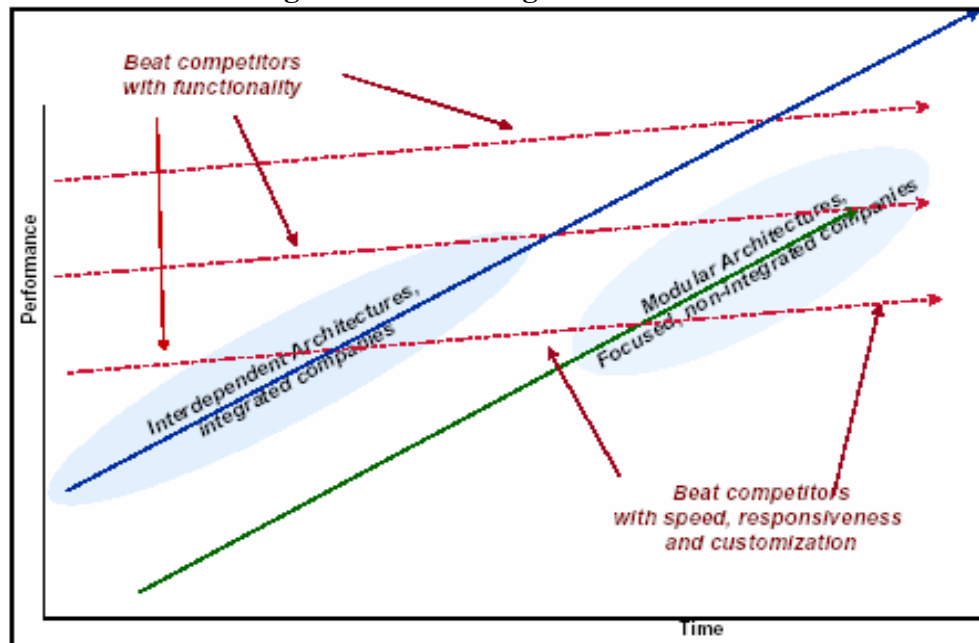
## **Framework: Integration and Disintegration in High-Tech Markets**

The enterprise storage market appears to follow the framework for understanding integration and disintegration in high-tech markets outlined by Dr. Clayton Christensen<sup>1</sup>. EMC introduced a disruptive technology to the storage industry in 1991 that changed the industry paradigm. Lower cost storage resulted in rapid market growth. Products generally fell short of customer needs so system performance was the key point of differentiation. The most efficient organizational structure to maximize system performance and profitability was vertical integration. Thus, profitability throughout the 1990's resided with the vertically integrated players like EMC.

As the gap in hardware performance has narrowed and customer needs are more fully met in mature segments like direct attached storage (DAS), the market has begun to shift toward modular architectures. In modular markets the value generally shifts towards software, high-value hardware components, and services. The basis for competition migrates from one of "better technology" to one of "speedy creation of customized product at low prices." EMC was slow to incorporate software and services offerings, which created opportunities for niche players to enter. To prepare for this coming change, EMC needs to *create the financial and operational flexibility to adapt as the paradigm shift evolves*.

**Figure 2** below graphically illustrates Christensen's model. The dashed lines represent customer performance needs while the solid lines show the performance delivered by products utilizing interdependent and modular architectures.

**Figure 2 – The Model of Integration & Disintegration<sup>1</sup>**



Source: Clayton Christensen

<sup>1</sup> Clayton Christensen, Michael Raynor and Matthew Verlinde, "Skate to Where the Money Will Be," *Harvard Business Review*, November 2001.

## **Company Analysis**

### **Industry Profitability Analysis**

In the 1990's there was little threat to profitability in the enterprise storage hardware industry. EMC had just usurped IBM with its Symmetrix RAID product in 1991, which quickly became the industry's "gold standard." However, the paradigm has since shifted; profitability in the enterprise storage hardware industry has dramatically declined since the evaporation of demand from its largest customers, dot-coms and telecoms, in 2000. This disruptive technology has inspired imitation by new entrants and entrenched incumbents alike. Since 2000, the formidable strength of the industry's entry barriers has eroded as competitors have learned RAID technology, built production facilities, and gained reputations as capable suppliers. These rivals have reduced the industry's average gross margins from 59% to 39%.

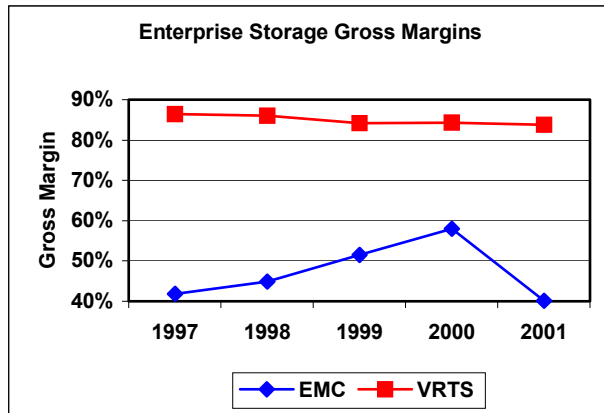
Since EMC introduced RAID technology in 1991, high entry barriers have protected the industry's profitability. Successful entrance into enterprise storage platforms required extensive engineering know-how, gained through R&D and experience, capital, and brand reputation. For large potential entrants, gathering the capital would pose little challenge, but acquiring the engineering talent, spending time and money on R&D, and acquiring a strong reputation would keep competition one *large* step behind the industry's leader, EMC. Reputation has proven to be a key asset and EMC has enjoyed the reputation as the producer of the *best storage platforms* since it bypassed IBM in 1991 with its RAID offering. Brand reputation has proven to be an especially important barrier for hardware and software manufacturers because corporate IT departments must always worry that choosing a *second-tier* brand may reduce their credibility in the event of a system crash; as a result, *the IT department* becomes the faulty party, not the equipment.

Segment rivalry is high as expected with the large number of competitors producing increasingly less differentiated hardware and slowing industry growth. Competitors like Compaq, Network Appliance, Hitachi, and IBM have slowly deciphered the RAID technology and have developed similar SAN and NAS offerings. Intense rivalry and more substitutable offerings in enterprise hardware have driven industry value and profits into software. As a result, hardware vendors have moved aggressively into software production and have devoted an increasing percentage of R&D to software design. Also, rivalry is complex because the major players both compete and cooperate in different market segments, leading to a complicated web of relationships within the industry. Despite the very competitive nature of the enterprise *software* market, margins have remained robust. As the largest software-only player, Veritas is a good barometer for trends in industry margins and has maintained licensing gross margins flat at 96% from 1999 to 2001.

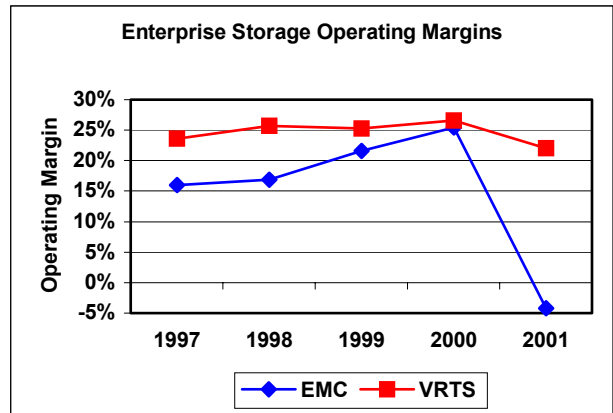
Further complicating the industry's profitability is the growing power of corporate IT purchasers, the main buyers of enterprise platforms. With the evaporation of the Internet euphoria and the onset of a global recession in 2001, IT managers and CFO's have demanded that hardware producers show an ROI for the capital expenditure. CFO's realize that enterprise IT investments represent a significant commitment of their resources, and with the rise of enterprise offerings they are no longer at the mercy of one industry leader.

Gross and operating margins of the premiere enterprise hardware and software players support the hypothesis that hardware has become increasingly competitive since 2000 while differentiation and profits remain strong in software. **Figures 3 and 4** below illustrate industry profitability levels using EMC as a proxy for hardware competitors and Veritas for software.

**Figure 3**



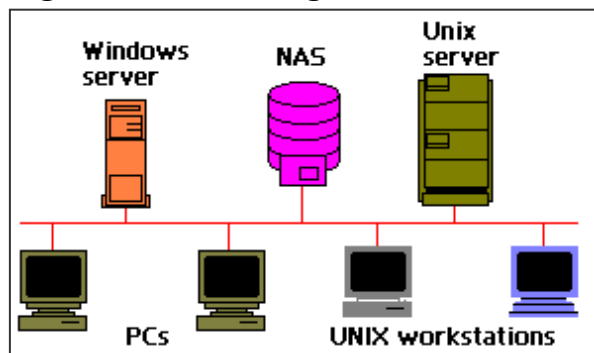
**Figure 4**



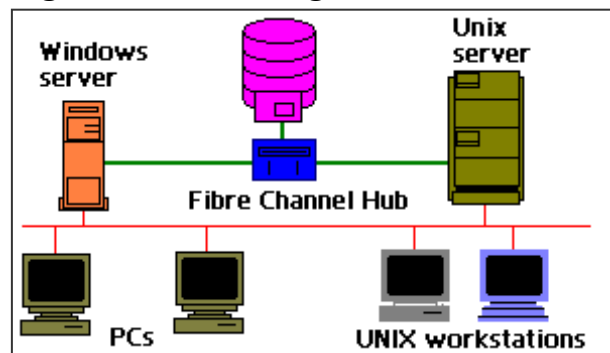
**Complements**

There are several critical pieces of hardware that allow for efficient operation of SAN or NAS networks, including file servers, optic fiber cable, and fiber switches (See **Figures 5 & 6**). Together, the aforementioned items form a SAN. NAS does not require the latter two items because the storage device and server typically attach to an existing local area network (LAN) or wide area network (WAN). Other noteworthy complements to network storage are software, professional consulting services, and research engineers.

**Figure 5 – NAS Configuration**



**Figure 6 – SAN Configuration**



Key complements to enterprise software are the underlying operating system platform (UNIX, Windows NT, NetWare), other products within the suite, third-party application development, and professional design and integration services. Strong IT services organizations are complemented by deep technical expertise and broad product lines.

### **Differentiation**

DAS used to be the standard offering until NAS and SAN became more prevalent 4-5 years ago. Networked storage offers two key benefits over DAS: (1) it requires less staff to monitor the network and (2) it allows for more efficient use of the available storage space in so far as the total available space is managed as one “storage pool.” DAS directly connects one server to one storage device, which limits the storage device’s utilization to the requirements of its joined server. Instead, joining storage devices to a network more efficiently assigns and allocates usage across *all* of the company’s storage devices. Both of these benefits create significant financial savings for enterprise buyers and have contributed to quick adoption of network storage.

Differentiation in the enterprise software market is driven by performance characteristics such as reliability, scalability, and cross-platform interoperability as well as after-sales service and support. Additionally, competitors try to differentiate themselves by offering broad product lines (EMC, Veritas, IBM), hardware integrated solutions (EMC), or a technology neutral stance (Veritas).

The industry has avoided significant price competition to date because competitors have remained far apart on the Hotelling Line<sup>2</sup>. Network storage offerings are still custom built for each purchaser; the competition and technology is “not good enough”<sup>3</sup> to allow for modular offerings. As mentioned before, this *paradigm is shifting* as the technology becomes more standardized, and competitors are moving much closer on the Hotelling Line, causing hardware prices to fall dramatically.

### **Cooperation**

The opportunities for cooperation in this industry differ for hardware and software vendors. There are few opportunities for cooperation among hardware vendors because firms currently receive greater rewards for the ability to provide a total storage solution that includes hardware, software, and services. However, as the technology becomes more standardized, thereby driving organizations to become more focused on one particular portion of the value chain, the opportunities for cooperation will abound.

Software vendors, however, regularly cooperate with hardware OEMs and VARs to ensure proper distribution of their products. This is becoming increasingly complex, as some partners are also competitors. Veritas has experienced greater success than EMC at partnering with other hardware producers because the OEMs do not compete directly with Veritas in hardware and the OEMs fear EMC’s ability to provide a single-vendor solution.

More cooperation on an industry-wide basis is unlikely in the near future because the participants have little to gain right now by lobbying the government, creating common standards, or joining a research consortium. The latter two events would only hasten the arrival of hardware standardization and modular designs, which would eliminate current competitive advantages.

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<sup>2</sup> Harold Hotelling, *Stability in Competition*. The Economic Journal, 1929.

<sup>3</sup> Clayton M. Christensen, *The Innovator’s Dilemma: When New Technologies Cause Great Firms to Fail*. Boston: Harvard Business School Press, 1997.

### **Market Segmentation**

Enterprise hardware products are segmented by their method of communicating with servers. DAS was the original storage design that directly mated a server to a storage device. However, as this model became cost ineffective, *network* storage became more prevalent. NAS provided a key capability; it attached storage devices to an existing LAN allowing greater utilization of storage devices. However, as demands for greater utilization and decreased maintenance costs increased, SANs were adapted. A SAN creates a *separate storage network* from the LAN and decreases total ownership costs by increasing storage utilization, thereby requiring a company to purchase fewer platforms, and decreasing maintenance costs through automation. SAN and NAS products are very expensive, usually requiring CFO approval.

Enterprise software products are generally divided into the following segments: data protection, file and volume management, and clustering and replication. Pricing is complex because products are sold directly via the company's sales force and indirectly through OEMs and VARs. Strip-down versions of solutions are commonly bundled with OEM operating systems while full-function versions can be purchased for an additional cost.

The storage services functions are generally divided into the following segments: design, implementation, integration, and maintenance. The design and maintenance functions are relatively simple and less costly, resulting in lower profit margins. Implementation and integration services are more profitable and EMC has a better chance of leveraging its talent pool in these functions.

### **War of Attrition**

Hardware margins are expected to remain robust enough to support several competitors in the market. As hardware becomes standardized, a lean, efficient manufacturer like Dell would be the early favorite in a war of attrition. Within the software market, dominant products in specific market niches like Veritas Volume Manager will become de facto standards. Extensive third-party development support, reputation, and lock-in due to a large installed base of customers with personnel trained on the product will support the tipping of the market segments in favor of one vendor. The economics of software – high fixed costs and very low variable costs – also support a single dominant competitor in each segment. Several competitors will likely be supported in the enterprise software market because they each have strong products capable of dominating a specific market niche.

### **First Mover Advantages**

EMC was rewarded with all of the traditional first-mover benefits when it introduced RAID technology in 1991. The company gained the reputation as providing the best storage systems and earned excellent profits throughout the 1990's. Leveraging its industry-leading position in hardware, EMC also gained a strong position and reputation early in the storage software market. However, this early market dominance has opened the door for niche competitors who created second-mover advantages by cooperating with competitors who feared EMC's dominance. One such competitor, Veritas, has established a strong position in the storage software market by offering platform-independent solutions through hardware OEMs like Sun, IBM, Hitachi, Compaq, and HP. Many industry analysts believe that this second-mover advantage has Veritas best positioned for the transition to modular architectures.



## **Strategic Issue**

The majority of EMC's revenues are derived from the sale of its storage hardware. Hardware margins will likely continue to erode as the core technology becomes standardized and modular designs replace integrated solutions. Given this expected market transition, the following strategic issue will be addressed:

*Assuming that enterprise storage hardware is being commoditized, what strategic direction should EMC take and how should EMC implement this strategy?*

## **Strategic Recommendations**

EMC must retain its market-leading position in total system solutions in the emerging SAN and NAS markets while simultaneously building modular capabilities for the DAS market. These modular capabilities will be critical as the SAN and NAS markets mature. Below are specific strategic recommendations for each primary business unit.

### **Corporate**

- Establish hardware, software, and services as independent profit centers.
- Newly appointed COO will lead coordination between the three groups.

### **Hardware**

- Expand distribution through server OEMs to increase sales opportunities and reduce reliance on EMC's expensive direct sales force.
- Further develop product offerings to provide good, better, and best system choices.
- Rationalize cost structure, particularly R&D and its large direct sales force.
- Consider outsourcing manufacturing while retaining hardware design, final assembly, and QA testing.

### **Software**

- Cooperate with other hardware OEMs for the distribution and reselling of EMC software solutions on competing hardware platforms.
- Design software products with a modular architecture at the core to ensure strong performance as a stand-alone product in future versions.
- Continue to closely integrate software and hardware for optimum performance in the emerging SAN and NAS markets.

### **Services**

- Always act in the customers' best interests, independent of technology platform.
- Solidify tight feedback loop to hardware and software groups to improve EMC's product competitiveness, recognize market trends, and identify customer needs.

### **Option theory of Capital Investment**

EMC must create a call option to prepare for imminent paradigm shift to modular, standardized hardware and software offerings. EMC should retain an R&D focus on creating “sustaining innovations”<sup>4</sup> that improve current products but divert some of its resources to “disruptive innovations”<sup>5</sup> that will destroy EMC’s current integrated model. Essentially, investing in this option allows EMC to destroy its own business model with modular designs using standardized off-the-shelf technology rather than let a competitor do it.

Developing strong software and IT consulting/services businesses capable of surviving independent of its hardware business gives EMC an extremely valuable real option to exit hardware in the future if commoditization destroys hardware profitability while remaining a powerhouse in the highest value-added parts of the enterprise storage market – software and services.

### **Implementation Recommendations**

#### **Organizational Design and Incentives**

In order to implement these strategic changes, EMC’s management must change key aspects of the organization structure and incentives. EMC has recently made very important organizational changes, including the creation of independent divisions for Open Software, EMC Global Services, and Global Alliances. The heads of these divisions are all at the Vice President level. EMC’s current organization structure, however, is still inadequate to manage this modular strategy because it lacks a COO to coordinate major group interactions and strategy. As shown in **Appendix Figure 7**, it appears that all operational and functional heads report directly to the CEO.

EMC must re-organize by appointing a COO to consolidate operations management and maximize product line performance while encouraging intra-divisional cooperation. The CEO simply does not have the bandwidth to adequately act as an internal expert / consultant to the operating division heads. The COO, as an expert adviser, will be tasked with coordinating strategy implementation, offering advice, and settling disputes between the divisions. It is key that the Storage Platforms, Open Software, and Global Services divisions all have equal status. Each of these operating divisions will function as profit centers with full responsibility for their division’s day-to-day operations and financial goals, as shown in **Appendix Figure 8**.

The incentive structure should maximize division performance, encourage intra-divisional cooperation and retain key employees. EMC must adapt to reward both excellent *integrated systems* and top-flight *modular products*. In integrated systems, the company should reward total system success with additional compensation based on design group and individual performance. Employees in modular products should be rewarded based on product and individual performance. EMC can manage these incentives by correctly aligning the variable portion of an individual’s salary with the specific strategy they are tasked to meet. Metrics for evaluating performance could include a combination of the following: operating profit, profit

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<sup>4</sup> Christensen

<sup>5</sup> Ibid.

growth, and customer retention/satisfaction. Within the sales organization, incentives should encourage distribution through OEMs and VARs to lower fixed costs.

Implementation is a tough task and could take years because the organization has historically valued integrated hardware solutions. Senior management can hasten the strategy's adaption by using *symbolic* gestures like treating the heads of the operating divisions equally and touting successes in the Open Software and Global Services divisions. Promotions from within these new divisions will also signal management's dedication to its new strategy.

## **Conclusion**

In order for EMC to sustain long-term financial growth, it must adapt an integrated model similar to that of IBM. To do this, EMC must continue devoting resources to building its software and professional services divisions. It must also re-work its cost structure so that it will remain competitive as low-cost producers attack during industry maturation. This will provide the financial resources necessary to build its software and consulting competencies. To effectively implement these changes, EMC must change its organizational structure and align managerial incentives. Together, these changes will increase the probability that EMC successfully weathers the imminent paradigm shift and sustains long-term financial growth.

## Appendix

Figure 7\*

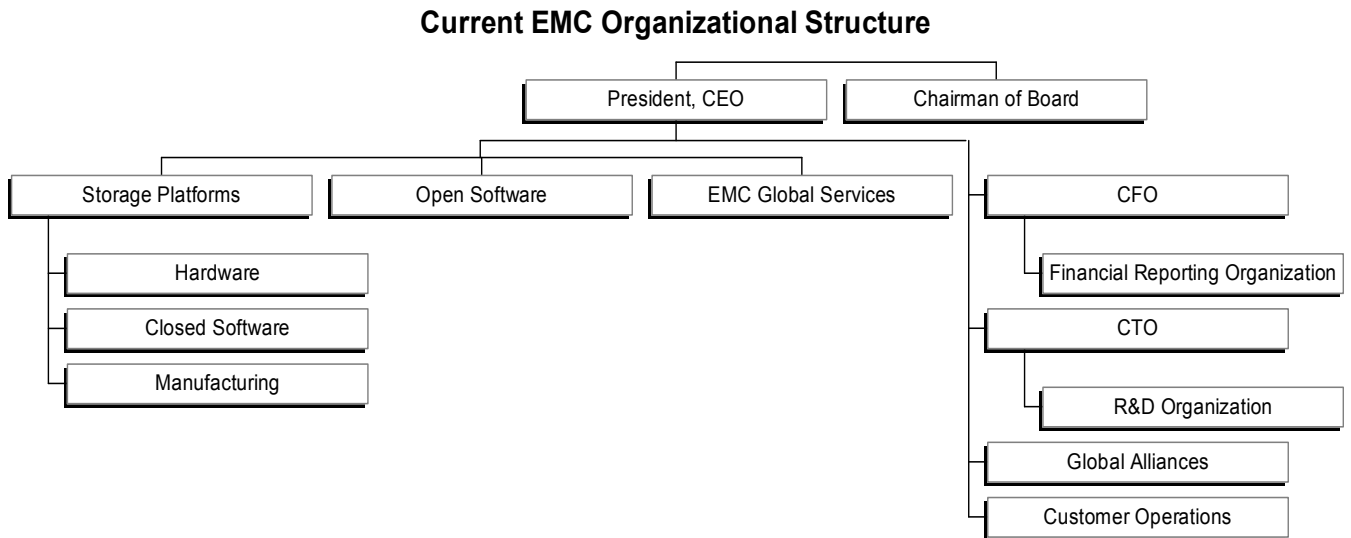
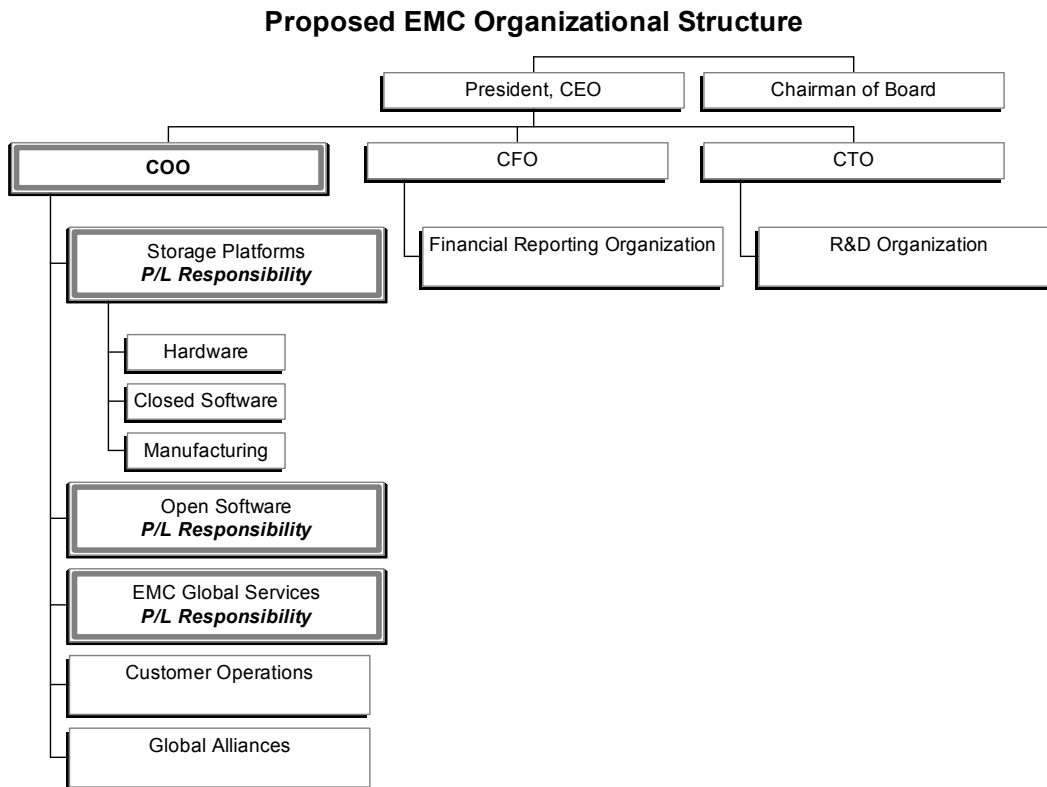


Figure 8



**\*EMC does not provide an actual organizational structure; this diagram is based on the descriptions and titles of EMC executives provided on *emc.com*.**