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민간기업 경쟁력제고 및 기술개발지원 정책방향에 대한 제언

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Strategic Responsibilities of the Chief Technology Officer

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Introduction

The significant role of technology in strategic business decisions has created the need for executives who understand technology and recognize profitable applications to products, services, and processes. Many companies have addressed this need through the appointment of a Chief Technology Officer (CTO) whose responsibilities include:

- monitoring new technologies,
- overseeing research projects,
- providing technical assessments of potential mergers and acquisitions,
- explaining products and technology strategies to the trade media, and
- participating in government, academic, and industry groups.

Origins of the Chief Technology Officer

In the 1950s and 1960s, many large corporations established beautiful research laboratories at locations remote from their headquarters and manufacturing facilities. The goal was to collect brilliant scientists and allow them to study relevant topics in an environment unhindered by day-to-day business concerns. The director of the laboratory was often a corporate vice president who did not participate in decisions regarding corporate strategy and direction. Instead, his responsibilities were to attract the best scientists, explore new ideas, publish respected research papers, and generate technologies that might

become new products. From these origins, the modern CTO position calls for a technologist or scientist who can translate technological capabilities into strategic business decisions. Lewis expresses this very clearly.

“The CTO’s key tasks are not those of lab director writ large but, rather, of a technical businessperson deeply involved in shaping and implementing overall corporate strategy.”¹

Strategic Responsibilities of the CTO

The CTO position is far from being standardized. Each company has unique requirements for its CTO and provides a unique organizational structure into which the person will fit. This section describes some of the more prominent responsibilities of the CTO as cited in the literature and extracted from interviews with CTOs.

Monitoring and Assessing New Technologies

The rate of change of technology guarantees that knowledge and expertise gained several years ago will no longer be completely valid. This creates the need for a technologically current person to serve as an advisor to senior executives during strategic decision-making. Paul O’Neill stated that a CTO should be expected to, “identify, access, [and] investigate high-risk, high-return technologies possessing potential application within existing businesses or for creating new businesses”.² Knowledge that is several

years old cannot effectively guide this type of assessment. If a company is planning to modify its production process or add new products, it must understand how the latest technologies can contribute to those plans. As an illustration of this, Peter Bridenbaugh recognized that recent technical advancements made it possible for mini-mills to operate profitably and to assault the markets held by large metal producing companies like Alcoa.² Because he was actively monitoring new technologies and assessing their applicability to business opportunities, Bridenbaugh was in a position to advise Alcoa of this threat while mini-mills still occupied a very limited niche in metals production. Though other executives within Alcoa had come up through the operational and scientific ranks, their focus had changed to organizational and financial issues. Because they were no longer intimately familiar with the latest scientific developments in metal production, the emergence of mini-mills did not appear to be a serious threat from their perspective. Junior engineers, on the other hand, understood the changes in technology, but did not possess the access necessary to present their opinions to upper management. Therefore, a CTO who embodies current knowledge, is networked with company engineers, has years of experience, and has access to executive decision-makers is a valuable resource in recognizing important new technologies and bringing them into the company's strategic decision-making process.

Darren McKnight, the CTO of defense contractor Titan Corp., listed the evaluation of new technologies as his number one responsibility.³ Titan had developed an electron beam technology to sterilize medical components and the company's senior technologists recognized that this capability could also be used to pasteurize food products - Titan created

the Surebeam subsidiary to pursue this market. Following the anthrax contaminations in Washington, D.C., McKnight and others recognized that Surebeam's systems could be used to kill anthrax hidden in postal envelopes. Backed by existing research and prior publications on the subject, Titan created a new market for electron beam systems and assigned a facility to sterilize selected mail destined for the nation's capital. The expertise of business executives, unaided by technologists, would not have been sufficient for identifying such a unique opportunity. Situations like this demonstrate the real contributions that can be made by a CTO.

Strategic Innovation

Michael Porter maintains that companies have to find ways of growing and building advantages rather than just eliminating disadvantages. Paul O'Neill emphasizes that established companies need a CTO to, "assure development of fundamental technologies offering clear competitive advantage for current and future businesses."² A significant part of this is strategic innovation. In some industries, new products based on new technology are the lifeblood of the company. In other industries, core products remain unchanged for decades, but the processes used to create them are continually evolving and becoming more efficient. Proctor & Gamble recognized that their products were mature, but that their scientists had a number of innovative ideas for improving these products and creating new ones. The company's CEO and CTO created the Innovation Leadership Team to find and allocate funds to support these new ideas. This program quickly led to eleven new products and a number of innovations waiting to become new products, giving Proctor & Gamble a significant lead on competitors.⁴ Even companies that create commodities like

laundry detergent, toilet paper, gasoline, and furniture must apply technology to improve their production processes and to add a competitive edge that their competitors cannot match.

Walter Robb, former CTO of General Electric Medical Systems, believes that, "it is the responsibility of the CTO to push the boundary on risk taking."⁵ The CTO's relationships with the R&D scientists equip him with knowledge about the state-of-the-art that will allow him to recommend risks that have a high probability of success. GE's innovative designs for CAT scanners and magnetic resonance imaging systems accepted high levels of risk in order to create unique products containing features beyond the technical reach of their competitors. Those calculated risks led to a market dominating position that extended for over a decade.

Ron Moritz, CTO of Symantec, says, "One of the key roles of the CTO is to provide the technical vision to complement the business vision, setting the tone and direction for the company's technologies. Leadership, in this context, comes from being able to set the technical course and from being able to define what the company's products and technologies might look like in two, three, or more years."⁶

Mergers and Acquisitions

Mergers and acquisitions (M&A) are an important part of the growth strategy of many companies. These involve important strategies in financing, governmental oversight, taxation, corporate culture, and technological synergy. Unfortunately, after studying more than 5,000 acquisitions, divestitures, spin-offs, equity investments, and alliances, Frick and Torres discovered that over half of the deals resulted in a lower market value for the resulting entities.⁷ Other McKinsey studies in the late 1980's reported that, at that time, more

than seventy percent of acquisitions failed to earn back the cost of capital used to purchase the company. Frick and Torres maintain that there are two major causes of this problem. First, the acquisition becomes an exercise in financial engineering. It focuses on successfully structuring the finances required to make the acquisition possible and loses sight of the strategic objectives of the acquisition. Second, it is a form of corporate ego boosting. Corporate leaders are eager to build an empire or capture high profile products. Frick and Torres contend that, in contrast to these two motives, value creating mergers and acquisitions are focused on the strategic value that can be achieved through the transaction. However, to make this happen, it is essential that the due diligence leading up to the deal include an evaluation of the technologies being acquired. The CTO's role in due diligence includes evaluating patents, reviewing technical publications, and studying trade data to determine the value of the target company and to rank it against its competitors. Darren McKnight at Titan Corporation includes these types of investigations in his list of key responsibilities.³ At Titan, each deal has included a strategic evaluation of the technologies within the target company and the synergies that those technologies could generate within the Titan organization.

Marketing and Media Relations

Media attention to company products and capabilities plays an important role in the success of those products. Constructing the information and images released to the public is primarily the responsibility of the marketing and sales departments. However, technical expertise is required to accurately translate some product details into terms that can be marketed. Rajeev Bharadwaj, the CTO of Ejasent, plays an active role in communicating with the

media. He believes that the CTO must translate technical details into real customer advantages that are superior to those of competing products. Start-ups must also create convincing presentations and demonstrations for venture capitalists (VCs) are the first customers for the company's ideas.

In addition to creating media worthy stories for publication, companies create media worthy experts to be interviewed and quoted. Trade magazines and television producers rely upon statements by insiders and experts who can speak authoritatively on a subject. These experts are like politicians – they're made, nurtured, and coached. They are also constantly accessible to the media for consultation. Ron Moritz, CTO of Symantec, was an expert in Internet security, but the media was not aware of his expertise. Therefore, Symantec's President took it upon himself to turn Moritz into a media recognized and consulted expert.⁶ This was part of the corporate strategy at Symantec and contributed to the success of its security products.

Government, Academia, Professional Organizations

Prominent technologists are often called upon to provide services to government, academic, and professional organizations. These services combine civic and professional duty with the opportunity to convey a positive image of the company and its products.

Governmental committees investigate issues of national importance. Service on these committees is an honor, but it also requires the dedication of time, energy, and money that could be focused on other pursuits. Participation brings several rewards that are an alternative form of return.

- Tacit recognition as a leader in the field,
- Opportunities to influence the decisions of the committee in a professionally positive manner, and
- Early and intimate access to the work generated by the committee.

CTOs often have multiple relationships with members of academia. These relationships lead to partnerships and funding for research that is of mutual interest. One of the most commercially successful and widely recognized industry/academia partnerships is the Media Lab at MIT. This lab investigates the application of computer technologies to practical social problems. In 2001, the lab received 95% of its \$36 million budget from 140 corporate sponsors. A CTO must insure that money and time spent on such projects is aligned with the corporate strategy and has a realistic potential of contributing to the company's competitive advantage.

Professional organizations and their associated meetings are an opportunity to project a positive image within the profession and to communicate important messages. Participation allows the CTO to tell partners, suppliers, competitors, and customers about their expertise, products, future strategy, or commitment to an industry.

Company Culture

The CTO can also serve an important role in creating the internal culture of the company. The CTO should initiate activities and policies that create an innovation and technology-friendly culture aligned with the company's business strategy.

The CTO should insure that policies and practices are constructed to attract the right type, right number, and right placement of

technologists. This will require the establishment of formal and informal networks to implement the policies and to insure that they are aligned throughout the company.¹ These networks will also serve as conduits through which the corporate vision and direction can be communicated.

In some companies networks of technologists tend to catalyze unofficial practices that are aimed at improving internal performance. Lewis reports the emergence of internal publications, technical seminars, lists of known experts, and technical expositions as expressions of the company's technology strategy.¹

Technology and Executive Leadership

Companies began adding Chief Technology Officers to the executive ranks in the 1980s because technology was becoming an integral part of the strategic decisions and future plans in all types of industries. The companies cited in this article found that the strategic use of technical expertise provided a competitive advantage that was difficult for competitors to match.

The CTO position is still relatively new, applications of it are often unique or ad hoc, and there remains some skepticism about the need for such a position. But, the significant role of technology in all industries is here to stay and executive decisions must be informed of the advantages that technology can provide. Over time we will find that executive decisions rely on the CTO as much as they have on the CFO, CIO, and other executive level specialties.

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