

Innovation for Innovators

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The Field-Grade CTO

If a chief information officer (CIO) can manage the internal use of information technology throughout an organization and a chief financial officer (CFO) can oversee the finances of an entire company, then it seems logical that a chief technology officer (CTO) should be able to direct the use of all non-IT technologies across a company's product-development and manufacturing processes, doesn't it?

But technology is not finance, or even IT. Technology is both more diverse and more specialized than finance and IT, and it may be more difficult to manage with the same top-down hierarchy used in those domains. Within any large corporation, there are literally hundreds of unique technologies to be evaluated, adapted, and incorporated into products or production processes. An aerospace company may have interests in metals, composites, radar systems, and avionics. At an oil company, the central technologies may be in remote sensing, seismology, and oceanography. While they are related areas, they are also widely divergent. It is difficult, if not impossible, for a single CTO to get his arms around all of the technologies that may be important to a complex organization and provide meaningful guidance about which ones to pursue and how.

Lewis and Lawrence (1990) counseled the CTO to get out of the research lab and contribute to the business strategy: "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." Perhaps, I would like to suggest, the CTO should also get out of the C-suite and into the detailed workings of the business units. In a world of diverse technologies, there is a need for more senior technologists looking into fewer technologies each. What's needed, in short, is a field-grade CTO.

Field-Grade Officers

The military has a long history of embedding functional experts into their field units. These field-grade officers fall between the senior ranks of generals and the lower company officers who have direct command of the troops. The field officer does not directly manage and direct combat troops; rather, he or she focuses on a specialty area such as logistics, intelligence, or communications, along with all of the details involved in that field. He or she brings a unique expertise to the field units, adding specialized knowledge where and when it is needed. Similarly, "field-grade CTOs" could be

distributed across business units, providing specialized expertise in the few technologies most important to each unit.

In fact, this structure has already been adopted in many companies, where technology leaders are focused on the use of technology within a specific field unit of the company. Having served as a CTO in a software company, a government acquisition office, and a nonprofit hospital system, I have observed that the function of the CTO has become much more of a field operation, rather than a single C-suite position (Smith 2007). Though there may be a single CTO at the top, most companies also employ a number of business-unit level CTOs engaged in the operations of just one specialized area. Further, this field-grade CTO may or may not have official reporting or accountability relationship to the C-suite CTO.

David Pratt, for example, has served as the chief technology and engineering officer, chief scientist, and fellow for the modeling, simulation, and training business unit of SAIC, a company of 46,000 people headquartered in Northern Virginia. He reports to the business unit's senior vice president and weighs in on all strategic issues involving that unit's products and services. He has a voice in decisions to make acquisitions, pursue new contracts, and expand into new markets. But he does not serve as the CTO for the entire company, nor is he expected to be a master of every technology that this global company uses. His relationship with the C-suite CTO is more akin to those within a consulting company. The C-suite CTO does not control the daily activities of Pratt and his peers in other SAIC business units, or even evaluate their annual performance. Rather, he expects to be able to call on the specialized expertise of the field-grade CTOs when new problems arise across the company. If a new business opportunity requires expertise in virtual reality combined with global communications, the company can call upon the expertise of Pratt and other experts to deliver a solution more rapidly than competitors. Once the immediate problem is solved, the field-grade CTOs return to their business units. What hierarchy that does exist among the CTOs is not meant to control their daily activities, but rather exists to provide a competitive advantage to SAIC in new business ventures.

Porter's Technology Value Chain

In his classic book, *Competitive Advantage* (1983), Michael Porter Michael Porter stated that, "technology is embodied in every value activity in the firm, and technological change can affect competition through its impact on virtually any activity (p.166). Most managers and executives remember this as the book that introduced the value chain, but they may have missed this discussion of technology across that value chain.

In his value chain model, Porter divided the company's various operations into primary activities—inbound logistics, operations, outbound logistics, marketing and sales, and service—and support activities—infrastructure, human resources management, technology development, and procurement. In addition to describing how each of the activities, whether primary or support, create value, Porter offered a concise description of the role of technology within each area. For instance, operations technologies include the materials that are used in production, the machinery that is used, the means of

handling and transporting material down the line, packaging for intra-facility handling, quality assurance methods, facilities design, and information technology on the production line.

Seemingly anticipating the clamor for a single C-suite CTO that would arise through the 1990s, Porter showed how technologies and their applications within different activities of the business are unique and each unique application makes significant contributions to the value chain. A field-grade CTO in an operations area, for instance, will focus on core manufacturing processes and materials. How is the product created and how can it be done faster, cheaper, and better?

And support activities are not a technology backwater. In fact, the IT department has totally transformed Porter's infrastructure, procurement, and human resources management activities since the book's publication. Leaders have redesigned entire companies around new IT infrastructures, introducing changes on a par with the addition of electric power and telephones in an earlier generation. IT is now so important that the CIO position has become almost universal in the executive ranks of companies around the world.

Not surprisingly, many of these CIOs are supported by a deputy with the title of CTO. A CTO-of-IT, like Herb Keller at Florida Hospital, usually handles the relationships with specific IT product vendors and the actual installation of the tools. Executive guidance from the CIO establishes the funding and strategic plan, which the CTO-of-IT then implements as part of the infrastructure support activity. He must also work with the operating units of the hospital, such as the emergency department, surgery, in-patient care, and the research group, to meet their unique IT needs. When the CTO of the research group wants to establish global telecommunications connections to conduct research into telesurgery, he and the CTO-of-IT develop a CTO-to-CTO collaboration between two field-grade officers to find effective, affordable, and regulation-compliant tools that can do the job. Though these CTOs have different reporting structures within the organization, they share the responsibility for solving an important problem within the hospital system.

Conclusion

Any title with the CxO form is automatically expected to be part of the executive suite, with one person holding the title. But the CTO title may not fit that mold. Given the variety of technologies—and contexts in which technologies are implemented—it may be time to rethink the notion of a C-suite CTO. Porter's Value Chain model suggested the need for these technology experts as early as the 1980s. Industry practice has met this need through the creation of field-grade CTOs.

References

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