

# The CTO in Transition

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In “5 Patterns of the Chief Technology Officer” we discussed some of the major combinations of style, capabilities, and temperament that were required of a CTO during different phases of the evolution of a business, specifically a business that was growing and changing at a rapid pace (Smith, 2004). That paper made reference to the fact that the CTO of an emerging start-up would face some major career and responsibility changes if and when the company was successful in its endeavors. Here we discuss some of the causes of discontinuities between the person occupying the seat of the CTO and the demands placed on the CTO as the company grows.

<u>Genius</u> Product Innovation	<u>Director</u> Innovation Management	<u>Administrator</u> Efficient Deployment	<u>Advocate</u> Customer Champion	<u>Executive</u> Strategic Vision
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Figure 1. Five Patterns of the CTO.

## Manipulating Technology

The team of people that come together to form a company with a technological foundation will certainly include someone who is a master of the technology, or ambitious to become such a master. This person, treated in the singular here, will experience his or her first transition very early in the process.

A technologist will have mastered a set of skills that allow him to manipulate technology effectively. This person will be able to work with the software, electrical, chemical, or biological materials to create a new and useful product. Computer programmers understand the language, operating system, hardware, and development tools that allow them to manipulate symbolic instructions to the computer. Electrical engineers will be able to design and/or construct circuits that can identify images, process signals, or control mechanical devices. As a creator or manipulator, this technologist will derive a degree of satisfaction from this ability, take great pride in it, and often tie his or her personal identity to this set of skills. This deep personal investment in technical skills is an important ingredient in driving a technologist to create a new company or product in the first place. It is one thing that has brought that person into the company of others eager to begin a new venture. It is also the primary source of their value to the group.

An ambitious technologist will be comfortable taking a hands-on role in the creation of the product and in making decisions that shape it. He will probably be accustomed to leading others through the force of technical expertise and an ability to demonstrate that when challenges arise. However, as the enterprise grows its technical base will expand until it exceeds his ability to be an expert in every area. As with other leaders, there are four sources of power that the CTO may employ. The first is the expert power that is often the most familiar to the CTO. He or she is used to leading people by being the best programmer, engineer, or scientist on the team and enjoying the respect and deference

that accompanies that. An extension of expert power is referent power in which the people being led accept that the CTO has power based on a respected reputation and/or the desire of the members of the team to be accepted and acknowledged by the CTO. This power emanates from those being led. A group grants representative power to a person that they have selected as their representative or leader. Political leaders are chosen and empowered in this way. Legitimate power comes from the chain of command. It is considered legitimate because the company grants it in order to achieve their objectives. Members of that company accept the legitimacy of the chain of command as part of their employment. Finally, there is coercive power, a form that is often the least familiar to the CTO. Coercive power stems from the CTO's ability to punish employees or grant rewards (Newell, 2002). To be an effective leader, the CTO must move beyond expert power and learn to employ the other forms of power effectively.

The technical expert is an invaluable ingredient in a new company. Technical skills are often the showcase of the company's capabilities and the person who has been knighted as the CTO of the company will be required to perform feats of expertise in front of investors, the news media, and industry professionals. This is the first transition – from “doer” to “advertisement for doing”. As a person, the CTO must be comfortable in the spotlight and have a certain flare that engenders confidence. If he does not possess this style, it can be taught, as it was at Symantec in the early years. Ron Moritz, CTO of Symantec, was an extremely proficient security professional, but largely unknown to the industry press. Symantec President, Roberto Medrano, created the marketing campaign that made Moritz available to the trade press, conferences, and media events. This was all designed to create an in-house, world recognized expert in the field. In Moritz's words, “Experts in this industry are like politicians – they are made, nurtured, and coached” (Aspatore, 2002). This transition is one of the first and smallest that are driven by the needs of the company. Many technologists drive their own careers based on their skills, interests, and personal ambitions. However, when they become an officer of the company and a marquee personality that can influence its future. They relinquish some degree of personal choice of direction and accept corporate direction to meet corporate needs.

While the start-up company is building its foundation, the CTO will switch back and forth between “doing” and “advertisement for doing”. This two-headed image is the very beginning of the transition that the CTO will face throughout the transformation of the company.

This transformation and those that follow may be called for by the nature of the business. But, it is not absolutely necessary that the technologist or CTO change himself to fit the company's needs. Many technologists choose to remain with their original skill set and image. When this is the choice, and company must turn to someone else to meet the needs they are experiencing. When a technologist chooses not to be molded by the needs of the company, such a choice is almost synonymous with choosing not to be the CTO. However, it is also possible that the path is too difficult for the technologist to navigate. There are limits on personal growth and company growth. More established companies transition very slowly. In this case, the individual employees find themselves growing at

a faster rate than the company can take advantage of. Under these conditions, individuals move from one job to another more challenging position.

However, when the company is growing faster than the individual can grow, then the opposite occurs. The company must move on to a more appropriately skilled person. Just as the growing individual left a hole for the company to fill when he or she moved to a new position, in a fast growing business, the company's need to move forward can leave a hole in the career of the individual that has to be filled by another company. Figure 2 illustrates this reversal of the growth rates.

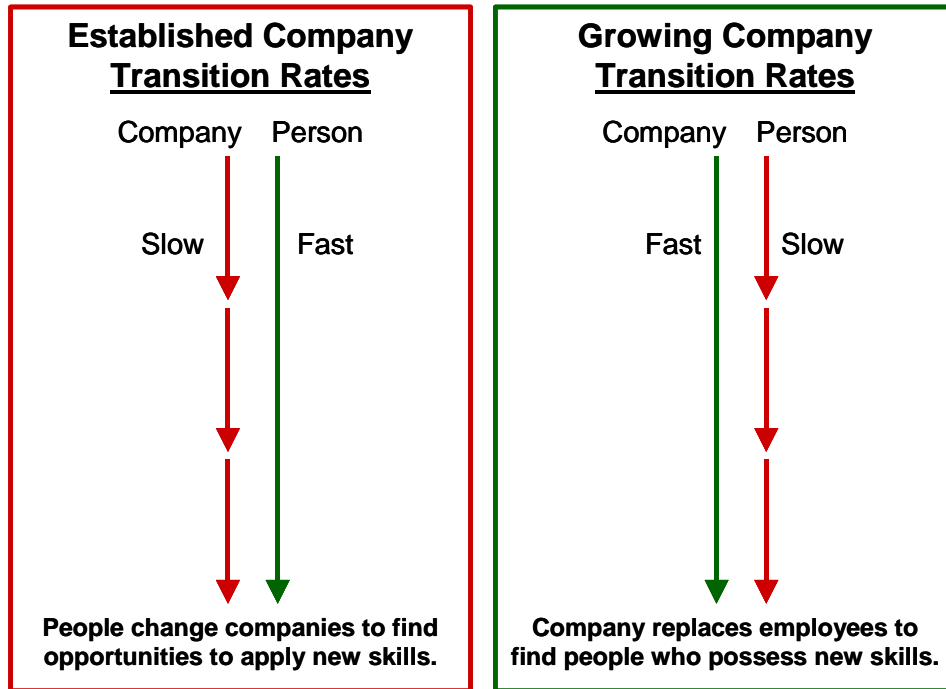


Figure 2. Effects of disparate personal and business growth rates.

### Managing Technology

If all goes well, the company will succeed at moving through its start-up phase to become a more stable business that is not on the verge of exhausting its finances. A CTO who has played a significant role in achieving this success, like the other executives and risk-takers in the company, will be rewarded financially and organizationally. Retaining or attaining the CTO position is one such reward, and something that has driven the proliferation of the CTO title among technology companies during the last decade.

As the CTO of a small stable company, the newly expanded technologist will find himself responsible for a much broader set of tasks associated with maintaining, maturing, and managing the product. Using a software company and a computer programmer as our examples through these transitions, we find that the CTO who was once simply a programmer is now being called upon to serve as a software engineer. In addition to creating a software product, he must now also handle issues dealing with

requirements definition, design, testing, integration, configuration management, quality assurance, and product support. All of these are necessary to insure that a product maintains its cohesiveness, functionality, and focus on its purpose. The CTO will find himself spending less time manipulating technology and more time managing technology that is manipulated by others (Figure 3). His technical expertise is an essential ingredient in performing this task successfully, but significant management skills must be added to allow him to be as effective at his newly enlarged job as he was as a programmer.

Typically this transition has been very difficult for technologists. They find that it impacts their personal identities and significantly changes the set of things that they have enjoyed doing every day. The transition requires relinquishing behaviors that have been directly responsible for personal successes and to replace them with skills that are much less familiar and less respected by a technical peer group.

Within a larger organization that has survived the start-up phase and achieved stability, the issues of concern to the company and the senior leaders will expand in size and extend outward in time. The CTO who was previously concerned with events occurring in the next six months will find that his horizon of interest has extended out to one or two years. He will need to deal with issues regarding the next generation product and the long-term support of the current product. His budget for operations will no longer be limited to the expenses necessary to fund a development team for six months, but will include balancing funds necessary for all technical operations for the next generation of the product. Finally, directly tied to the expansion from programmer to software engineer, will be the inclusion of a larger team of people. These people will not all have the same set of professional skills, be focused on the same urgent objectives, or practice similar business functions.

Company Stage	CTO Focus	CTO Resources
<b>Start-up</b>	<ul style="list-style-type: none"> <li>•Inventing</li> <li>•Productizing</li> </ul>	<div style="background-color: red; color: white; padding: 5px; text-align: center;"><b>Manipulating Technology</b></div> Timeline = 6 months Budget = \$100,000 Leadership = 10 people
<b>Stabilization</b>	<ul style="list-style-type: none"> <li>•Software Engineering</li> <li>•Configuration Management</li> <li>•Quality Assurance</li> </ul>	<div style="background-color: blue; color: white; padding: 5px; text-align: center;"><b>Managing Technology</b></div> Timeline = 1-2 years Budget = \$10,000,000 Leadership = 100+ people

Figure 3. Comparison of the manipulating and managing phases of the CTO position.

### Planning Products

In the third phase of the evolution of the CTO, the person transitions from managing multiple technologies to planning the next generation of products and services that will drive the company over the next five years. As the technical seeds that launched the company become mature, the executive team, of which the CTO is a member, must look

for ways to maintain their position and sustain their growth. Technology-based companies cannot rest on previous successes and expect to remain healthy. Eventually every technology becomes a commodity that is imitated and sold by a number of vendors. When this occurs, the profit margins are far too small to support the research and innovation necessary to invent new products. Therefore, for a technology-driven company to remain on the leading edge and maintain the source of their competitive advantage they must constantly push into new territory.

The challenge that Dell Computer is presenting to Hewlett Packard in selling printers is an excellent illustration of this need. HP is driven by its ability to invent new technologies to support its core products and to open new markets with new products. Dell, on the other hand, is a distributor of technology developed by others. They may make minor modifications to the product to improve its usability, but they do not make significant investments in research and invention. Therefore, as the technology that drives HP products is released to the public domain, reverse engineered, or imitated, the company loses some of its competitive advantage. Though HP may have sold 43.6 million printers in 2003, companies that can offer similar products at lower prices because they do not invest in research are constantly eroding the low end of their product mix. When such a company partners with a distributor like Dell, it significantly accelerates this erosion. Dell has sufficient penetration to influence customer buying across the computer industry, just as Wal-Mart does across consumer products.

In this environment, HP must carefully plan the release of new products or improvements to existing products. It must transform its product-base every couple of years to maintain a unique position that can justify significant profit margins. Without this forward planning, the company will fall into a price war over commodity products. The most damaging effect of such a price war is that the profit margins will not support the significant research and development that gives HP its edge. The results of such a war would be to eliminate HP's R&D resources, stop the progression of printing technology, and reduce HP to the level of a vendor of widely available technologies.

Michael Dell has said, "The days of engineering-led companies are coming to an end" (Lohr, 2004). This speaks directly to the career transition of the CTO. The skills that keep HP and others like them in a leadership position are not primarily "engineering" or "technical". They are the ability to plan the future product mix, build partnerships that deliver unique advantage, and create financial instruments to fund the company. The engineer is still at the heart of the company, but perhaps not at the head.

### **Visioning the Future**

If a company is extremely successful it will achieve a position of industry dominance. Companies like GE, IBM, Microsoft, ALCOA, Lockheed Martin, GM, Toyota, Cisco, and hundreds of others have transitioned from a small start-up to a world leader in their field. This is usually a slow process requiring multiple decades of dedicated effort.

The CTOs of such companies have a very unique set of responsibilities. They are charged with visioning the future. They must serve as a primary catalyst for extracting, organizing, selling, and applying a vision of the future. The “vision thing” is not their responsibility alone, but they are at the crux of generating the vision and applying to across the company. Pat Gelsinger, the CTO of Intel, is driving his company toward a vision of merged computing and communication (Hari, 2003). He must convince technologists across Intel that the future lies in the unification of those two separate industries and that Intel must reside at the center of that unification. Recently, many companies have recognized that telephone switching need not be a separate network from their computer data networks. Companies are turning to Voice Over Internet Protocol (VoIP) telephones rather than traditional analog lines and corporate switching systems. These devices bring both the computer and the telephone services into a single infrastructure and can significantly reduce the cost of telephone services. Eventually this will lead to the realization that there is no need for a separate desktop device for voice and data communications. Next-generation desktop computers will incorporate the functionality and ease of use of the telephone device. At the heart of this new corporate computing device will be computer processors that Intel hopes will come from its factories.

In this situation, Intel and Gelsinger are looking at the next step in the evolution of two different industries. They are seeing the trends that are moving the world into a new configuration and placing themselves in the best position to capitalize on the future. Notice that Intel is not independently trying to create the merger of computers and communication. Instead they recognize where businesses, customers, and society are moving and are attempting to apply their own spin to the future that their customers are creating. In most cases, visioning is not the creation of a new, unique, original, and personal picture of the future. Instead, it accurately perceives where the world is going over the next 5-10 years and searching for a way to be part of the future that is already forming. The CTO and the corporation seek to find a unique contribution that they can make to the new world. They become partners with larger forces, contribute to the progress around them, and reap the benefits of helping move society forward.

A CTO trying to ride the corporate transition from “expansion” to “dominance” may or may not be able to convert his or her talents into those necessary to operate at this level. The CTO of a dominant company is more concerned with products that do not exist, market needs that cannot be met, and profit margins that cannot be measured. This person must be able to move away from a focus on existing customers, established competitors, and specified product lines. He or she must be able to envision competition from new sources outside of the traditional industry. In the convergence of computers and communication, Intel is striving to be the leader. But they may find their competition coming from Lucent and Cisco rather than their traditional competitors at AMD and IBM. The convergence may transform the computer just as much as it transforms the telephone. It may become more of a communication device as professionals recognize that they use very little of the available computational power of the machine, but rely on it heavily for telephone calls, email, and document formatting. This type of transformation of the market base is something that the CTO of a dominant company

must be able to see coming, must be able to prepare the company for. There is no reason that the imagination and foresight have to come from the single person holding the CTO title. But the CTO is an essential link in expressing those ideas, giving them credibility, and using them to refocus a corporate entity.

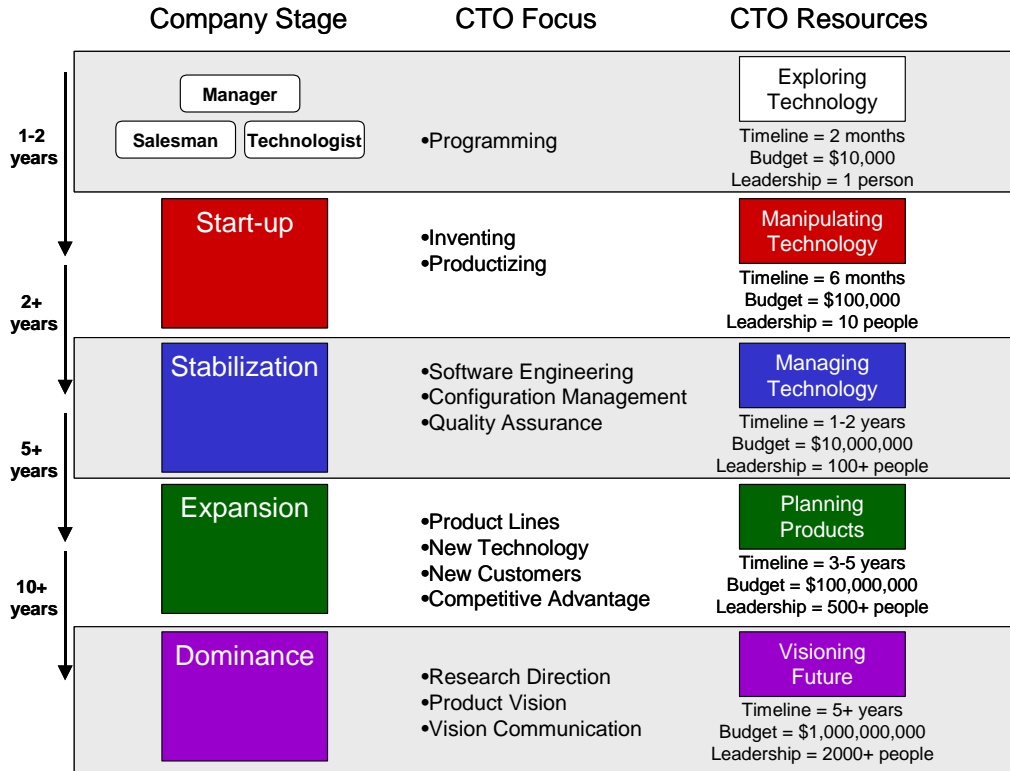


Figure 4. Demands of Transition on the CTO

## Conclusion

The professional life of the CTO is strongly driven by the state of the company that he or she serves. Early stage companies require much more hands-on expertise with specific technologies. Mid-stage companies need a CTO who can focus on improving existing products and leading teams that can create replacements for those products. Industry dominating companies need a CTO that can focus a vision of the future. This person must be able to find and codify opportunities that exist now or that will arise along the developmental trajectory of the world. Once codified, he or she must be able to influence the corporation to pursue these visions and keep the company on a path to successful innovation, avoiding distractions that diffuse energy and confuse purpose.

Each company and each individual have different growth rates. It is very unlikely that the rate of growth of the company's first CTO will be able to match the growth rate of the company throughout its ascent to higher levels. Traditionally, people have been able to grow and adapt much faster than companies. As a result, we are accustomed to people moving from one job, company, or industry to another. However, in the information age,

it is equally likely for companies to grow faster than specific individuals can follow. When this happens it is the company that must move on to a new employee.

## References

- Aspatore Editors. (2000). *Inside the Minds of Chief Technology Officers*. New York: Aspatore Books.
- Hari, P. (November 10, 2003). [“We Use a Distributed R&D Model”](#). Businessworld Online.
- Lohr, S. (May 24, 2004). [“The Distributor vs. the Innovator”](#). *New York Times*.
- Newell, M.W. (2002). *Preparing for the Project Management Professional Certification Exam*. New York: AMACOM.
- Smith, R. (2004). “5 Patterns of the Chief Technology Officer”. [CTOnet.org](#).

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