

## ISB CTO

### Week 1: Role of a CTO: Introduction

The role of the Chief Technology Officer (CTO) is gaining significant prominence in today's digital economy, where every company is now operating as a technology company.

In this dynamic environment marked by volatility, uncertainty, complexity, and ambiguity, competition has intensified not only among traditional rivals but also with the emergence of new players known as digital giants. Companies like Facebook, Amazon, Apple, and Google leverage their technological knowledge and capabilities to disrupt various industries, including finance, healthcare, and education. Simultaneously, the presence of numerous tech entrepreneurs further intensifies the competition and innovation landscape.

As a result, incumbent companies, digital giants, and tech entrepreneurs are all striving to harness technology as a platform for innovation and competitive advantage. Thus, the need for effective leadership arises, complementing the existing capabilities of CEOs and other senior business executives. In this context, as technology strategy becomes tightly intertwined with business strategy, firms face the question of how to respond effectively.

Dr Mark Maybury, the CTO of Stanley Black & Decker, emphasises that technology, for the first time in our history, can help solve challenges not only for corporations but also for society as a whole. This reality prompts firms of all sizes to contemplate the creation of new roles that can enhance their ability to thrive in this new world. This is where the role of the CTO becomes particularly important.

A survey conducted by Deloitte and the Wall Street Journal (2020 Deloitte WSJ Intelligence global survey) revealed the following:

- 93% of CEOs recognise technology as the key driver of competitive advantage and innovation.
- 84% of CEOs consider mastering technology a critical challenge and the key to their success.
- 40% of CEOs view technology as the primary differentiating factor in their competitive strategies.

#### Need for a CTO role

The role of a Chief Technology Officer (CTO) has its roots in the dot-com boom revolution. During that time, companies like Amazon, E-Trade, and eBay emerged as pioneers of the dot-com revolution, led by founders who possessed extensive technological knowledge. These visionary founders recognised the potential of technology as the foundation for creating new businesses and strategies on the internet. Consequently, there arose a need for individuals who could complement their entrepreneurial vision by overseeing the development of robust and scalable

technology infrastructure. This led to the emergence of the role of the Chief Technology Officer, whose responsibilities included:

- Working with technology vendors
- Creating a technology strategy
- Architecting the technology platform
- Integrate seamlessly emerging technologies for product, service, and customer offerings.

## **Roles of a CTO**

Over the past two decades, the role of the Chief Technology Officer has evolved to become even more integral to how businesses operate on a technological foundation. As companies have grown in size, the necessity of having a Chief Technology Officer has persisted.

Today, the CTO is an executive who: oversees the technology vision, direction, and strategy of the company. They are:

- Is responsible for
  - Determining the key technologies to incorporate into the infrastructure.
  - Sourcing those technologies from vendors.
  - Forming partnerships.
- Is externally focussed on customers and undertakes tasks such as:
  - Shaping the product vision.
  - Determining product availability.
  - Conducting customer experiments.

Interestingly, the Chief Technology Officer has become one of the external faces of the company and is now a member of the C-suite, alongside the CEO, Chief Operating Officer, and other executives.

## **Duties of a CTO**

The duties of a Chief Technology Officer encompass:

- Developing long-term technology strategy and vision of the company.
- Identifying the appropriate technology stack to align with the business model and vision.
- Recruiting talent for critical technical roles.
- Representing the technical side of the company to important stakeholders, including the board of directors, customers, and suppliers.

The CTO plays a translational or boundary-spanning role, bridging the gap between the business strategy and the technology strategy, ensuring that the technology strategy enables the business strategy.

## Value delivery by CTOs

In order to assess the effectiveness and purpose of CTOs within an organisation, it is important to understand the dimensions of value that they deliver.



### Innovation:

This dimension emphasises on the critical role of CTOs as facilitators of a firm's technology strategy and as drivers of digital innovation. CTOs have the ability to shed light on the direction of technology trends and their implications for the business. They can help organisations understand the significance of technologies such as cloud computing, artificial intelligence (AI), and quantum computing. By envisioning how these technologies can transform product innovation, customer relationships, operations, and even business models, CTOs serve as catalysts for new possibilities enabled by digital innovation.

### Purpose:

The second dimension highlights the importance of connecting new ideas with a strategic business case beyond financial considerations. CTOs can shape a business case around technology that goes beyond mere financial analysis. They can steer attention towards the strategic implications of innovation, asking questions such as how it can reduce environmental impact, decrease job stress, or enable talent reskilling. CTOs can also drive attention towards responsible computing, particularly in the context of AI, by addressing ethical concerns and ensuring the use of citizen data in an ethical manner.

### Partnerships:

This dimension recognises that innovation and value creation extend beyond the boundaries of a single firm. CTOs play a crucial role in bringing together partnership ecosystems for the organisation, encompassing both existing and new partnerships. They can cultivate relationships with companies specialising in emerging technologies or digital innovation, leveraging external knowledge and expertise. CTOs also serve as a translational voice to customers, educating them about potential products and services stemming from digital innovation and investments.

In summary, the value delivered by CTOs is defined by their contributions in the areas of innovation, purpose, and partnerships. They serve as facilitators of digital innovation, exploring the implications of emerging technologies and trends. CTOs can shape a strategic business case around technology, encompassing values beyond financial considerations. Furthermore, they foster partnerships and ecosystems, both internally and externally, to unlock the full potential of digital innovation and create value for the organisation.

## CTO vs CIO

While the CIO role has been well-known for a long time, it is crucial to understand the distinction and unique contributions of a CTO in today's context. Although there are various ways to differentiate these roles, they share synergies while also possessing distinct characteristics.

The CIO role can be described as inward-looking and

- Focuses on enhancing business efficiency and effectiveness through improvements in business processes and data management.
- Aligns technology with the business to drive operational efficiency, innovation, speed, and agility.

In contrast, the CTO role is more outward-looking and

- Concentrates on exploring new technologies and forming partnerships with vendors.
- Is driven by leveraging technology to enhance customer offerings and advocate for an innovative product portfolio.
- Involves understanding and supporting the voice of the customer internally within the organisation.

The distinctions between the CIO and CTO can be tabulated as below:

	CIO	CTO
<b>Primary focus</b>	Internal IT operations, including IT infrastructure, business processes, core systems, process automation, and data warehousing	Technology trends, research and development (R&D), new products, new services, customer advocacy, and the voice of the customer
<b>Stakeholders</b>	Internal users	Customers
<b>Metrics of success</b>	Related to cost, reliability, and availability of IT operations	Impact on revenue and sales

Both the CTO and the CIO play necessary and important roles in organisations and are connected by the notion that firms must be strategic and innovative in their use of technology, as in today's landscape competitive advantage stems from IT and digital offerings. However, their focuses differ as follows:

CIO	CTO
<p>Focuses on</p> <ul style="list-style-type: none"> <li>• Applying IT to internal operations,</li> <li>• Managing IT personnel, services, applications</li> <li>• Reducing internal transaction costs</li> <li>• Improving short-term IT performance</li> </ul>	<p>Focuses on</p> <ul style="list-style-type: none"> <li>• Applying technology to products and services</li> <li>• Managing digital R&amp;D and innovation, Stimulating the creation of new products and services, both internally and externally,</li> <li>• Positioning the company for long-term competitive advantage</li> <li>• Building new partnerships and ecosystems.</li> </ul>

### Shared responsibilities of CTO and CIO

These are related to data privacy, innovation strategy, ecosystem strategy, software development life cycle, cybersecurity, and working with the C-Suite. However, the CIO applies these concepts internally to enhance the organisation's supply chain management, customer relationship processes, HR processes, end-user experience, business continuity, and scalability. In contrast, the CTO's focus remains external, addressing customer-oriented technology strategy, the portfolio of product and service offerings, and the external technology architecture.

It is essential to recognise the importance of both roles as they diverge due to the increasing significance of digital innovation and strategy.

### Qualities of a CTO

The primary role of a CTO is to maintain an external focus and their responsibilities revolve around comprehending customer needs and identifying potential partnership opportunities. The CTO's qualities can thus be categorised into four dimensions:

- Ability to understand customer needs, external trends and collaborations
- Strategic planning
- Team management
- Project management

These dimensions can be better understood by examining the four distinct personas that a CTO embodies within the organisational framework.

#### Digital business leader

In this role the CTO skilfully harmonising technology and business to create innovative products, services, and business models. Hence, their proficiency as a catalyst for strategic initiatives, adeptness in strategic planning, and deep understanding of customer needs are vital to their success as digital business leaders.

#### Digital innovator

A CTO acts as catalysts for innovation, identifying areas where technology can enhance business operations. Consequently, proficiency in strategic planning and project

management becomes crucial in effectively applying strategic thinking to innovative ideas and successfully executing them.

### Digital strategy catalyst

Aligned with the concept of a business leader, the CTO plays a pivotal role in educating others about digital innovation. Often assuming the position of an evangelist, they facilitate the organisation-wide understanding of digital innovation principles, applicable to various domains such as customer relationships and supply chain management.

### Business enabler of technology leverage

In today's context, a firm's success hinges on its ability to continually leverage technology for ongoing innovation. While the CTO may contribute ideas, true success lies in enabling others to think like a CTO. Thus, the CTO assumes the role of empowering the organisation to effectively leverage technology, acting as a catalyst for technological progress.

Revisiting the defining qualities of a CTO, they encompass a focus on customer needs, strategic planning, team management, and project management. Two sub-dimensions that come into play under project management are

- Financial planning and management for developing robust business justifications.
- Operations planning and management for CTOs to navigate project management responsibilities

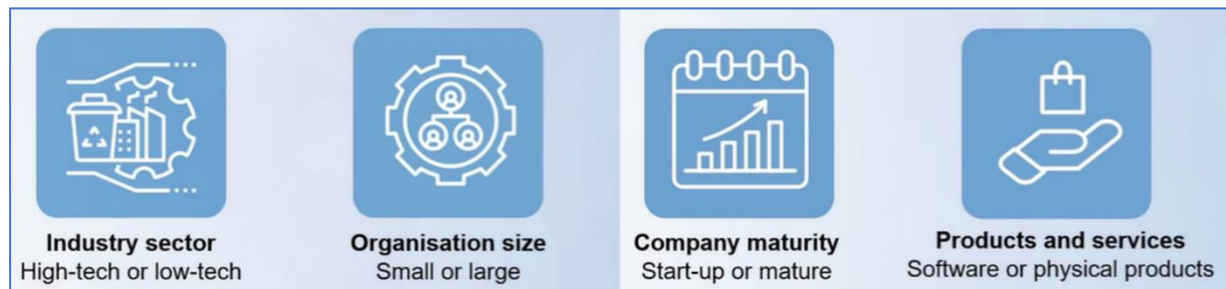
### Alternative framework describing CTO qualities:

Customer champion	Technology visionary
<ul style="list-style-type: none"> <li>• Listens actively to and understands customer feedback</li> <li>• Translates it into actionable ideas, and effectively communicates these concepts within the organisation</li> <li>• Possesses the acumen to convey organisational ideas and innovations back to the customer</li> </ul>	<ul style="list-style-type: none"> <li>• Is open to significant industry trends,</li> <li>• Monitors closely the technological advancements by leading companies and predicts emerging patterns</li> <li>• Understands concepts like generative AI and educates the organisation about its potential before ambiguity proliferates</li> </ul>
Infrastructure commander	Big picture thinker
<ul style="list-style-type: none"> <li>• Is external focussed as organisations recognise the need for distinct internal and external infrastructures</li> <li>• Orchestrates, commands, and architects the external architecture of the organisation</li> </ul>	<ul style="list-style-type: none"> <li>• Is able to comprehend the disruptive impacts that technology is likely to have on the organisation</li> <li>• Has the ability to anticipate these disruptions and effectively prepare the organisation for them</li> </ul>

A CTO's multifaceted role in combining technology and business requires a comprehensive skill set and a deep understanding of external dynamics, enabling them to drive innovation and guide the organisation towards technological success.

## Factors Affecting the Role of a CTO

The role and expectations of a CTO can be influenced by various factors. These factors can vary depending on the following:



Let's explore each of these factors in detail.

### Industry sector

In the context of digital innovation and the digital economy, it is meaningful to categorise industry sectors as either tech or non-tech.

- **Tech companies**
  - Producers of technology products and services, including digital companies like Amazon, Apple, and Netflix.
  - The CTO's role is to translate the tech vision into products, services, and infrastructure.
- **Non-tech companies**
  - Traditionally consumers of IT services, for example companies such as Hindustan Lever, Maruti, Procter & Gamble, Reliance, and Tata Hotels
  - The CTO complements the CIO's role by educating others, building infrastructure, translating digital aspects into products and services, and driving innovation.

### Size of organisation

- **Small-sized companies**
  - CTO often takes on additional responsibilities such as Chief Marketing Officer, Chief Revenue Officer, or Chief Growth Officer.
  - They have a front-facing role with customers, suppliers, and external partners, focusing on innovation, purpose, and partnerships.
- **Medium-sized organisations**
  - The CTO becomes a more specialised member of the team
  - They are involved in organisational building, acquiring and leading people and skills, developing technology vision, orchestrating the ecosystem, and forming open innovation networks.
  -



- **Large organisations**
  - The CTO becomes even more specialised and collaborative, taking on a big-picture thinker role.
  - They focus on future technology trends and strategic planning.

### Company maturity

- **Start-ups**
  - The CTO's role is often frenzied and ad hoc due to the need to develop products, find customers, secure funding, and ensure survival.
- **Mature organisations**
  - The CTO's role becomes more deliberative and well-defined, while still maintaining an external orientation.
  - Collaboration and culture-building through teams become crucial aspects of the CTO's responsibilities in mature organisations.

### Organisation offering

- **Product companies**

CTO focusses on R&D, voice of the customer, concept testing, and quality assurance.
- **Software companies**

CTO places a stronger emphasis on software development lifecycle, project management, software maturity, and product quality from a software perspective.

In summary, the role of a CTO can vary based on several factors: industry sector (tech vs. non-tech), organisation size, company maturity, and primary offering (product vs. software). Understanding these factors helps to contextualise and define the expectations and responsibilities of a CTO within different organisations.

## The Role of a CTO in Different Sized Organisations

### In a start-up

When it comes to start-ups, the responsibilities and tasks of a CTO differ slightly from those in other companies. In order to understand the role of a CTO in a startup, it is important to delve deeper into their specific functions. In a startup,

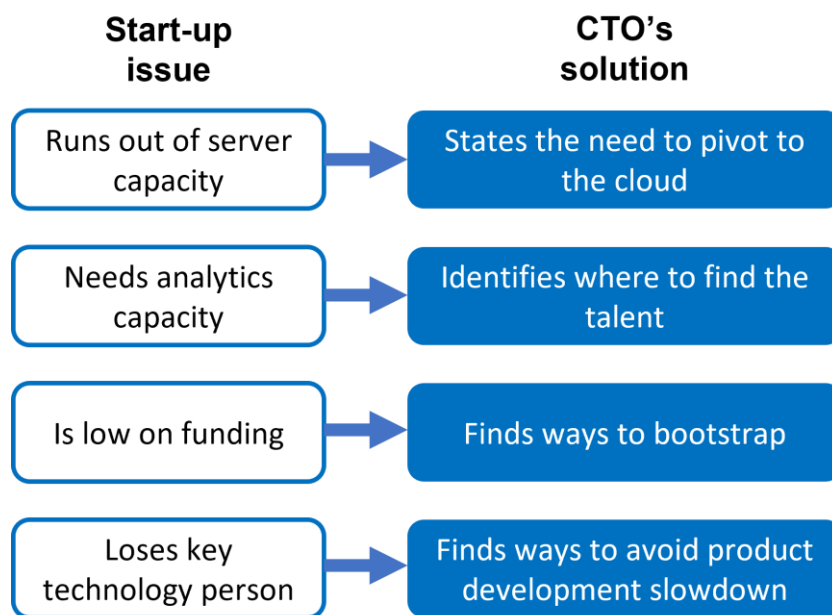
- The CTO serves as the bridge between the business and the technology team.
- To the business, the CTO is seen as the tech expert, while to the technology team, the CTO is seen as the business expert.
- The CTO to act as a translator, effectively conveying the needs and requirements between these two domains.

The startup CTO must be versatile and wear multiple hats. They are often hired to be hands-on in development tasks. Additionally, the CTO should possess a fair degree of business domain knowledge, have a vision for the company, and understand customer needs.



It is important to differentiate between customer needs and wants, as exemplified by Steve Jobs' famous statement: "We give the customer what they will need, not what they want." This implies understanding the customer's context and how technology can improve their lives, sometimes addressing needs the customer may not be aware of. Thus, the CTO also plays a vital role in educating customers about the product offering and how it fulfils important customer wants.

Furthermore, the CTO is responsible for translating the company's vision and mission, identifying obstacles and challenges, and finding practical solutions. Let us look at some issues and solutions that a CTO may suggest:



The CTO's commitment to fostering a functional culture is also essential. Startups are known for their frenzied, chaotic, and ad hoc environments, which can potentially burn out employees. Alongside the CEO, the CTO may have a significant role in boosting morale and keeping the team motivated, as these factors contribute to the success of the startup.

In summary, the role of a CTO in a startup encompasses various responsibilities, including involvement in minimum viable product development, enhancing user experience, overseeing application architecture, managing vendor and customer relationships, and talent management.

### In a mid-sized firm

In a midsize firm, the CTO has fewer responsibilities due to the presence of specialised individuals in various departments such as marketing, manufacturing, and customer relationships. Consequently, the CTO's role becomes more collaborative within the team. In this context, the CTO's primary focus is on

- Creating and overseeing the technology strategy
- Envisioning how technology will be utilised and implemented
- Aiming to increase the maturity of technology processes

- Transitioning from an ad hoc and chaotic environment to a more organised structure with defined processes

As a result, the CTO becomes less hands-on and more focused on

- Enabling teams
- Cultivating a suitable culture
- Implementing methodologies.
- Building a larger team and formalising roles

Instead of having extensive knowledge in every aspect, the CTO becomes a big-picture thinker who can articulate a global vision and translate it into specific projects or technology initiatives. Additionally, the CTO needs to possess a solid understanding of prioritising urgency versus importance.

### In a large-sized firm

In a large firm, specialisation is even more prominent, with various individuals fulfilling specialised roles. In such companies, the role of the CTO transforms into that of an **evangelist and strategic thinker**. Although the CTO still sets the strategy, culture, and technology direction, their primary focus is on future-proofing the business. This involves identifying potential challenges, trends, and changes in the market to position the business strategically and prevent obsolescence. The CTO assumes the role of a **charismatic visionary**, serving as a spokesperson and a vital member of the leadership team. They often contribute to board meetings and establish connections with leaders from other companies, particularly in the technology sector.

It is evident that the role of a CTO varies significantly between startups, midsize firms, and large companies.

### Skills of a CTO

The role of a CTO encompasses a core set of skills that are essential for success. Mastering these skills enables a CTO to excel in their role and drive technological excellence within the organisation. Let us briefly look into each of these skills.

<b>Strategic Thinking</b>	<ul style="list-style-type: none"> <li>• Must possess the ability to comprehend the broader business and technology landscape, understand the industry, and grasp the firm's competitive strategy</li> <li>• Should be capable of blending technology and strategy to educate the leadership team</li> <li>• Must be able to envision the future direction of products, services, customer offerings, and business model</li> </ul>
<b>Innovation catalyst</b>	<ul style="list-style-type: none"> <li>• Must identify opportunities where technology trends intersect with business needs</li> <li>• Must find ways to enhance customer relationships, improve operations, and drive innovation</li> </ul>

<b>Cross-functional acumen</b>	<ul style="list-style-type: none"> <li>Needs to understand the connections between various functions within the organisation, including marketing, supply chain, manufacturing, operations, warehousing, and aftersales service</li> <li>Plays a key role in facilitating success that hinges upon cross-disciplinary innovation, by applying technology across functional boundaries</li> </ul>
<b>Continuous learning</b>	<ul style="list-style-type: none"> <li>Ensures that the organisation doesn't become complacent, always seeking what lies ahead</li> <li>Must actively learn from customers, vendors, and colleagues and synthesise that knowledge to generate new ideas</li> </ul>
<b>Effective communication</b>	<ul style="list-style-type: none"> <li>Communicates with customers, internal colleagues, employees, investors, and the public</li> <li>Understands that the relevance and impact of different communication media is essential for effective communication</li> </ul>
<b>People management</b>	<ul style="list-style-type: none"> <li>Is an enabler of people and therefore plays a pivotal to acquiring, retaining, and motivating talent</li> <li>Must excel in managing talent in the face of intense competition</li> </ul>
<b>Digital acumen</b>	<ul style="list-style-type: none"> <li>Must understand the evolution of technology and its implications for products, processes, and operations</li> <li>Involves translating these ideas into understandable terms for others.</li> </ul>

## Future of the CTO Role

The future of the CTO lies in harnessing the synergy between human capability and technological advancements, with vast potential awaiting exploration. As technology continues to advance, new roles and skills will emerge, necessitating adaptive thinking from CTOs who will guide their teams through these transformative changes. They will motivate their colleagues, allay any fears stemming from the unknown, and steer the organisation towards success.

As companies expand, the responsibilities of the CTO expand as well. Their focus shifts towards nurturing the potential of their personnel, moving beyond the technical aspects and emphasising the importance of collaborative teamwork in advancing the organisation's objectives. The CTO must facilitate an environment where people and teams can effectively collaborate for the betterment of the business.