



# COS 448: Innovating Across Technology, Business, & Markets

Spring 2011

MW 1100-1220 in CS105

Prof. JP Singh

TA: Muneeb Ali

# Logistics: Grading

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## Grading:

- Paper in Lieu of Mid Term - 30%
- Paper in lieu of Final - 30%
- **Writeup** + Oral Presentation(s) - 25%
- Class/Precept Participation - 15%

## Pre-requisites:

- COS 217 or COS 226 or equivalent

# Logistics: Office Hours

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## Prof. JP Singh:

- Room 423
- W 1:30 to 3:30

## Muneeb Ali:

- Room 105 (after lectures)
- MW 12:20 to 1:00
- By appointment MW afternoon

# What is a CTO?

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Traditional view:

“As the right hand of the CIO, the CTO is responsible for designing and recommending the appropriate technology solutions to support the policies and directives issued by the CIO. In so doing, the CIO is able to marry the recommended technologies to the strategic business objectives of the company. This approach establishes the CTO as the technology specialist.

As a technology specialist, the CTO should have a skill set not dissimilar to that of the CIO. However, unlike the CIO, the CTO should place more emphasis on a strong technology background and, although important, less on business education.”

# A view I like better

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Nathan Myrsvold (former CTO of Microsoft):

“Hell if I know.”

# He Goes on to Say

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People (technologists) are too obsessive about the technology and not obsessive enough about what people are going to do with it

In general, in computer science for as long as there's been computer science, there have been trends where people say "I have a new programming language which will set us all free". Programming languages ultimately solve very little. Programming languages allow people to express their ideas as software perhaps a little bit easier. But the really interesting thing is the programs!

a market which is obsessed with the tools and the appurtenances rather than the actual effects is clearly focussing on the wrong thing

Five or 10 years ago, those bits-and-bytes CTOs could often succeed solely by being the smartest techies in the room. Now, however, they need to know how to successfully play in both the technology space and the executive suite.

# Berray and Sampath '4 Models'

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Infrastructure Manager

Technology Visionary and Operations Manager

External Facing Technologist

Big Thinker

- Spends his/her time evaluating how technology can be used internally by the business to 1) enable new business models and business lines, 2) increase revenues, and 3) preempt a competitor's attempts to use technology to disrupt or dislodge his/her company's market position.

- Responsibilities often include advanced technology, competitive analysis, technology assessment, prototyping lab, partnering, planning, and architecture standards. May report directly either to the CIO or the CEO, and generally has a small, elite staff. In some cases, they operate alone.

First two: CTO manages a large organization, and that is main source of influence

Next two: CTO succeeds by influence. May manage small team. Reports to CEO.

# View: Wikipedia

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An executive-level position in a company or other entity whose occupant is focused on scientific and technological issues within an organization. It typically involves overseeing Research and Development (R&D) activities, and formulating long-term visions and strategies at the officer level. Essentially, a CTO is responsible for the transformation of capital - be it monetary, intellectual, or political - into technology in furtherance of the company's objectives. They must typically combine a strong technical or scientific background with business development skills.

There's little ambiguity about the role of the CEO or the CFO at major companies, but ask what a CTO does, and you're likely to get a variety of responses. In some companies, the CTO heads research and development. In other companies, the CTO is just like a CIO. In still others, the CIO reports to the CTO. And there are also CTOs who work in IT departments and report to the CIO.



# View: Wikipedia (alternate)

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As a corporate officer position, the CTO typically reports directly to the CEO and is primarily concerned with long-term and "big picture" issues (while still having deep technical knowledge of the relevant field).

Depending on company structure and hierarchy, there may also be positions such as Director of R&D and VP of Engineering whom the CTO interacts with and/or oversees.

The CTO also needs a working familiarity with Regulatory (e.g. FDA, EPA, CPSC, as-applicable) and Intellectual Property (IP) issues (e.g. patents, trade secrets, license contracts), and an ability to interface with legal counsel to incorporate those considerations into strategic planning and inter-company negotiations.

# CTO vs CIO

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## Wikipedia:

A CIO is likely to solve organizational problems **through acquiring and adapting existing technologies** (especially those of an IT nature), whereas a CTO is principally **overseeing development of new technologies** (of various types). Many large companies have both positions.

Another major distinction is between technologies that a firm seeks to actually develop to commercialize *itself* vs. technologies that *support* or enable a firm to carry out its ongoing operations. A CTO is focused on technology integral to products being sold to customers/clients, while a CIO is a more internally-oriented position focused on technology needed for running the company (and in IT fields, for maintaining foundational software platforms for any new applications).

In an enterprise whose primary technology concerns are addressable by ready-made technologies, a CIO might be the primary officer overseeing technology issues at the executive level. In an enterprise whose primary technology concerns do involve developing (and/or marketing) new technologies, a CTO is more likely to be the primary representative of these concerns at the executive level.

# The US Govt now has both

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Aneesh Chopra is CTO. Job, according to the President, is to

“promote technological innovation to help the country meet its goals such as job creation, reducing health care costs, and protecting the homeland.

Together with [Chief Information Officer Vivek Kundra](#), their jobs are to make the government more effective, efficient, and transparent.”

# CTO vs Chief Science Officer

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## Wikipedia:

In some organizations, the same person may hold the Chief Science Officer (CSO) title along with that of Chief Technology Officer (CTO). Alternatively, a company could have one or the other, or both occupied by separate people. Often, a Chief Science Officer exists in heavily research-oriented companies, while a Chief Technology Officer exists in product development focused companies. The typical category of Research and Development that exists in many science/technology companies could be led by either post, depending upon which area is the organization's primary focus.

A Chief Science Officer almost always has a basic/pure science background and advanced degree, whereas a Chief Technology Officer often has a background in engineering and/or business development.

# Other Definitions

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Medcof: The Chief Technology Officer (CTO) is the most senior executive responsible for technology in the corporation and ideally plays an important role in formulating firm strategy and ensuring that technological considerations are optimally integrated into that strategy (1,2).

“That ‘guy’ who gets paid to sit in the corner and think 'technical' deep thoughts”

or "that ‘guy’ who gets to swoop in and rearrange my project at the last minute on a whim.”

or "technical founder who really can't manage anyone?"

# Smith view

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**Genius.** This is often one of the founders of the company who is a **wizard at the core technology** that launched their product or service.

**Director.** For bigger companies, the CTO is not usually a "doer", but a **director of what needs to be done**. He/she may be very technical, but spends their time managing product development or research labs.

**Executive.** In large companies the CTO may be a member of the executive staff and spend their time on **strategic directions for the company**. The focus is not on creating technologies, but on creating strategy.

**Advocate.** This person is focused on the experience of the customer with the product or service. This is a hands-on, in the trenches person.

**Administrator.** This person is interested in scheduling the efficient deployment of the product and looking for the best licensing deals for vendor products.

**Void.** Many companies have a CTO void.

# My Perspective

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## Both Sides of the Table:

- Hardest position to fill (and most sought after) because needs combined deep understanding of business, business processes, and technology
- Not just focused on the application or the technology, but the **fundamental relationships between the two**
- Be an **interpreter between the business and the engineers**: "Broadly, you're taking the summation of the engineering organization and the summation of the customer-partner-analyst input, and you're mapping information back and forth between the two"
- Able to get deep quickly and **size the impact of a new technology** with only incomplete information
- Tech background a must, but business/marketing background equally important

# My Perspective

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## Innovation:

- Marry what's possible in technology with what's valuable in market
- Push innovation, rally the engineers to be able to innovate
- Innovator's Aura
- Opposite: "be pragmatic. no technology for technology's sake. don't be swayed by the "cool stuff" - in fact, keep the cool stuff from the production code folks



# My Perspective

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## Long Term Success of Company:

- See things from the perspective of what's **best for the overall company**, as the person crossing the boundary
- Always **look at the long term** and future-proofing

## Pattern Recognition (Synthesis, Distillation)

## Championing Excellence in all things

- Principle of selective neglect

# My Perspective

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## Tech for tech sake vs for application:

- Scientists and engineers think things are important if they are technically interesting. But most people think things are important if they're useful
- No technology for technology's sake - only for transformational reasons, solve business problems with technology

# My Perspective

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## Future-looking:

- Choosing main directions and grand themes, to seek out the right path for a time two or three years down the road, rather than the next quarter
- Make sure the company does not just focus on delivering quarterly results

# My Perspective

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## Change Agent:

- Positioning company for changes that are likely to happen
- Internal evangelist, as well as an external spokesperson
- Make everyone in company to understand the big picture
- Apply technology for business solutions or convince convince company to pivot (requires understanding of technology, business, and what is possible)

# My Perspective

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## Environment for technical and product success:

- Make people believers, allow people to contribute
- Hire and retain smart people
- Pass the credit, but take the blame
- Draw credit and recognition to the people who take initiative
- Best people in the right positions and build a culture of open accountability
- Build teams and mentor, teach and guide. listen well.
- Accountable for all technical aspects of the business
- Challenge the empire builders (traditional IT / engineering roles)

# My Perspective

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## Evangelist and Explainer:

- Give people a sense of confidence about how all the pieces fit together
- Create and articulate the strategy
- Create environment where people seek to understand and ask questions openly

## Abstraction:

- Able to talk to business executives without being too technical or detail oriented

## Strategy:

- Influence the company - not through direct management, but through relationships and purity of the idea and rational

# My Perspective

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## Open-mindedness:

- Respect for people
- Open to new ideas, new technologies
- Willingness to change
- Intellectual curiosity

## Trusted partner and Advisor:

- Most senior and most trusted technical advisor to the CEO and president
- Honest on all fronts, give the “reality check” inside and outside company
- Always motivated by doing the right thing