



Qualities of Excellent Systems Engineers

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Survey of INCOSE Leaders

1. What undergraduate degrees are the best preparation for a SE career?
2. Can an SE be effective with an undergraduate SE degree?
3. How does your organization select people for the SE role?
4. Should the Chief SE report to the PM?
5. How does your organization view the value/importance of SEs?
6. What characteristics define the really successful SE?

Best Undergraduate Degrees

- Mechanical Engineering
- Electrical Engineering
- Physics
- Aeronautical Engineering
- Industrial Engineering
- Computer Engineering

Need a strong, calculus-based, scientific background

Opinion on BS SE

- Most focus on tools and techniques, not on science
- SE is a synthesis field and it helps if you have a very solid understanding of other related scientific fields
- Need to have some depth in one or more scientific fields

Some universities now require a 21-credit engineering course basis before starting SE courses

How to identify SE candidates

- Look for bright engineers who have mastered at least one discipline; have shown an interest in and curiosity about other disciplines
- Engineers with system test or subsystem design experience
- People with a "systems thinking" mindset and broad knowledge of the domain and multiple disciplines
- Only people with a proven track record of getting things done
- Select from experienced domain engineers

Organization's View of SEs

- Critical to business success
- Indispensable
- They are the architects of the product and the ongoing technical knowledge resource for in-process technical/system trades
- Very important; a path to higher management
- Important to getting a quality result

Characteristics of Successful Systems Engineers

- Ability to teach
- Ability to listen and persuade
- Experience in analysis of system performance effectiveness
- Passion for understanding the entire system
- Have been associated with at least one failure in their first discipline
- Systems thinking; soft skills
- Ability to listen/speak to persons with diverse backgrounds & agendas
- Ability to form and hold complex mental models
- Knowing when to listen to the experts recommendations
- Constructive paranoia; the ability to look at a system and consider what might go wrong
- Ability to lead by example
- Curious mind; willing and able to delve into multiple technical fields simultaneously, while maintaining the big picture

Scar Tissue!

What to consider in Selecting & Grooming Systems Engineers

- People with a willingness to continue learning
- Technical expertise in several fields
- Political savvy, customer knowledge, application knowledge of product domain
- Ability to look at the big picture; to translate the needs of multiple stakeholders
- Ability to deal with ambiguity
- High personal integrity

Being a Systems Engineer Requires:

- A desire to see and influence the “big picture”
- An ability to multiplex ... to be working several diverse actions at one time without getting overly involved in a single issue
- A talent for recognizing issues early
- An ability to balance system design to optimize performance
- An understanding of many engineering and scientific disciplines and the ability to converse technically with the practitioners of those disciplines

The Bottom Line

- Systems Engineering is a blend of engineering and technical management
- One needs to be:
 - A skilled and accomplished engineer
 - An excellent communicator
 - Able to lead by example
 - An adept multiplexer/juggler
 - A technical planner
 - Able to react decisively to issues

Chief Systems Engineers are responsible for the whole program and rarely have the accompanying authority.

They succeed by convincing the Customer, management, peers and subordinates that their solutions are appropriate and optimal.