Transformational Skills: What do you need after a degree from MIT?

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Student Center, MIT.
Few Words of Introduction:

• Born and brought up in a village in South India
• Undergraduate Degree – Osmania University, India.
• M.S, M.E and D.Sc (Mech. Engg.) – MIT

• 34 Years working in the “manufacturing sector”
  • Ford Motor Co.,
  • International Harvester Co.,
  • Norton (Abrasives / Ceramics) (125 + Years old) !
  • Saint – Gobain (340 Years old) !!
• 2 + Yrs: Founder, **STIMS Institute**
  for KNOWLEDGE INTEGRATION
Few Words of Introduction:

Results:

- Innovation
  - New Products, New Business Development, Core Technology
    - Applications Technology Centers in USA, Germany, China, India
- Mentoring, Coaching of engineers across the globe
- 2 Books, scores of papers, publications, Presentations

Two Phrases to remember:

SYSTEM THINKING and TRANSFORMATIONAL SKILLS
References:

• **The system Approach** – *A strategy to survive and succeed in the Global Economy* (2000)

• **Thriving in the 21st century economy:**
  *Transformational skills for Technical Professionals* (2013)

http://www.amazon.com/K.-Subramanian/e/B001K8H8N8/ref=ntt_athr_dp_pel_1
• “Work” --- what is it?

• Emerging business models for workers?
Work – What is it?

Traditional Organization  Breakdown of “Work”

Blue-Collar White-Collar
Jobs  Mgt.  Mgt.  Mgt.

Investors
(Corporate and
Finance)

Professional
Work

Information Work

Physical Labor
“Professional”:

Some one who provides a “solution” that meets the needs and gets paid for that.

Carpenter: Makes furniture that some one wants to buy and USE.

Plumber: Identifies the leak in a pipe line and fixes it to the satisfaction of the home –owner

Cardiac Surgeon: Fixes the broken heart and restores it to good health

Engineer: ???

Technologist: ???
### Bi-modal
Organizations, Jobs, Projects, Business Models, ....

<table>
<thead>
<tr>
<th>Company</th>
<th>Median salary</th>
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<tbody>
<tr>
<td>Honeywell</td>
<td>$74,700</td>
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<tr>
<td>Amazon</td>
<td>$91,600</td>
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<td>Google</td>
<td>$102,000</td>
</tr>
<tr>
<td>Microsoft</td>
<td>$110,000</td>
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<tr>
<td>Berkshire Hathaway</td>
<td>$53,600</td>
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<tr>
<td>Sunoco</td>
<td>$56,200</td>
</tr>
<tr>
<td>Walt Disney</td>
<td>$56,800</td>
</tr>
<tr>
<td>McDonald’s</td>
<td>$22,000</td>
</tr>
<tr>
<td>Walmart</td>
<td>$22,400</td>
</tr>
<tr>
<td>Target</td>
<td>$29,900</td>
</tr>
</tbody>
</table>

**http://www.payscale.com/data-packages/ceo-income**

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Bimodal model for jobs is also seen within a company (e.g.) - Apple

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Salaries in USD</th>
<th>Avg. Salary</th>
<th>$20K</th>
<th>$50K</th>
<th>$100K</th>
<th>$150K</th>
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<tbody>
<tr>
<td>Mac Specialist (Apple Store) - Hourly</td>
<td>$11.95h</td>
<td>$6</td>
<td>$10</td>
<td>$15</td>
<td>$20</td>
<td>$30</td>
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<td>Software Engineer</td>
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<td>$15</td>
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<tr>
<td>Specialist - Hourly</td>
<td>$13.16h</td>
<td>$10</td>
<td>$15</td>
<td>$19</td>
<td>$20</td>
<td>$30</td>
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<td></td>
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<tr>
<td>Mac Genius - Hourly</td>
<td>$18.68h</td>
<td>$15</td>
<td>$20</td>
<td>$26</td>
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<tr>
<td>Apple Family Room Specialist - Hourly</td>
<td>$13.49h</td>
<td>$10</td>
<td>$15</td>
<td>$18</td>
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<tr>
<td>Senior Software Engineer</td>
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<td>$24</td>
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<tr>
<td>Creatives - Hourly</td>
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<td>$15</td>
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<td>$25</td>
<td>$30</td>
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<tr>
<td>Software QA Engineer</td>
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<tr>
<td>Software Engineer III</td>
<td>$111.75p</td>
<td>$65K</td>
<td>$100</td>
<td>$150</td>
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<td>$300</td>
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<tr>
<td>Sales Specialist - Hourly</td>
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<td>$12</td>
<td>$16</td>
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<td>$30</td>
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<td>Apple Expert - Hourly</td>
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<td>$12</td>
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<td>$27.96h</td>
<td>$15</td>
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<td>$25</td>
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<tr>
<td>Global Supply Manager</td>
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<td>$100</td>
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<td></td>
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</tr>
</tbody>
</table>

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# New Solutions Vs. Replication Solutions

<table>
<thead>
<tr>
<th>Features</th>
<th>New Solutions</th>
<th>Replication Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain specific knowledge</td>
<td>Intensive (critical)</td>
<td>Neutral and useful (not critical)</td>
</tr>
<tr>
<td>IT solutions</td>
<td>Custom and tailored</td>
<td>Standard (plug and play)</td>
</tr>
<tr>
<td>Organization/team</td>
<td>Small and specialized</td>
<td>Large and flat</td>
</tr>
<tr>
<td>Team skills</td>
<td>Cross functional</td>
<td>Narrow and common</td>
</tr>
<tr>
<td>Rules and standards</td>
<td>Create new rules as needed</td>
<td>SOP and follow the rules strictly</td>
</tr>
<tr>
<td>When you need to break the rules?</td>
<td>Be creative, wise, and considerate of others</td>
<td>Don’t try: you will be shut out of the “system”</td>
</tr>
<tr>
<td>Authority</td>
<td>Belongs to those with specialized know-how</td>
<td>Belongs to those in charge of the operations mgt.</td>
</tr>
<tr>
<td>Risk and uncertainty</td>
<td>High, thanks to new ideas and their experimentation</td>
<td>Low, thanks to proven “plug and play” solutions</td>
</tr>
<tr>
<td>Reward</td>
<td>Team reward such as IPO, growth, and stock options</td>
<td>Individual reward based on task execution</td>
</tr>
</tbody>
</table>
Sources of knowledge and their ordering

20\textsuperscript{st} Century Paradigm

- Academic Education (Primary Source of Knowledge)
- Industry/Sector Specific Knowledge
- Skills for Transformation

End of 20\textsuperscript{th} Century

- Academic Education
- Industry/Sector Specific Knowledge
- Skills for TRANSFORMATION
  - Identify, Develop and Implement New Solutions

Transformational Skills:
Ability to Discover, Develop and Deploy “New Solutions”.

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Ordering of Knowledge Required for Success in the 21st Century

- Transformational Skills
- Industry / Sector Specific Knowledge
- Academic Education
• **Need**: A relentless stream of new solutions

• **Transformational Skills**: Skills to Define/Discover, Develop AND Deploy / Exploit a stream of “New Solutions”
Transformational Skills

- Wick (Transforms the oil in the candle into a flame and hence into a source of light) = Transformational Skills

- Candle (oil & holder) = Academic Knowledge & Industry know-how

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Transformational Skills for 21st Century Professionals.

Deployment

X

Develop

X

Discover / Define

= Transformational

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Transformational Skills:

1. Develop a common language:

   • What is a “Solution”? 
   • What are your “Outputs”? 
     • PRODUCT? 
     • PROCESS? 
     • Application / USE?
What is a Solution?

Solution: “input/transformation/output” system leading to added value to those who are willing to reward for such value addition!

- Create and implement New Solutions
- Replicate known solutions in larger quantities

**Descriptions:**
- More Innovation
- More Entrepreneurship
- Work Smarter and Work Harder
- Keep Jumping From Job to Job
- Become Global
- Become Transformational
- Get Higher College Degrees
- Get More Skills
- Interdisciplinary
Solution: Has a Nucleus Composed of Physical Processes Integrally Linked With a Collection of Service Processes

Tangible outputs of every solution:

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New Solution:
Supply Chain Vs. Technology Value Chain
New Solution:
Supply Chain Vs. Technology Value Chain

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Transformational Skills:

1. Develop a common language:
   • “Solution”?
   • “Outputs”?
     • PRODUCT ?
     • PROCESS ?
     • Application / USE ?
   • Science ? Engineering ? Management ? Technology ?
   • Manufacturing ?
   • STEM ?
   • System ? Phenomena ? Value ?
   • Innovation ?
   • End to End Innovation ?
   • Co – Creation of Value? Building from outside in?

Common Language is the essential building block to identify the “need”.
Transformational Skills:

1. Develop a common language:
   - What is a “Solution”?
   - What are your “Outputs”?
     - PRODUCT?
     - PROCESS?
     - Application / USE?

2. Core Capabilities –
   What do you bring to the job?
     --- On your own?
     --- Along with your team?
     --- As part of your company, industry?
3-Dimensions of Core Capabilities
New Solutions: They are needed everywhere!

A broken or weak leg anywhere in this structure is an opportunity requiring “New Solution”
Alignment of Core Capabilities for Professional Solutions

Technology = Science X Engineering X Mgt.

T-Shaped Thinking

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Globalization – the paradigm:

• Create and Implement New Solutions by leveraging all Core Capabilities, using resources from all across the Globe

• Provide value-added Solutions for all users also across the Globe

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Transformational Skills No.3: System Thinking

What is the objective? – It depends on if your eyes are open or closed
**What is a “System”?**

A system is a **collection of parts**, which interact with each other to function as a whole.  --- Draper Kauffman, “Systems Thinking”

A system is a perceived whole, whose elements **“hang together”** because they continually affect each other over time and operate toward a common purpose.  --- Peter Senge, “Fifth Discipline”

A system is a network of interdependent components that work together to try **to accomplish the aim** of the system. A system must have an aim (goal). Without aim there is no system.  --- W. Edwards Deming, “The New Economics”

**System: Input/Transformation/output scheme**
The Traditional Fish Bone Diagram

**Cause**
- Investment
- Expenses
- Constraints

**Effect**
- Technical Output
- System Output

**Transformation**

**Value or Benefit**
- Change (What?)
- Effect (Why?)

**The System Thinking**

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Transformational Skills for 21st Century Professionals.

Discover/Define

Develop

Deployment

Emotional Intelligence for New Solutions

End-to-End Innovation

Build Ecosystem for Core Technology Platforms

Emphasis on Science and Mobile Diagnostics

System Approach for Knowledge Integration

3-D View of Core Capabilities

Develop Common Language

We shall cover the other Transformational Skills in a future talk?

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Progressive Evolution of a professional through Transformational Skills.

Sustainability

Impact

Core Technology Platforms; EINS

Goal

End-to-End Innovation

New Solutions

Tasks

Transformational Skills

Profession

Career

Job

Assignment
What is your new SAT Score?
(for System Thinking and Transformational Skills)

Discover, Develop & Deploy
“New Solutions”

<table>
<thead>
<tr>
<th>Skill</th>
<th>ACCESS</th>
<th>Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Education</td>
<td>Industry/Sector Know-how</td>
<td></td>
</tr>
</tbody>
</table>

No. of Professionals Required

Knowledge / Technical Skills Required

- Economy 1
- Economy 2

Typical Skill Level of Technical Professionals

New Solutions
Replication of Known Solutions

What is your new SAT Score?
(for System Thinking and Transformational Skills)

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Thank You