Winning the Technology and Knowledge Transfer Race - key to wealth generation and growth in 21st century

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Winning the Technology and Knowledge Transfer Race
Key to wealth generation and growth in 21st century

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Agenda

- Historical Shifts in Economic Emphasis
- Why Technology and Knowledge Transfer Race?
- Disclosing the Technology Black-Box for Managerial Actions
- The Framework of Technology and Knowledge Transfer Race
- Conclusion
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**Historical shifts in Economic Emphasis**

- **Primitive Economies** were Dependent on Nature and had very limited options
- **Agriculture centric Economy**
- **Industry & Service centric Economy**
- **Knowledge centric Economy**
- **Manufacturing and Processing**
- **Utility services**
- **Support services**
- **Recycling and Synthesizing**
- **Innovation services**
- **Manipulating and Controlling**

**Modern Economies are more dependent on Knowledge and have many more options**

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**Why Technology and Knowledge Transfer Race?**

A few global phenomena have converged to make rapid Technology and knowledge transfer essential for nearly every organization. For example:

- **Some Technological Mega-trends that have far-reaching effects on our everyday life**
  - The shrinking distance barrier for physical movement of people and goods due to dramatic improvements in transportation technologies.
  - Shortening time delay for all kinds of social transactions resulting from sophistication in various communication technologies.

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Why Technology and Knowledge Transfer Race?

- Relaxing space constraint by reducing physical size of products and support infrastructure through miniaturization technologies.
- Enabling real-time audio-visual simulations for diverse learning and entertaining in virtual-space using multimedia technologies.
- Offering alternatives to overcome shortage of superior property materials and energy source by hybrid, molecular and nuclear technologies.
- Manipulating biological-processes for the production of food and medicine using genetic technologies.

Any Business Nowadays is International Business

Due to enhanced mobility of goods, it is not necessary for an enterprise to be located close to either raw-material or customer.

Utilizing Technology as the Limitless Resource

- Two major types of resources: one is the stock of available natural-resources; and the other is the human-made technological-resources.
- Nature-based-derived-resources are finite in our planet earth, while creativity-based-technological-resources are limitless or infinite.
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Why Technology and Knowledge Transfer Race?

- **Now Moving From Market To Technology Control**
  - Developed countries, which until recently had advocated free trade and market economy, are now becoming protectionist with respect to technology under different pretexts.
  - Rising protectionism in technological capability by restricting the flow of knowledge, know-how and equipment is evident.

- **Intellectual capital has now overshadows physical capital, and knowledge is its main ingredient.**

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### Intellectual Capital and Key Issues of Managing Them

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<thead>
<tr>
<th>Intellectual Capital</th>
<th>Key management issues</th>
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<tr>
<td><strong>Human Capital</strong> (Tacit knowledge in the heads of employees and managers)</td>
<td>• Employee turnover&lt;br&gt;• Competencies&lt;br&gt;• Education and training&lt;br&gt;• Empowerment and recognition</td>
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<tr>
<td>• Experience&lt;br&gt;• Know-how&lt;br&gt;• Skills&lt;br&gt;• Creativity</td>
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<tr>
<td><strong>Intellectual assets</strong> (previously tacit knowledge that has been codified or documented)</td>
<td>• Specifications&lt;br&gt;• Creativity&lt;br&gt;• Process management&lt;br&gt;• Information technology and database warehousing&lt;br&gt;• Systems and standards management&lt;br&gt;• Codification of techniques&lt;br&gt;• Document control&lt;br&gt;• Design centers and document control</td>
</tr>
<tr>
<td>• Programs&lt;br&gt;• Inventions&lt;br&gt;• Processes&lt;br&gt;• Databases&lt;br&gt;• Methodologies&lt;br&gt;• Documents&lt;br&gt;• Drawings&lt;br&gt;• Designs</td>
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<tr>
<td><strong>Intellectual Property</strong> (Legally or otherwise protected subset of intellectual assets)</td>
<td>• Exclusive use and licensing&lt;br&gt;• Content convertible to profits&lt;br&gt;• Brands&lt;br&gt;• Codes</td>
</tr>
<tr>
<td>• Copyright&lt;br&gt;• Patents&lt;br&gt;• Trademarks&lt;br&gt;• Trade secrets</td>
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Why Technology and Knowledge Transfer Race?

- **The Pace of Technological Change is Going to be More**
  - Two-thirds of all the technological innovations that have occurred in the history of human civilization took place in the last two generations.

- **Large pool of available technological resources**
  - There is a large and growing reservoir of proven, valuable and profitable best practice business knowledge that is available for transfer compared to anytime before in history.

- **Emergence and growth of digital economy**
  - Within digital economy businesses are highly dependent on the technologies and explicit encoding of knowledge. Effective use of intellectual resources becomes ever more important.

Why Technology and Knowledge Transfer Race?

- **Speed has become critical to every facet of business**
  - Driven by the capabilities of high-speed bandwidth, PC microchip improvements, digital technology, and growth of the Internet, speed has become critical to every facet of business. Gives an edge to those who rapidly transfer technology and knowledge.

Because of these and some other phenomena, every organization, whether management or employees realize it yet or not, needs to rapidly transfer technology and knowledge to succeed.
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**TECHNOLOGY**

* A Black-Box
* Different interpretations by different people

To avoid the problem of different interpretations and to facilitate the explicit examination of technology related issues let us open the “black box” and look at the components of the process technology which forms the integrated whole.

**Components of Technology**

- **Object-embodied form**
  - Physical Facilities
    - (Equipment, Machine, Structure)
  - Technoware
- **Document-embodied form**
  - Recorded Facts
    - (Facts, Designs, Theories)
  - Inforware
- **Institution-embodied form**
  - Organizational Frameworks
    - (Methods, Linkages, Practices)
  - Orgaware
- **Person-embodied form**
  - Human Abilities
    - (Skills, Experience)
  - Humanware

**Disclosing the Technology Black-Box for Managerial Actions**

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**Characteristics of the components of technology**

- Interact dynamically and required simultaneously
- Relative importance depends upon type of transformation.
- Different combinations can produce similar outputs
- Improvement enhances technology content addition

**The Framework of Technology and Knowledge Transfer Race**

- Them (competitors)
- Them (others)
- Us

- Input
- Output
- Technology Resources
- Capability Enhancement
- Transformation activities
- Firm
- Technology Infrastructure
- VF
- I
- STQC
- ICPD
- FAS
- National Dev Policy Climate
- Owners
- Customers
- Clusters
- Rivals

**National Dev Policy Climate**
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- Often owning technology components is confused with having technological capabilities.

- To compete, a firm must have the ability to:
  - Use the technological resources it has very effectively so that it can recover the investment made in it and generate surpluses for further growth;
  - Buy or sell useful products/services as well as technology at good prices so that it can either continuously improve the sophistication of its technological resources or make money from what it owns;
  - Adapt and improve the technology for more effective operations and competitiveness; and
  - Ultimately generate its own technology.

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### Classification of Technological Capabilities

**Function specific technological capabilities are:**

- **Acquiring Capability** (specifying, sourcing and procuring)
- **Utilizing Capability** (Operating and supporting)
- **Vending Capability** (Marketing and Servicing)
- **Modifying Capability** (Improvising and improving)
- **Innovating Capability**
  - **Designing Capability** (Conceiving and devising)
  - **Generating Capability** (Innovating and commercializing)

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- Operating Capabilities
- Acquiring Capabilities
- Supporting Capabilities
- Innovating Capabilities
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**Technology Strategies**

<table>
<thead>
<tr>
<th>Technology Capabilities</th>
<th>Technology Components</th>
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<tr>
<td>Acquiring, Modifying</td>
<td>Technoware (T)</td>
</tr>
<tr>
<td>Utilizing, Designing</td>
<td>Humanware (H)</td>
</tr>
<tr>
<td>Vending, Generating</td>
<td>Inforware (I)</td>
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<td>Orgaware (O)</td>
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**Roadmap of Technology-based Strategic Progression**

- **Leader** (Image capitalization)
- **Exploiter** (Quality maximization)
- **Follower** (Feature optimization)
- **Extender** (Price minimization)

**Business Strategies**

- Strategy for Image Building
- Strategy for Segment Superiority
- Strategy for Customer Satisfaction
- Strategy for Profit & Survival

- Prestige Creation
- Feature Specializ'n
- Value Maxim’ion
- Cost Minim’tion

- Image Leadership
- Niche Leadership
- Quality Leadership
- Price Leadership

**Technology Life Cycle**

- Introduction
- Growth
- Maturity
- Decline

**Customer Sensitivity Focused Strategies for competition**

- Produce STA Technologies
- Adapt Advanced Technologies
- Utilize Standard Technologies
- Salvage Obsolete Technologies

**Integrating Business and Technology Strategy**

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- Technology Strategies
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- Image Leadership
- Niche Leadership
- Quality Leadership
- Price Leadership

**Technology Strategies**

- Extender (Price minimization)
- Exploiter (Quality maximization)
- Follower (Feature optimization)
- Leader (Image capitalization)

**Technology Capabilities**

- Acquiring
- Modifying
- Utilizing
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**Technology Components**

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Institutional Technology Infrastructure

Two major categories:
- Technological activity guiding and supporting infrastructure
- Technological activity strengthening infrastructure

The race corresponds to the fast paced global economy, where

Every driver wants to get best out of his car

Technology & Knowledge Transfer Race in the broader sense of transferring technology & knowledge:
- From outside to inside the organization
- From individual to organization repository
- From organizational repository to individual
- From tacit to explicit
- Etc
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Policies for Nurturing Globalization and Competitive Growth

- Small and medium scale enterprises in the developing countries need market friendly government intervention to join and benefit from the globalized market conditions prevailing at present.

- Policy instruments (incentives, taxes, interest rates, etc.) need to be flexible to encourage technological innovation and to match with the requirements of the natural growth process of technological capability of productive enterprises.

- It must be remembered that firms compete from the platform (technology climate and technology infrastructure) created by the government.

Conclusion

- It appears that three major factors contributed to ineffective technology management at the firm level are:
  - Inadequate understanding of the process of technology change
  - Inadequate appreciation of the importance of technology and knowledge transfer
  - Inadequate top management involvement with technology

- The 21st century landscape is marked by - a fast pace of innovation and a focus on intellectual capital. In this context technology and knowledge management is seen as a critical discipline for increasing productivity and efficient innovation.
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Conclusion (continued)

- Whether we like it or not, the developing country enterprises have to face the competition from the developed countries which are already ahead of us in the technology and knowledge race.

- Under these circumstances rapid technology and knowledge transfer has become a necessity for the developing country enterprises for their survival and growth.

- To achieve this objective, a concerted effort from both the enterprises and the Government is very much warranted.