

ITU, ESCAP, APT

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**Role of ICT in Enhancing
Technological Capabilities**

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Plan of Presentation

- Technology and Competitive Advantage
- Technological Capability
- Information and Communication Technology (ICT) Interventions and Technological Capability Development
- Implementation Issues
- Concluding Remarks



1. Technology and Competitive Advantage

- A firm strengthens its competitiveness if it can create greater **“value”** for its customer than its competitors.
- The main five determinants of customer value creation are:
 - ✓ **Quality** (of the product or service)
 - ✓ **Speed** (of delivery)
 - ✓ **Flexibility** (extent of customisation)
 - ✓ **Convenience** (from order to delivery)
 - ✓ **Cost** (life cycle cost to the customer)
- These may be referred to as the Core Value Determinants (CVD)



- Based on these Core Value Determinants (CVDs), customer value may be defined as:

$$\text{Customer Value} = \frac{\text{F (Quality, Speed, Flexibility, Convenience)}}{\text{Cost}}$$

- In today's context, all of these CVDs have to necessarily incorporate environmental and sustainability dimensions.



- Technology strengthens a firm's competitive advantage by helping it to enhance customer value by bringing about:
 - ✓ Improved quality
 - ✓ Increased speed of delivery
 - ✓ Greater customisation of products and services
 - ✓ Greater convenience for the customer
 - ✓ Lowered cost through productivity gains
- A firm that can create more customer value than another, within the same market segment will be the more competitive of the two.
- Firms create this value through the deployment of its technological capabilities.



2. Technological Capability

- Technological capability may be divided, for expository ease, into:
 - ✓ Tactical technological capabilities
 - ✓ Strategic technological capabilities
 - ✓ Supplementary technological capabilities



- Tactical technological capabilities
 - ✓ Production capability
 - ✓ Selling and servicing capability
- Strategic technological capabilities
 - ✓ Design engineering capability
 - ✓ R&D capability

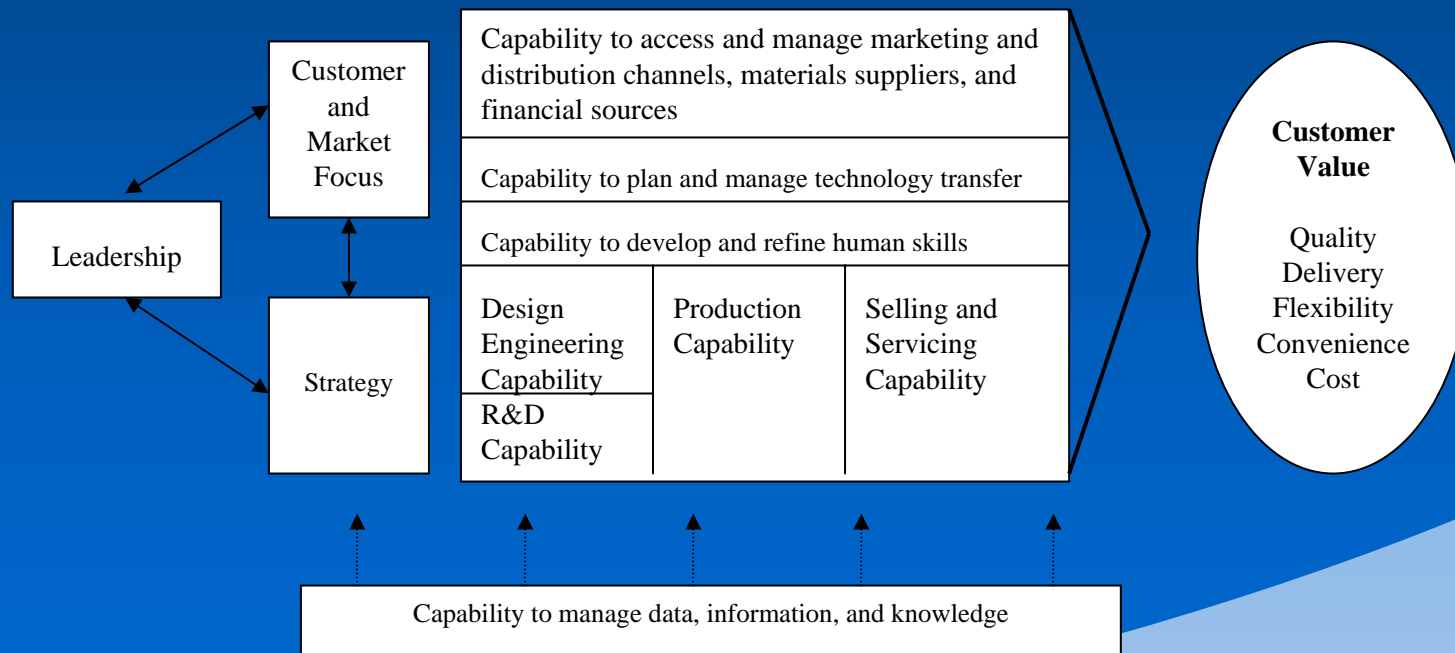


- Supplementary technological capabilities
 - ✓ Capability to plan and manage technology transfer
 - ✓ Capability to continuously develop and refine human skills
 - ✓ Capability to access and work effectively with marketing and distribution channels
 - ✓ Capability to effectively access necessary material inputs for production through effective partnering with global supply networks
 - ✓ Capability to identify funding sources and obtain funds at competitive rates from global sources for expansion and growth
- Figure 1 shows these capabilities schematically



Figure 1. Customer Value Creation through Technological Capability

Source: K. Ramanathan (2005)



- It is the “fusion” of these core technological and supplementary capabilities that will determine how the firm competes. A unique fusion could lead to the emergence of a “core competence”
- These core and supplementary capabilities are built up over time and a lot depends on how they are nurtured and developed.
- This nurturing and development will depend on the “leadership triad” of leadership, strategy, and customer focus.
- The “fusion” process and the “leadership triad” will be supported by the firm’s infrastructure for managing data, information, and knowledge.

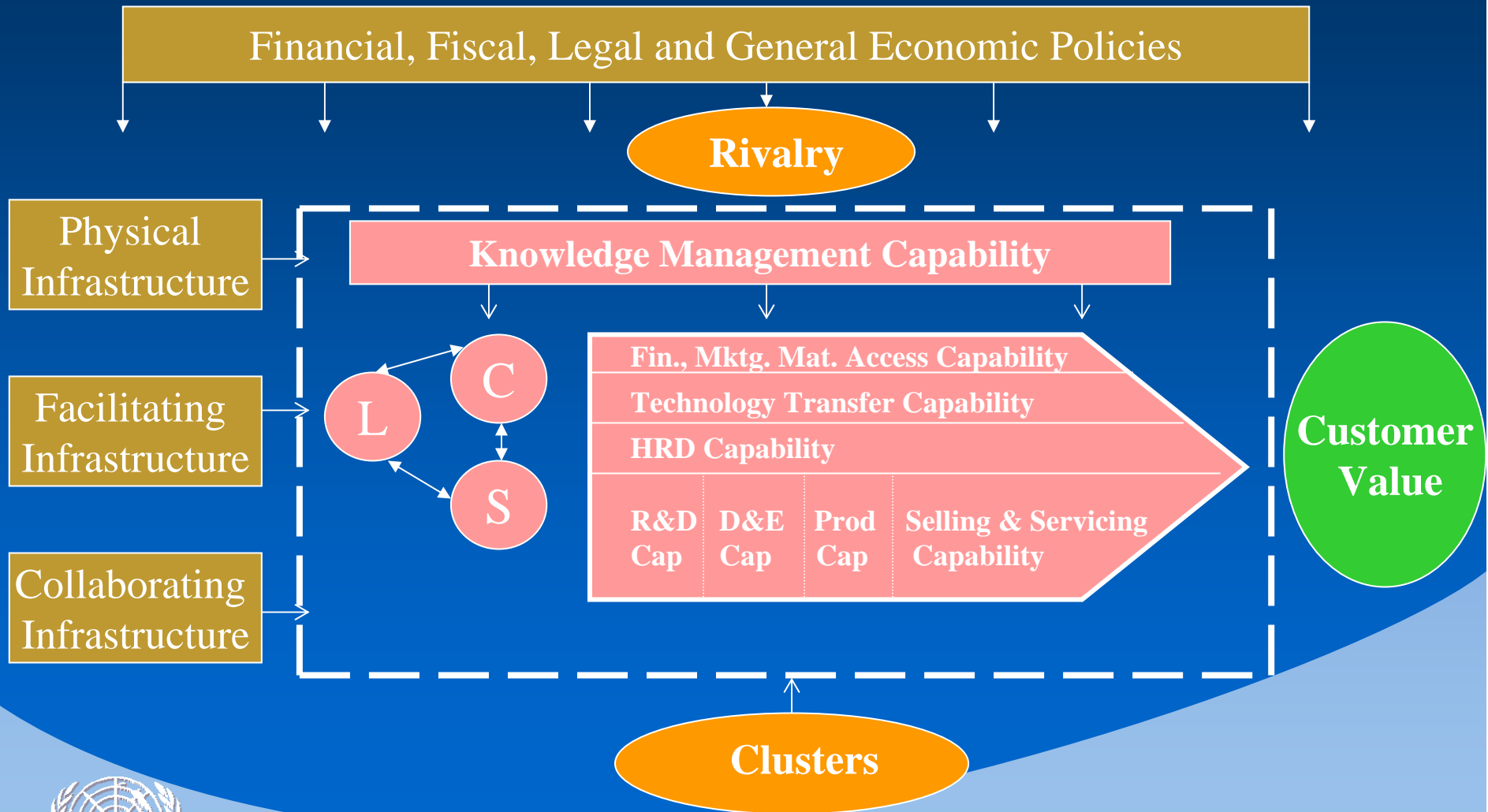


- It must be noted that the performance of the firm is influenced to a great extent by the National Innovation System (NIS) through:
 - ✓ Physical infrastructure (electricity, telecommunication water, roads, ports etc.)
 - ✓ Facilitating infrastructure (Investment promotion boards, venture capital firms, S&T information centers, technology transfer centers, etc.)
 - ✓ Collaborating infrastructure (R&D institutes, universities, design engineering and production units)
 - ✓ Level and intensity of market rivalry
 - ✓ Cluster availability (component manufacturers, suppliers etc.)
 - ✓ Policy setting



Figure 2. The Influence of the NIS on the Firm

Source: K. Ramanathan, The Role of Technology Transfer Services in Technology Capacity Building and Enhancing the Competitiveness of SMEs, UNESCAP-ITMRC Workshop on "Subnational Innovation systems and Technology Capacity-building Policies to Enhance Competitiveness of SMEs, Mongolia, 2007



3. ICT Interventions and Technological Capability Development

- Production capability enhancement
 - ✓ ERP systems for shortening production planning cycles and the seamless integration of demand flow management, materials and services management, quality, costing, and accounting.
 - ✓ Intelligent manufacturing systems (KBSs, NNs, GAs, FL, CBR, and HS) for process planning, quality management, maintenance and diagnosis, and scheduling



- Selling and servicing capability

- ✓ Proactive cybermarketing

- ✓ Web-based provision of technical information, bulletins, etc.

- ✓ Use of intelligent agents to enhance customer search, information provision, and personalizing content

- ✓ e-camera for progress monitoring

- ✓ Integration of telephony, Web, and database technologies for effective CRM



- Design engineering and R&D capability
 - ✓ Use of CAD and rapid prototyping.
 - ✓ Use of AI techniques such as KBS, NN, GA, FL, CBR, HS etc.
 - ✓ Integration of Internet and Intranet applications for shortening product development time.
 - ✓ Using online research firms and for acquiring business intelligence and state-of-the-art scientific information



- Supplementary Capabilities

- ✓ Technology transfer capability

- Search* - IT-enabled tools such as: online search of patent databases; research web sites; meta-search engines, directories, and online libraries; trade mailing lists etc.

- Assessment* - Groupware and Intranet for internal discussion and the use of web-based services of specialist firms to acquire potential partner information

- Negotiation* - Internet telephony, videoconferencing, teleconferencing, and privately hosted electronic arbitration rooms

- ✓ Funds Identification capability

- Use of Internet-based consulting firms, and “intelligent software agents” for organizing and filtering “hits.”



- Supplementary Capabilities (cont.)

- ✓ Materials access capability

- Internet-enabled B2B collaboration (“supplier electronic store” for online ordering, “buyer electronic marketplace,” and the “e-mall” approach).

- This requires firms to integrate their own back-end information systems with those of their suppliers

- ✓ Human resources development capability

- Use of multimedia technology for employee orientation programs, product familiarization, delivering operation and maintenance instructions etc.

- Web-based virtual classrooms (one-to-one and one-to-many).



4. Implementation Issues

- Technological capability development has, in general, been based on “learning by doing” and “learning by changing.”
- The emphasis has been on trying to do what is already being done, better.
- In the e-business era of today, ICT offers firms the scope for doing things that they are not already doing.



- This requires a shift from “inductive reasoning” to “deductive reasoning.”
- The hardest part is to recognize and creatively deploy the new, unfamiliar capabilities of ICT instead of its familiar ones.
- Some of the important issues that need to be examined include the following.



Reasons for adopting ICT-based interventions

- There must be a clear understanding of the drivers to obtain top management commitment and allocation of resources.

Intrafirm adaptability

- Compatibility of new systems with existing systems that will continue to be used.

Interfirm adaptability

- Compatibility of new systems with those of partners in the supply chain and other support service providers.



Architecture

- Ensuring that intended applications, software, hardware, networks, and data management can be integrated into a cohesive platform.

Scalability and reliability

- Ensuring that the new systems are not mere replications but suit the needs of the firm.

Security

- Protecting information flow and integrity.



Skill availability

- Developing and/or acquiring multidisciplinary skills to design, implement, and improve the systems.

Cost

- Phased implementation and obtaining resources to meet both direct and indirect costs.

Creating a favorable culture

- Introducing measures for generating appropriate behavior that supports acceptance and new ways of working.

5. Concluding Remarks

- This presentation has essentially tried to conceptualize the role of ICT in enhancing technological capability.
- However, to gain better insights into factors that promote and/or inhibit the adoption and deployment of ICT-based interventions to strengthen technological capability, more work needs to be done.
- It is proposed that, initially, a series of case studies be carried out in firms that have successfully implemented ICT-based approaches to enhance technological capability



- Such studies could provide valuable insights into critical success and failure factors and provide a basis for developing indicators to assess the extent to which ICT is being deployed by firms to upgrade technological capability.
- Often it is easy to develop input indicators that reflect the extent to which resources are being allocated in ICT deployment.
- However, it is necessary to move beyond input indicators to assess the extent to which, for instance, production capability or design capability, has been enhanced due to ICT-based interventions.



- This would require the development of process, output, as well as impact indicators.
- Also indicators are needed to assess the extent to which the NIS is supporting or inhibiting the adoption of ICT-based interventions by firms.
- It is in this context that case studies could be valuable since the views of practicing managers can be very useful in designing indicators that can help practitioners.
- Even more challenging would be the development of ICT-related indicators for assessing technological capability enhancement at the sectoral level.





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Thank you

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