



**UN-ESCWA**  
UNITED NATIONS ECONOMIC & SOCIAL COMMISSION FOR WESTERN ASIA



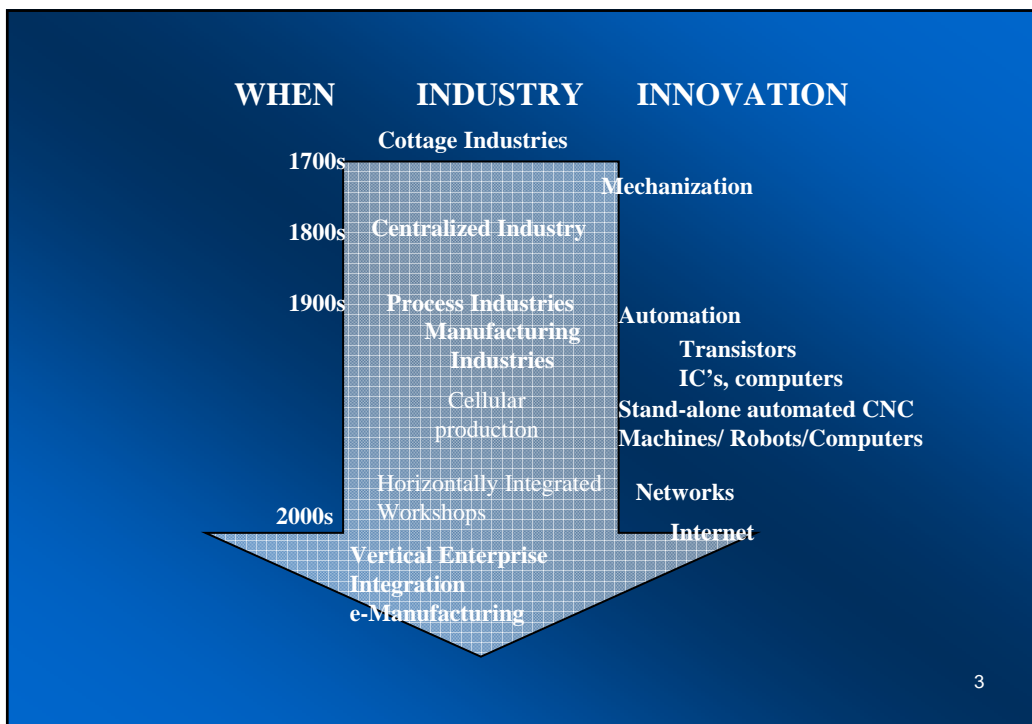
*for* REGIONAL  
INTEGRATION

## **Mechanisms and Models for Harnessing Technology in SMEs**

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### **Technology Models: Historical Perspective**

- Historic eras: Stone Age, Industrial Age
- Last century: nations labeled interchangeably as *“industrial,” “great,”* and *“rich”*
- Technology revolutionized production and contributed to making *“super powers”*
- Exchange of knowledge and technologies between the military and productive civil industries
- Models of operations and productions were introduced or in some cases eliminated based on adopted technologies in processing and assembly



## Production Competitiveness Today

Demanding purchasing markets require:

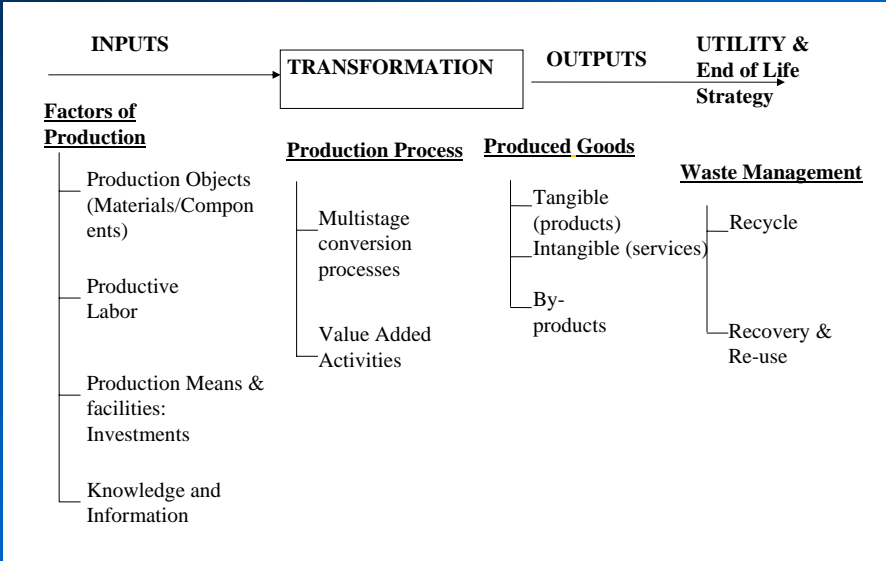
- Low price
- More features
- Better performance
- Short delivery time
- Higher Reliability/Support
- Known Standards and Quality Seals
- Wide product line
- Custom made product
- Variable order size

Enterprises are improving:

- Innovation
- Customization
- Waste reduction
- Product proliferation
- Efficiency
- Informed decision making
- Flexibility
- Quality deployment and assurance

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Production process general model



## Technology Productivity Tools

- Technology tools at different nodes of the process
- Across the enterprise utilities' technology
  - Office IT, e-mail, SMS, accounting, others
- Industrial technologies deliver efficiency focus that can be easily integrated in an enterprise resource planning and control program
- Abundantly available in the ESCWA region, including Arabic Human Machine Interface

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## *Technology in “Production Inputs”*

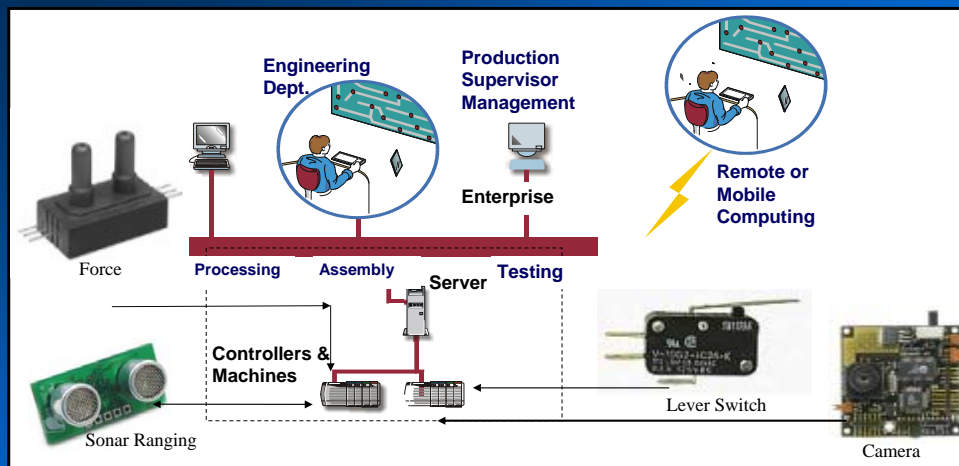
- Knowledge
  - Capturing and applying knowledge
  - Managing and protecting knowledge as a real asset
  - Knowledge mining is a gradual process
- Raw materials
  - Procurement: IT and internet
  - Purchasing optimized: lists of reliable and competitive suppliers
- Labor
  - Start with knowledgeable team: training and continuous learning
- Capital
  - Technology offers information from production
  - Decision making is made based on data and educated analysis
  - Capital monitors the performance, can detect or predict failures

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## *Tech in “Production Transformation”*

- Skillful transformation of raw materials using methods and tools is “*technology!*”
- Doing that in a clever and efficient way is “*modern industrial technologies.*”
  - material handling
  - inventory warehousing
  - design and planning
  - material processing and assembly
  - testing and packaging
  - facilities management/supervision and control

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## *Tech in “Production Output”*

- Products and services
- Technology tools:
  - Marketing (web based)
    - advertising
    - public relations
    - graphic design
    - packaging
    - on line sales and promotion
  - delivery
  - service and maintenance
- e-commerce
- product history-log and performances tags
- Internet: service and maintenance scheduling

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## *Tech in “End of Life Strategy”*

- SMEs can reduce waste and improve performance and marketability
- Sound business plans an exit strategy:
  - product design has end of life disposal strategy
- Product design characteristics translated into components and system specifications
- Process redirects heat/water/pressure into other stages of production
- Specifications guide designers and producers to select materials and processing methods compatible with proper management of disposed product after the end of service cycle
- Technology tools offer the assembly and processing alternative schemes that make recovery and recycling possible and feasible
- Technology is offering efficient and affordable tools making the recycling and reutilization of components and materials a lucrative business opportunity

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## Guide to introduce Technology in SME's

- Careful selective introduction of adequate technology tools that are justified and fully utilized
- Important to educate the internal stakeholders of the importance & timing of such well-informed step
- Realize: it is not an all-or-nothing proposition
- Use modular - scalable applications, and commercially available tools
- Choose technology blocks that install/integrate with existing systems

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## Cost of Technology in SME's

DIRECT	INDIRECT
Purchase of equipment	Plant layout modification (if needed)
Installation and Interfacing	Maintenance and upgrading
Cost changes in associated utilities	Forecasted system upgrade
Hiring/Outsourcing of skilled workers	Retraining of workers

- Spending on technology is relative
- Global markets are about competition
- SMEs cannot afford R&D and training: Universities' role
- Concentrate on critical line of business technologies
- Avoid drifting on tangents of enabling technology tools
- Service providers as deployment partners
- ***Free management to more productive business development work***

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## Value Added Production in ESCWA

- Value added production and export is critical for the socio-economic development of the region
- Is globally competitive and requires innovation and productivity in the operations
- Technology has become the productivity tool for enterprises
- ESCWA region trade balance has been in favor of the region if we account for the oil revenues
- Trade deficit once oil exports are excluded

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## *Models for Incorporating Technology into SMEs*

- SMEs are nodes in the global value added chains
- Linkages with other enterprises are facilitated by technology: ICT
- Technology in SME's:
  - tool and / or
  - product
- Many business models for harnessing technology in SME's
- Most practical scenarios fall into:
  - Turnkey imported solution
  - Home grown technology product or service
  - Customization and adaptation of existing off the shelf tools
  - Outsourced and Sub-contracting of technology based services
- Universal advantages and disadvantages of each class
- SME nature and business conditions will have unique requirements to meet and hence might not follow the general guidelines

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## *Tech Linkage Model I: Imported Turn Key*

- ESCWA region: some SME's sectors are here to stay and are related to the natural resources and/or the culture of the region
- Mastering regionally associated technologies becomes critical and necessary: Examples
  - petrochemical based production,
  - plastic industry,
  - Arabic software,
  - agro-food processing,
  - water desalination technologies
- Turn key systems or hybrid technology solutions might be more suitable for SME ventures that are temporary and do not take advantage of the region comparative factors (e.g. labor, raw material, markets, knowledge): Examples
  - Watch assembly
  - Computer assembly
  - Diamond tools

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### **Box 1: Technology Linkage Example**

#### **Purchasing Turn key Technology production to ESCWA region**

Italian manufacturing of Diamond Tools for the Stone and Construction Industry

40 years of work, and established network of 100 international sales outlets

Business was purchased by ESCWA region investors

Chain of parts suppliers and knowledge support in local labs and universities was established

Products: Diamond Circular and Linear Saw Blades, Wire, and



Many lessons:

- Regional investments in technology production is lucrative and can be bandwagon on successful European or Western experiences and networks
- Competitive advantages in relocating technology production to the region
- Turn key facilities has knowledge multiplier effects
- Branding of successful products can also be legally and properly acquired and might be a turning factor in determining the success in markets

## *Tech Linkage Model II: Home Grown Innovation*

- Educated workforce identification of gaps in markets: process, product
- Innovation yields SME competitiveness:
  - Productivity improvement
  - New products and services (potential spin-off)
  - New enterprise born
- R&D activities and facilities are essential
- Reported discouraging indicators of R&D in region
  - published scientific papers
  - IPR data and patents registration
  - R&D budgets
- Internationally recognized methods and assessment tools of R&D, might not be the norm practice in the region
  - Registering patents and inventions is not consistent with the reserved behavior of family based guarded business in the region
  - Publishing papers in international refereed journal is not appropriate for innovative solutions of regional socio-economic problems, journals common focus on sectors not yet developed in ESCWA region (e.g. Aerospace, nanotechnologies, others).
- Evident that most SME's in region are carrying out some forms of R&D despite weak standard indicators

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### **Box 2: Technology Linkage Example**

#### **Home Grown innovative technology products in ESCWA region**

University research in ESCWA region led to the establishment of a business for automated material testing machines for local, regional and then international markets

*According to the SME web site:*

*"Our **Core strength** alliance with client teams for the development of special purpose products and systems."*

Local design, prototyping, programming, and debugging

Integration and packaging in Germany

Many lessons were learned:

- Innovation has no nationality or geographic monopoly
- Technology markets' perception of the region production remains a challenge
- Creative solution with professionalism and quality assurance can be enhanced with branching in internationally trusted production communities

### *Tech Linkage Model III: Customization*

- Integrating off-the-shelf technology components and sub-systems is innovative and offers rewarding value added activity
- Many customization exercises are useful to solve needs in the market and everyday life
- ESCWA region has many socio-economic needs that represent business opportunities in supplying solutions
- When these needs are common with many other societies, the solutions will most probably be imported and local competition is likely to fail
- ***However, some of these regional needs might be unique***
- ***Local design and supply of solutions might become competitive and profitable***

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#### **Box 3: Technology Linkage Example**

##### **Customized technology solutions in the ESCWA region**



In many ESCWA countries, power sector is not reliable, and inter-  
Long power blackouts and extremely noisy power sources  
Foreign solutions to this problem were not designed for such environment  
Expanded the capacity of existing products and offered: power stabilizers, un-  
interruptible power supplies (UPS) especially medium and large, and battery chargers.

15 years, 30 employees products' sales in many regional markets (unstable politics)

##### **Learned lessons:**

- Crafting customized products to meet local socio-economic needs might make business sense
- Local knowledge of own problems coupled with educated workforce can spark innovation and entrepreneurship
- Hybrid innovative opportunities make the most of both worlds (Home grown and turn key)

### *Tech Linkage Model IV: Outsourcing & Sub-contracting*

- Business arrangement is bi-directional:
  - Forward (from the SMEs to technology service providers)
  - Backward (deliver services and products based on demand)
- SMEs outsource non essential technology services to providers and focus on core business development and production optimization
- SMEs shop the world markets for other enterprises, especially larger ones that are outsourcing much of their value added activities: OEM, licensing, others
- ESCWA region has the competitive advantages to grow such business scenarios (market size, raw materials, selective skilled labor)
- ***Alliances with other enterprises offer unique opportunities of learning and knowledge exchanges that has unlimited growth potential in the markets***

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#### **Box 4: Technology Linkage Example**

##### **Outsourcing Technology production in ESCWA**

Local SME started in 2002 machining key lock parts for a MNC based in France  
Based on confirmed requirements and amounts (from one part to 50,000 parts)

Large orders required a local network of smaller CNC shops to produce outside the facilities around 20,000 parts yearly

Local shops went through rigorous qualifying process and continuous auditing

*“Send us your design: we can produce your exact requirement or help you optimize your part design. If you do not have the design just send us the part and we will perform the drawing with the appropriate design”*

Many lessons were learned:

- Outsourcing and sub-contracting can benefit firms of all sizes
- Technical skills are tremendously enhanced through sub-contracting
- SMEs have a competitive edge: customized design, fast delivery, etc
- Firms of all sizes are suffering from lack of IPR protection



Model	ADVANTAGES	DISADVANTAGES
<i>Imported Turn Key</i>	<ul style="list-style-type: none"><li>➤ Quick installation</li><li>➤ Tested reliable solution</li><li>➤ Professional support</li><li>➤ Clear training and info</li></ul>	<ul style="list-style-type: none"><li>➤ Expensive</li><li>➤ Closed architecture</li><li>➤ Reliance on supplier</li><li>➤ Limited skill upgrading</li></ul>
<i>Home Grown Innovation</i>	<ul style="list-style-type: none"><li>➤ Mastering of solution</li><li>➤ Accumulated knowledge</li><li>➤ Needed features only</li></ul>	<ul style="list-style-type: none"><li>➤ Slow set up</li><li>➤ Slow learning curve</li><li>➤ Trials are needed</li></ul>
<i>Customization</i>	<ul style="list-style-type: none"><li>➤ Capitalizes on experience</li><li>➤ Transfer technology/skill</li><li>➤ Best practices mix</li></ul>	<ul style="list-style-type: none"><li>➤ Interfacing challenges</li><li>➤ Integrated black boxes</li><li>➤ Some reliance on others</li></ul>
<i>Outsourcing and Sub-contracting</i>	<ul style="list-style-type: none"><li>➤ Promised savings</li><li>➤ Reliable services</li><li>➤ Focus on core business</li></ul>	<ul style="list-style-type: none"><li>➤ High reliance on others</li><li>➤ IP and security risks</li><li>➤ Potential competition</li></ul>

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## Conclusions

- SMEs Competitiveness is supported by productive processes, efficient consumption of inputs, proper deployment of tech tools
- Market needs and business strategy of SMEs determine the model for harnessing technology for productivity
- Competitiveness is based on Knowledge as an asset like: raw material, capital, and labor
- Dual role of Technology in SMEs: Improved productivity and enabler for creation of high value added products
- Proliferation of ICT and multi-disciplinary technologies supports the region SMEs to leap frog into application and production of technologies
- Many business alliance models for SMEs in the ESCWA region (e.g. Turnkey, Home innovation, Customization, Outsourcing and Sub-contracting)

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