

# STIMULATE ECONOMIC RECOVERY – WITH TECHNOLOGY-BASED INNOVATION

2 December 2009

LEADER'S ANGLE: University of Stellenbosch Business School



**DR. RIAS J. VAN WYK**

**DIRECTOR: TECHNOSCAN<sup>®</sup> CENTRE**

**P.O. Box 390516, EDINA,  
MN 55439, USA**

**EMAIL: [PROJECTS@TECHNOSCAN.COM](mailto:PROJECTS@TECHNOSCAN.COM)**

Slides for one hour presentation  
Proprietary materials. Copyright applies.



# Purpose

- ❖ To describe new tools for stimulating technology-based economic renewal

# Diagnosis

- ❖ Economic slowdown
- ❖ Financial bailout
- ❖ Physical stimulus

# Physical stimulus

- ❖ Targets for stimulation
  - Physical infrastructure
  - Sustainable technologies
  - Replacements for foreign oil
  - Technologically impotent companies
- ❖ Opportunity for management
  - Boost technology-based innovation
- ❖ Management needs
  - Better tools for techno-economic mapping

# Techno-economic mapping: Essential features

- ❖ Where are we?
  - What is our profile of technological capabilities?
- ❖ Where do we want to go?
  - New processes – think 3
  - New products – think 30
  - New industry – think 360
- ❖ How are we going to get there?
  - Matching capabilities and opportunities

# Two radical new tools

- ❖ Conspectus of the technological landscape
- ❖ Metrics for quantifying technological progress

# Conspectus of the technological landscape: Possible models

- ❖ Personal-pragmatic model
  - Not formalized – no unifying theory
- ❖ Thematic model
  - Partially formalized – based on scientific categories – no unifying theory
- ❖ Economic model
  - Formalized – based on economic categories – unifying theory - complex
- ❖ Functional model
  - Formalized – based on technological categories – unifying theory - simple

# The functionality grid as conspectus

		Action		
		Process	Transport	Store
Output	Matter (M)	Transforming substances	Moving substances	Holding substances
	Energy (E)	Generating energy	Distributing energy	Keeping energy
	Information (I)	Composing messages	Sending messages	Saving messages

Van Wyk, Rias J: *Technology - A Unifying Code*, 2004, SMG, Cape Town, p. 34

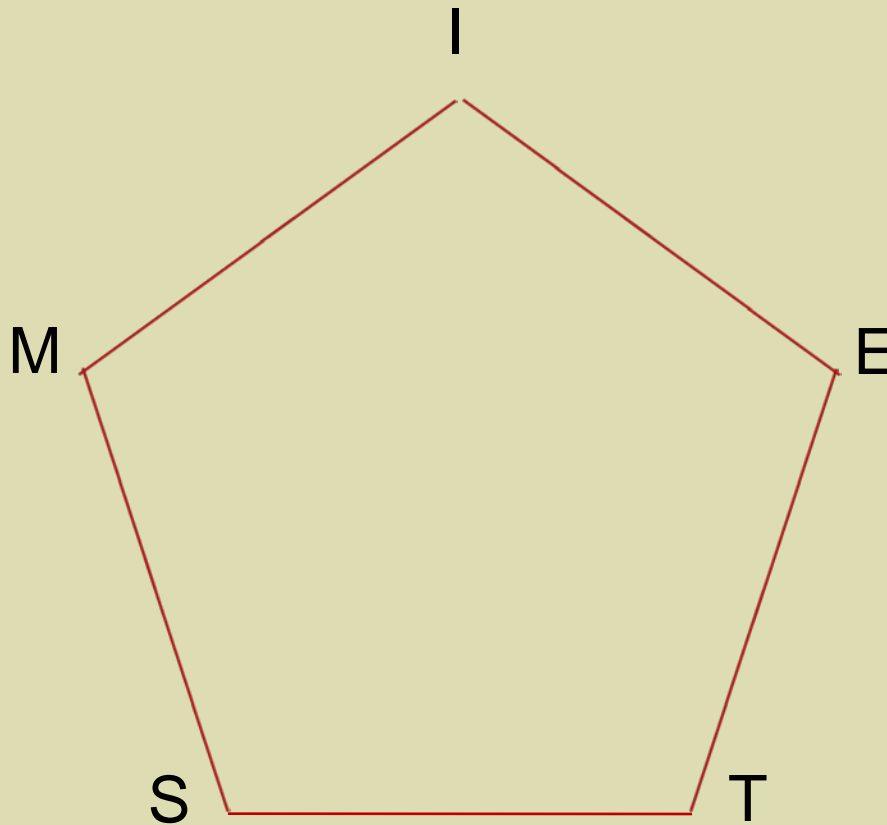
Based on: Ropohl, Gunter: *Eine Systemtheorie der Technik*, 1979, Carl Hanser Verlag, Munich and Vienna, p. 178.

Van Wyk, R.J. Copyright 2009, Technoscan Centre, P.O. Box 390516, Edina, MN 55439, USA

# Metrics of technological progress

- ❖ Triple trends of technological progress
  - Do more with less
  - Take less time while doing so
  - Use less space in the process
- ❖ Find metrics to express each trend
- ❖ Functional performance metrics (FPMs)

# Functional performance metrics (FPMs): Basic units



M = Matter  
E = Energy  
I = Information  
S = Space  
T = Time

# Examples of FPMs: Energy processing

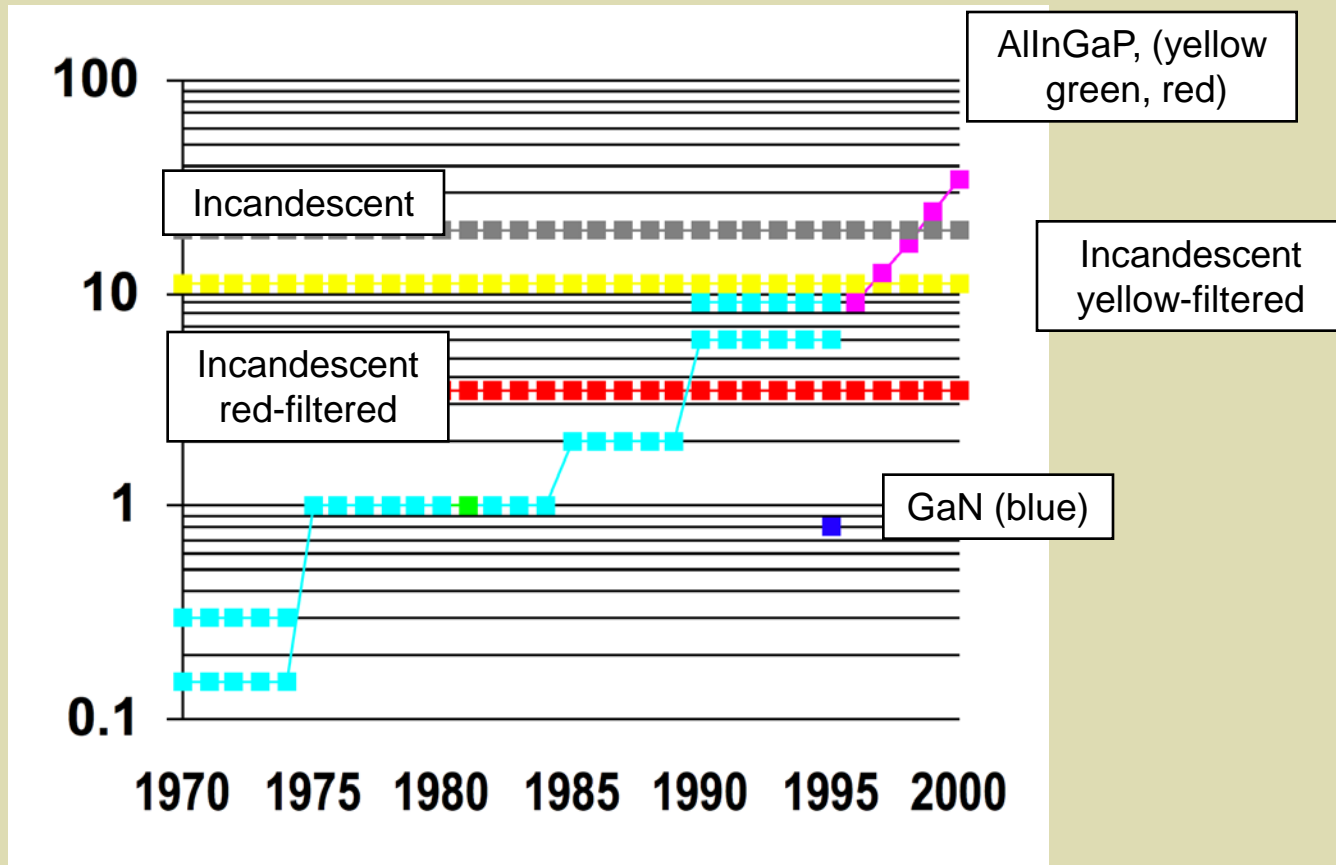
- ❖ Do more with less
  - $E_o/M_i$
  - $E_o/E_i$
  - $E_o/I_i$
- ❖ Take less time while doing so
  - $E_o/T$
- ❖ Use less space in the process
  - $E_o/S$

The subscripts “o” and “I” refer to *output* and *input* respectively

# Example of improvement in $E_o/E_i$ : Light emitting diodes (LEDs)



Lumens  
per watt



# System of metrics to quantify technological progress

- ❖ Nine pathways of technological progress
- ❖ Five metrics for each pathway
- ❖ Forty-five generic measures of technological progress

# Conspectus as prospectus

## Bold view of opportunities

		Action		
		Process	Transport	Store
Output	Matter	*Economies of scale	*Magnetically levitated devices	*Intelligent and active packaging
	Energy	*New energy conversion effects	*Wireless *Solar tubes	*Vehicle pack *Light battery
	Information	*Pervasive sensing	*Wi <sup>3</sup>	*Molecular stores

# Resources

1. Gaynor, Gerard (Ed.). 1998, *The Handbook of Technology Management*, McGraw-Hill, New York. Swamidass.
2. Van Wyk, Rias J, 2004 *Technology – A Unifying Code*, Stage Media Group, Cape Town (Available Amazon.com)
3. Van Wyk, Rias J.; Tschirky, Hugo, 2007, “A board charter for technology”, *Director’s Monthly*, July, pp.15-18.
4. Van Wyk, Rias J., Karschnia, Bob; Olson, Wayne; 2008, “Atlas of Technological Advance”, *Research-Technology Management*, September/October Vol. 51, No. 5, pp. 61-66
5. Van Wyk, Rias J. 2009 “Technological renewal in the USA: The pivotal role of MOT” *Proceedings, 18<sup>th</sup> International Conference for the International Association for Management of Technology*, Orlando, Florida, April 5-9, Section 16.
6. Van Wyk, Rias J. 2009 “Technology assessment for portfolio managers” *Technovation*, July (In press.)

# Wrap up

- ❖ Improve techno-economic mapping
- ❖ New tools
  - Technological conspectus
  - Metrics to quantify technological progress
- ❖ Will lead to improvement in
  - Techno audit
  - Opportunity scan
  - Matching capability and opportunities
- ❖ How do you start?
  - Feasibility study
  - Contact USB