

Performance & Evaluation of R & D Institutes

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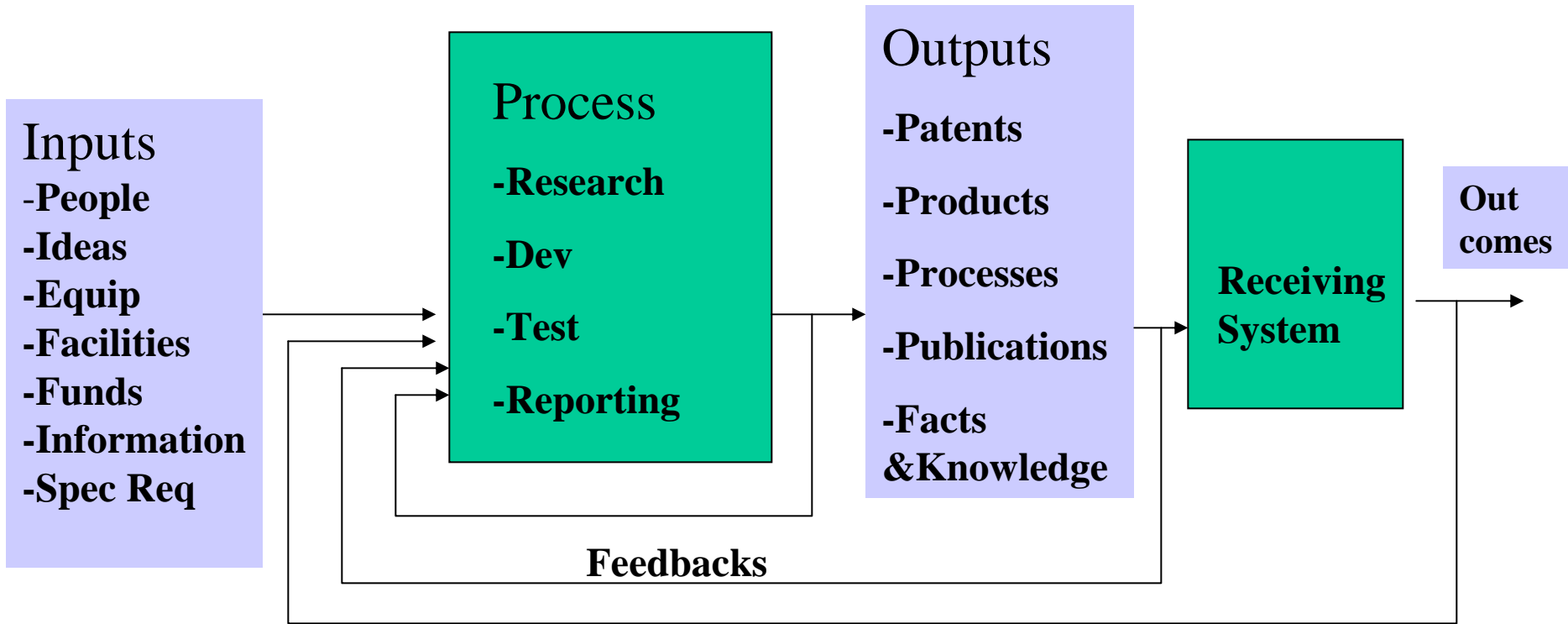
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OUT LINE

- * Performance & Evaluation of R & D Labs is Difficult**
- * Management Schools also have the same Problems**
- * Strategic Management and R & D Labs**
- * C-MMACS Performance**
- * Concluding**

Systems Approach to R & D Evaluation

R & D Lab as a System



Ref: Measuring R & D Productivity, Brown, Svenson, Res Tech Mgt, Nov-Dec 1998

Why Evaluation Systems Fail? (Contd)

- 1. Too much emphasis on internal Measurements**
- 2. Too much focus on Individual Behavior**
- 3. Outputs of Questionable values to the Organization**
- 4. Measurement System too much complex**
- 5. Too Objective or too Subjective**

Efficient Performance Measurements (Contd)

Quali-Quantitative Approach:

- 1. Focus on External Measurements also along with Internal measures**
- 2. Focus on Outputs and NOT on Behavior of Individuals**
- 3. Measure ONLY Valuable Outputs: Cost, Quantity, Quality**
- 4. Make Measurement System Simple (≤ 8 Indices)**
- 5. R& D Evaluation System should be Separate from other Evaluation Systems of the Organization**

Another Approach to R & D Effectiveness

10 Important Activities for R & D Effectiveness:

- 1. Selecting proper R & D Projects**
- 2. Planning & Managing Projects**
- 3. Generating New Product Ideas**
- 4. Quality of R & D Process and Methods**
- 5. Motivating Technical people**

Ref: “Measuring R & D Effectiveness”, Szakonyi,

Research Technology Management, March/April 94

Another Approach to R & D Effectiveness (Contd)

- 6. Establishing Cross-disciplinary Teams (Technical or Functional)**
- 7. Coordinating R & D and Marketing**
- 8. Transferring Technology to Manufacturing**
- 9. Collaboration between R & D and Finance
(Proper Communication)**
- 10. Linking R & D to Business Planning (Strategic Plan of 3-5 Years)**

Common Factors of R & D Effectiveness

Literature in the Last 30 years:

- * **Good R & D Planning**
- * **Identifying Market needs of R & D**
- * **Good Management of R & D Personnel**
- * **Effective Transfer to Manufacturing**
- * **Proper Financial Criteria for evaluation of R & D**
- * **Good Teamwork**

Measurement System for R & D Effectiveness (Contd)

SIX Levels at which an R&D Organization may Operate (Similar to CMM/PCMM Levels):

LEVELS:

1. Issue **NOT** Recognized
2. **Initial Efforts** made to address the issues
3. **Right skills** in place
4. **Appropriate Methods** used
5. **Responsibilities** are clarified
6. **Continuous** Improvement underway

Some Quotes.....

Measuring and Enhancing R & D Productivity and Effectiveness ... has gained the status of SURVIVAL TACTICS for the R & D Community (Chester, VP for Res & Tech, GM Hughes Res Lab)

“Pioneering Research is closely connected to the company's most pressing business problems...Research must “COPRODUCE” new technologies and work practices by developing with PARTNERS throughout the organization, and shared value of why these innovations are Important”

- J S Brown, Xerox Palo Alto Research Center.

**Ref: “Research, Development and Engineering Metrics, by Hauser”,
Sloan School of Management, MIT,
Management Science, Dec 1998**

Some More Quotes.....(Conted)

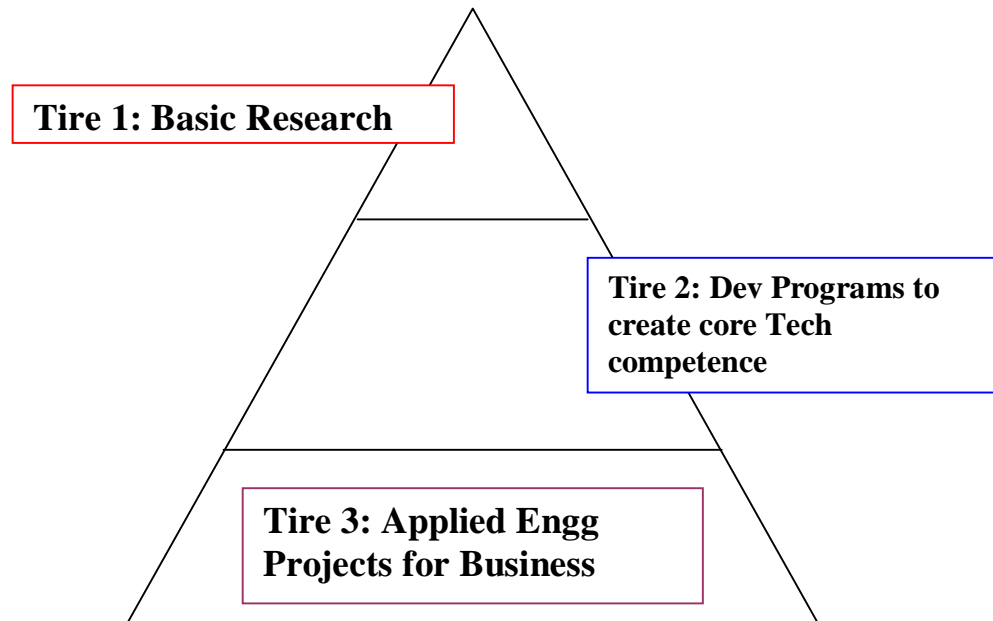
Customer knows the direction but lacks the Expertise

whereas

Researcher has expertise but lacks the direction.

Holding R & D Expenditure constant, an organization's innovative output is directly related to the percentage of expenditure allocated to the Basic Research.

Hauser's Metaphor for R, D & E (Contd)



More Details of Hauser's Model

- * 43 CTOs and CEOs
- * 10 Research Institutes (with intensive International Organizations)
- * Interviews of Scientists
- * Secondary Data
- * Outside CTOs, Consultants and Academic Researchers

Author's claims of this Research:

- *Qualitative Descriptions,*
- *Formal Analysis, and*
- *Properties of Metrics*

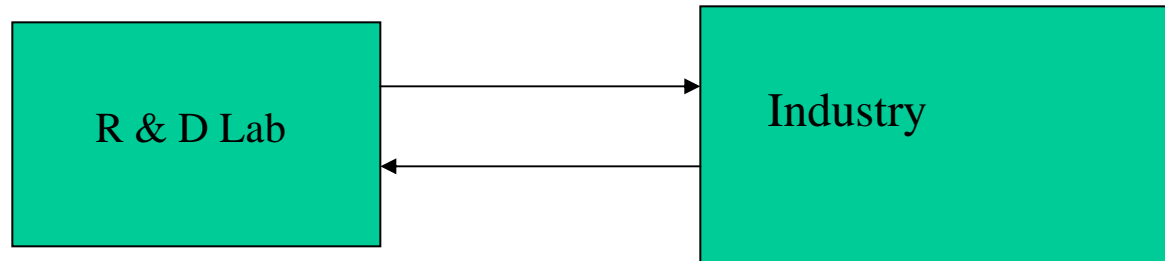
to Evaluate R, D & E more Effectively.

Benchmarking Non-Corporate R & D Organizations

- * **Sample of 60 R & D Organizations around the world**
- * **IDRC, Canada & DANIDA, Denmark**
- * **Coordinated by WAITRO (World Association of Industrial Technology Research Organizations)**

(Ref: “Benchmarking the Best Practices of Non-Corporate R & D Organizations”, Nath and Mrinalini, National Institute of Science, Technology and Development Studies, New Delhi, Benchmarking-International Journal, Vol 7-2, 2000)

Industry Linkages



“Most Non corporate Organizations are facing tough time in terms of availability of funds and justification of their effectiveness.”

(Ref: “Benchmarking the Best Practices of Non-corporate R & D Organizations”, Nath and Mrinalini, Benchmarking, Vol 7-2, 2000

Why the Linkage Problem?

FIVE Factors underlying growing alienation Between R & D and Industry: (UNIDO Report)

- **Failure** of the Original Objectives of the Industries
- **Changes** in the Requirements by the Industries
- **LACK** of Updating of capabilities and skills
- **Inability** to deal with new problems
- **Reduction** in State support

Core Processes of WAITRO

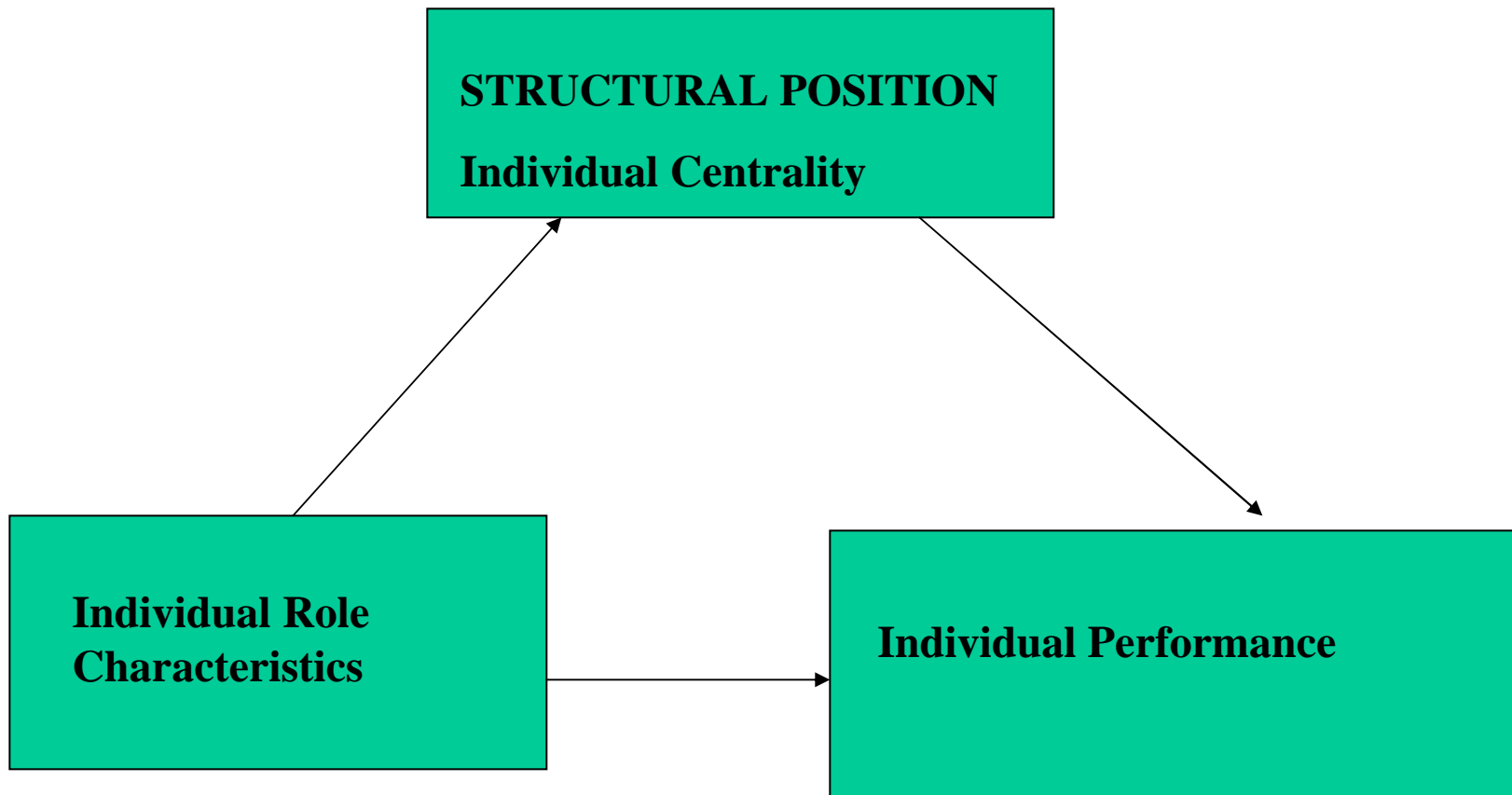
- 1. RTO (Research & Technology Organizations) Governance**
- 2. Finance Management**
- 3. RTO Services**
- 4. Business Development**
- 5. Organization management**
- 6. Project Management**
- 7. Capacity Building**
- 8. Personnel Management**
- 9. Networking of Personnel**
- 10. Policies & Programs (Strategic Plan)**

Soar Project

- * **Carnegie Mellon University**
- * **Computer Model for “Cognitive Science and where it should be going?”**
- * **27 International Institutes involved in 1993**
- * **LISP & C**
- * **Faculty, Senior Researchers, Students**
- * **Structural Equation Modeling (Lisrel) was also used**

*(Ref: “Individual Centrality and Performance in Virtual R & D Groups”,
Ahuja et al, Management Science, Jan 2003)*

Individual Centrality MODEL (Conted)



Important Features of MODEL (Conted)

- * **Measurement of Network Characteristics of Individuals**
 - **Functional Role**
 - **Status Role**
 - **Communication Role**
- * **Centrality is the KEY Measure of Social Network Analysis (SNA)**
- * **Virtual Groups form their own informal groups**
- * **Centrality a stronger direct predictor of performance of R & D Labs than individual characteristics**
- * **Emails in June, July, August of 1989 and 1993 considered.**
- * **Software Package UNINET IV of SNA was used for Analysis**

Important References:

- * **Research Technology Management**
- * **IEEE Transactions on Engineering Management**
- * **R & D Management**

- * *Book (Reprint of 31 Articles) from Research Technology Management Journal*

Performance Evaluation of Management Institutes

- * Performance Criteria for the Ranking of Management Institutes is equally confusing!**
- Management Institutes' Ranking is a Commercial Activity by some leading Magazines**
- * R & D Institutes' Evaluation is MORE Complex compared to management Institutes**

Business Today - August 4, 2003

- **Internal Capacity(100 Points)**
 - **Intellectual Capital**
 - **Process Efficiency**
 - **Infrastructure**
- **Market Performance (100 Points)**
 - **Placement**
 - **Industry Interface**
 - **Alumni Activities**

Asia Inc- Sept 1997

- * **Quality of Incoming Students (28%)**
- * **Quality of Education (34%)**
- * **Market Value of Students (38%)**

International Business Week- Oct 2, 2000

- * **Intellectual Capital** (10%)
- * **Students** (45%)
- * **Recruiters** (45%)

The Wall Street Journal

- * **Recruiters' Perception of School and Students (80%)**
- * **School's Mass Appeal (20%)**

WWW.USNEWS.COM

Top Engineering Schools

Rank	School	Overall score	Peer assessment score (5.0 highest)	Recruiter assessment score (5.0 highest)	'02 average quantitative GRE score	'02 average analytical GRE score	'02 acceptance rate	'02 Ph.D. students/faculty	'02 faculty membership in Natl. Academy of Engineering	'02 engineering school research expenditures (in millions)	'02 research expenditures per faculty member (in thousands)	Ph.D.'s granted 2001-02
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Strategic Plan

Strategy Definition 1:

Strategy is concerned with missions, objectives, policies and significant resource utilization *PLAN*.

Strategy Definition 2:

Plan or course of action leading to the allocation of an organization's scarce resources, over time, to reach identified goals.

Important Methodologies of Strategic management

- * **SWOT**
- * **Porter's Five Force Model**
- * **Value Chain**
- * **Strategic Grid**
- * **Critical Success Factors (CSF)**
- * **Balanced Score Card**
- * **Analytic Hierarchical Process (AHP)**
- * **Data Envelopment Analysis (DEA)**
- * **Simulation (Continuous Time, DYNAMO, iThink)**
- * **And other methods** ===== >>>>>

C-MMACS

Mission: The primary mission of C-MMACS is to play enabling role by developing wide ranging capabilities in mathematical modeling and computer simulation.

Objectives:

- * Critical Issues of scientific significance and social benefit**
- * Developer of new techniques/algorithms etc**
- * Train and develop high quality manpower**

C-MMACS (contd)

Major Projects:

- * Climate and Environmental Modeling**
- * Geological Hazards and Resources**
- * Industrial Computational Mechanics**
- * Other Modeling Areas**

C-MMACS (contd)

Reported Performance Measures:

- * External Cash Flow (ECF) : Important Indicator**
- * SCI (Science Citation Index): 0.58 for C-MMACS,**
 - It is at 8th position,**
which is Average at International Level
 - SCI is 0.34 for CSIR as an Organization**

SWOT Analysis of C-MMACS

STRENGTHS:

- * Qualified Scientists**
- * World Class Computing Facility**
- * Access to R & D Labs in India**
- * Government's High Priority Support**
- * Indian Cost Advantage**
- * Bangalore Location**
- * Good Infrastructure Facility for Working**

SWOT Analysis of C-MMACS

WEAKNESS:

- * Resource Restriction**
- * Average level in International Benchmarking**
- * Weak links with private sector/multinationals**
- * Restricted Involvement with Academic Institutes**
- * Visible Salary disparity compared to private sector**
- ***

SWOT Analysis of C-MMACS

OPPORTUNITIES:

- * India may become destination for R & D activities**
- * Possibility of Higher ECF**
- * Greater Collaboration efforts with International Institutes**
- * Greater partnership with private sector**
- ***

SWOT Analysis of C-MMACS

THREATS:

- * Reduction in Government Support**
- * Migration of Scientists to Private Sector/Multinationals**
- * Mismatch between requirement and availability of students from Academic Institutes**
- * Citizens' demand for greater transparency and accountability**
 - eGovernance and easy Internet access may become important enabler**
- * Emerging competing R & D Facilities in Private Sector and in other Asian countries**

In Conclusion.....

Can C-MMACS :

- * reach SCI of 0.8 by 2006?**
- * have High Performance Computing of Rs 150 Crore by 2006?**
- * be one of the top three International R & D Labs in :**
 - Climate & Environ Modeling ?**
 - Geological Hazards & Resources Modeling ?**

In Conclusion....

It is Possible =====>>>>>>>>

If we have a Good and dynamic

STRATEGIC PLAN

Thank You