DEVELOPING ENTREPRENEUR ENGINEERS TO BRIDGE THE GAP BETWEEN TOWN AND GOWN IN EMERGING ECONOMY

Prof. Toyin Ashiru

Tricontinental Group

OUTLINE

- INTRODUCTION
- BEYOND THE CLASSROOMS
- EMPLOYABILITY OF GRADUATE ENGINEERS
- EDUCATION AND SKILLS MISMATCH
- CHALLENGES WITH LOCAL CONTENT
- UNIVERSITY/INDUSTRY COLLABORATION
- CASE STUDIES
- WRAP-UP

Let me start with my personal experience

Patent on my invention

US005378346A

United States Patent [19]

Ashiru, et al.

[11] **Patent Number: 5,378,3**

[45] **Date of Patent: Jan. 3, 1**

[54] **ELECTROPLATING**

[76] Inventors: **Oluwatoyin A. Ashiru,** c/o International Tin Research Institute, Kinston Lane, Uxbridge, Middlesex UB8 3PJ, England; **Stephen J. Blunden,** 109 Twyford Road West Harrow, Middlesex HA2 OSJ, England

[21] Appl. No.: **969,183**

[22] PCT Filed: **Aug. 30, 1991**

[86] PCT No.: **PCT/GB91/01473**

§ 371 Date: **Oct. 12, 1993**

§ 102(e) Date: **Oct. 12, 1993**

[87] PCT Pub. No.: **WO92/04485**

PCT Pub. Date: **Mar. 19. 1992**

[30] **Foreign Application Priority Data**

Aug. 31, 1990 [GB] United Kingdom 90189
Jun. 7, 1991 [GB] United Kingdom 91122

[51] **Int. Cl.**[6] **C25D 3**

[52] **U.S. Cl.** **205/244;** 205/ 205/

[58] **Field of Search** 205/244, 252, 253, 106/1.05, 1.29, 1.25,

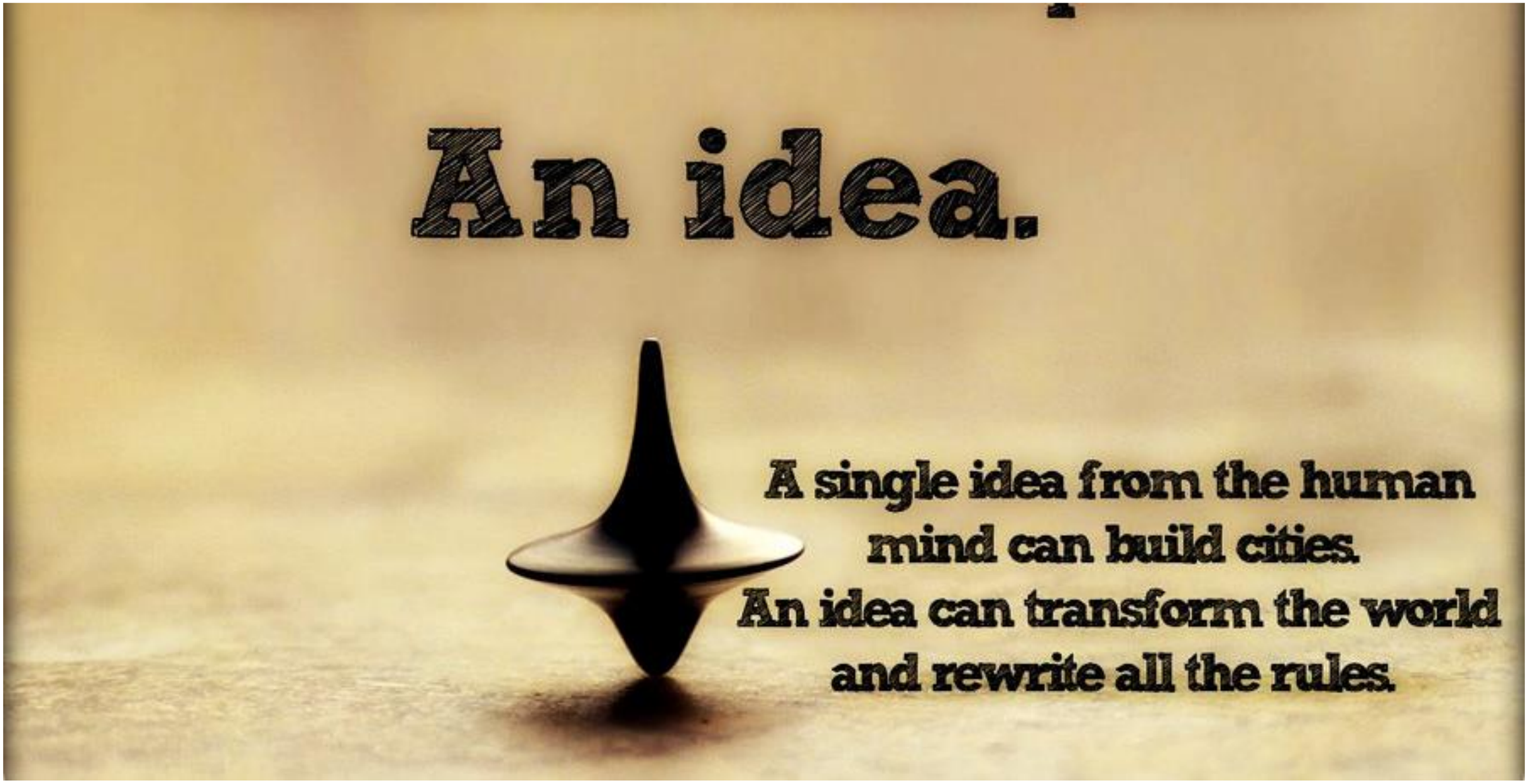
Primary Examiner—John Niebling
Assistant Examiner—Edna Wong

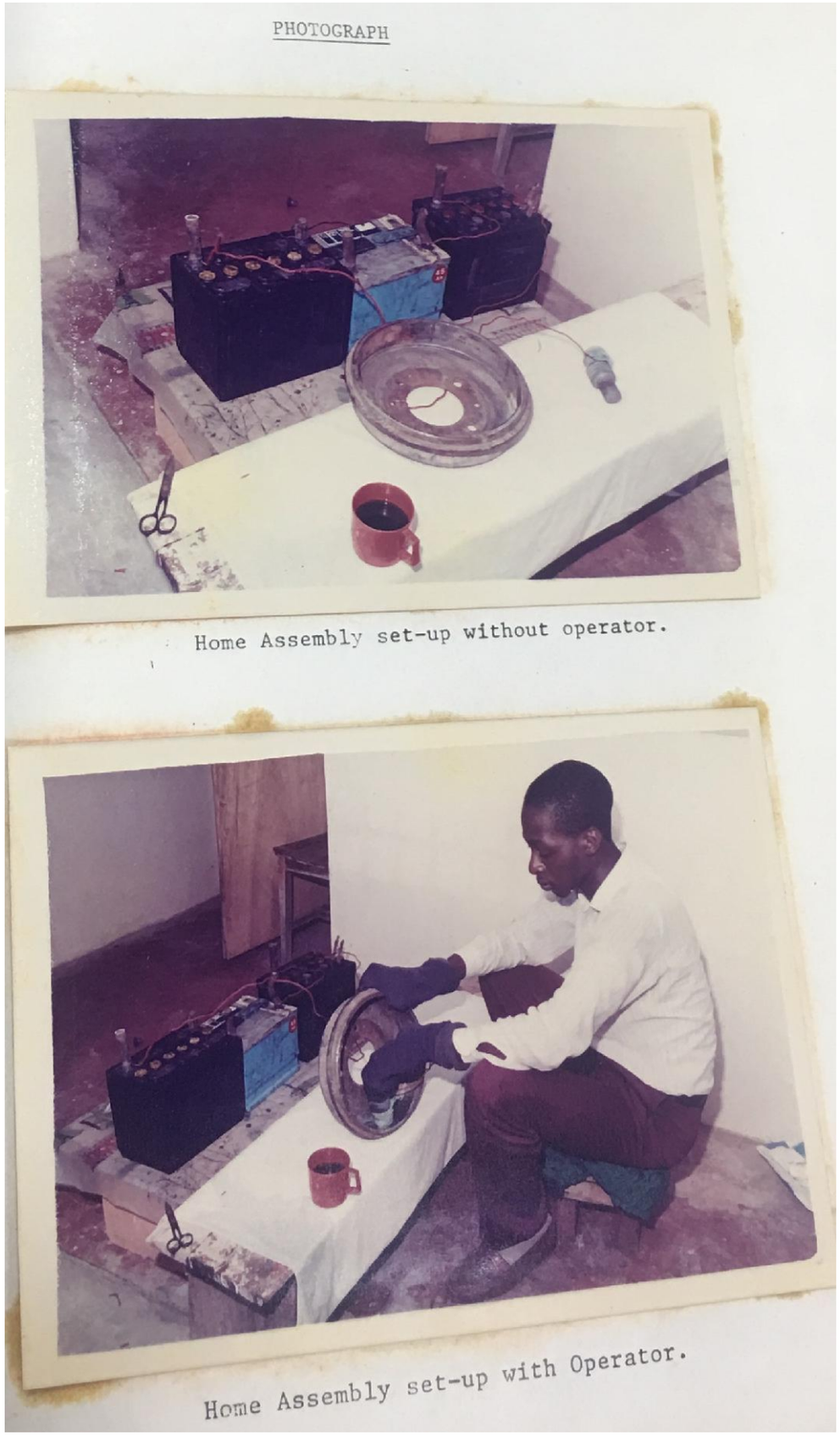
[57] **ABSTRACT**

Tin-zinc alloys can be electroplated from an aqu alkaline solution containing an alkali metal zincat alkali metal stannate, and an alkali metal tartrate. electroplating bath is alkaline with a pH of 11 tc preferably 12.0 to 13.5.

6 Claims, No Drawings

What is the most resilient parasite?




PHOTOGRAPH

Home Assembly set-up without operator.

Home Assembly set-up with Operator.

1985-1987

UNIVERSITY B.SC PROJECTS-

RESEARCH AND INVENTION INITIATIVE

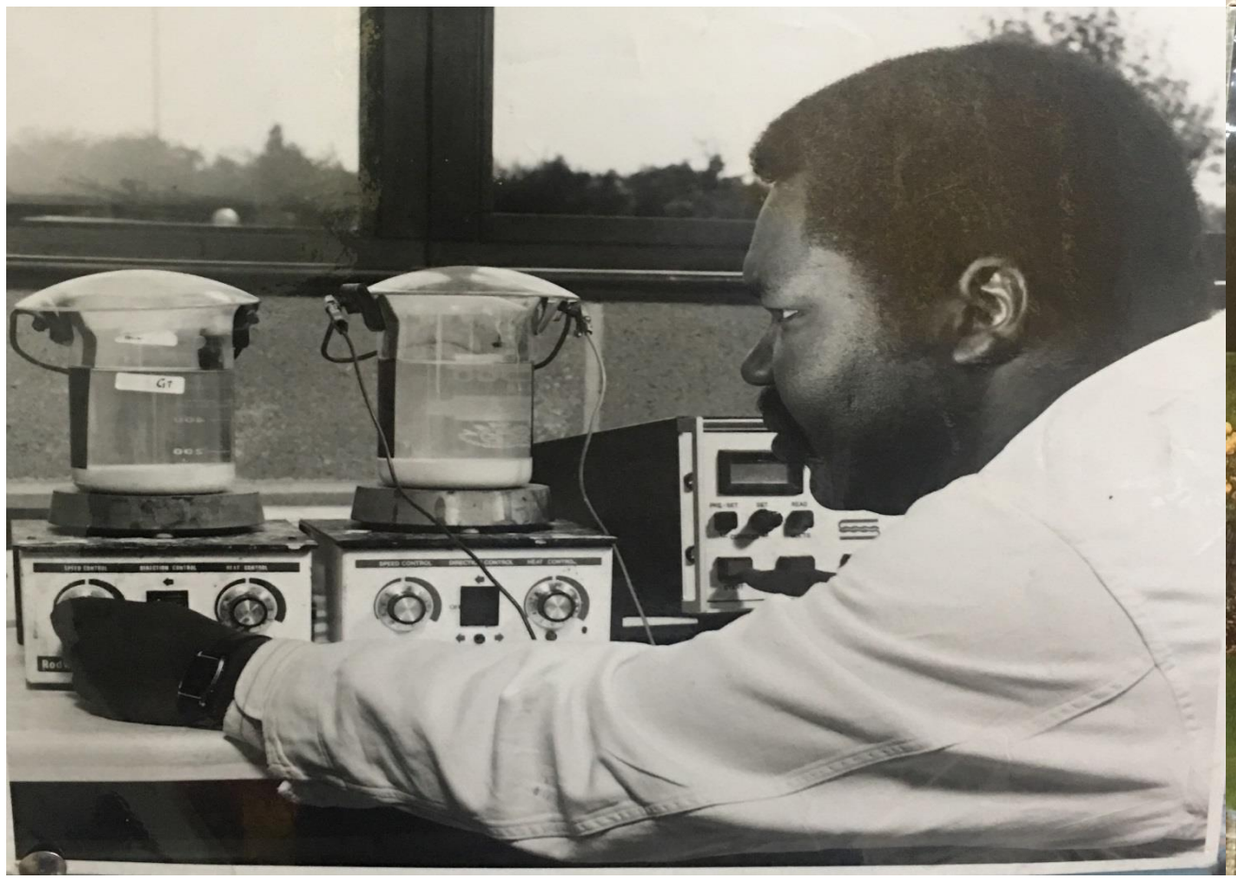
Students developed an electrochemical metallizing system for manufacturing and repairing of industrial components

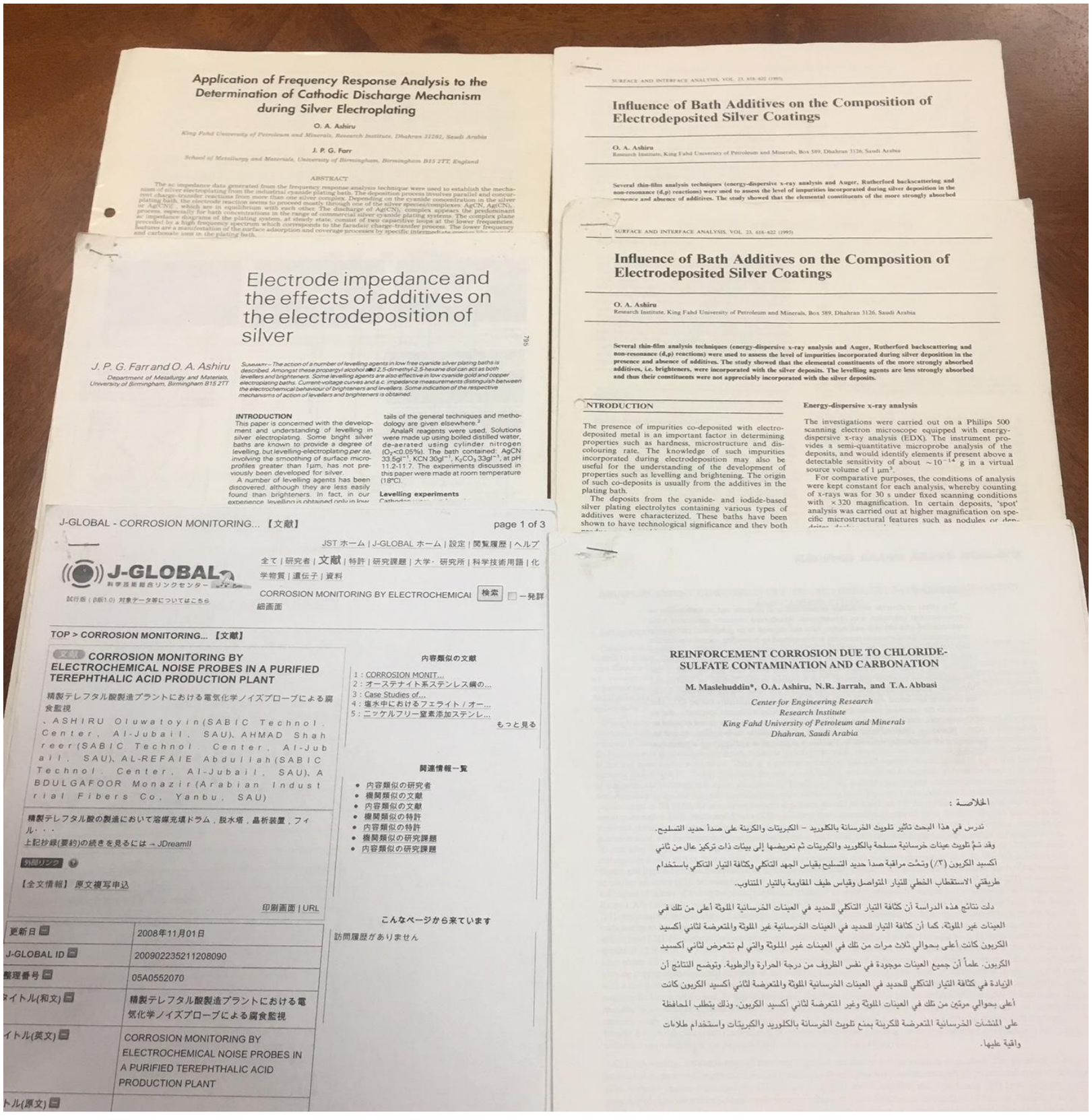
1987-1990

PROJECT REJECTED AND MOCKED BY UNIVERSITY COMMUNITY IN NIGERIA

1991

Process accepted Internationally and sponsored for improvement





Application of Frequency Response Analysis to the Determination of Cathodic Discharge Mechanism during Silver Electroplating

O. A. Ashiru
King Fahd University of Petroleum and Minerals, Research Institute, Dhahran 31261, Saudi Arabia
J. P. G. Farr
School of Metallurgy and Materials, University of Birmingham, Birmingham B15 2TT, England

ABSTRACT
The ac impedance data generated from the frequency response analysis technique were used to establish the mechanism of silver electroplating from the industrial cyanide plating bath. The deposition process involves parallel and concurrent charge-transfer reactions from more than one silver complex. Depending on the cyanide concentration in the silver plating bath, the electrode reaction seems to proceed mostly through one of the silver species/complexes: $Ag(CN)$, $Ag(CN)_2^-$ or $Ag(CN)_3^{2-}$, which are in equilibrium with each other. The discharge of $Ag(CN)_2^-$ complex appears the predominant process, especially for bath concentrations in the range of commercial silver cyanide plating systems. The complex plane ac impedance diagrams of the plating system, at steady state, consist of two capacitive loops at the lower frequencies preceded by a high frequency spectrum which corresponds to the faradaic charge-transfer process. The lower frequency features are a manifestation of the surface adsorption and coverage processes by specific intermediate species like cyanide and carbonate ions in the plating bath.

Electrode impedance and the effects of additives on the electrodeposition of silver

J. P. G. Farr and O. A. Ashiru
Department of Metallurgy and Materials, University of Birmingham, Birmingham B15 2TT

SUMMARY—The action of a number of levelling agents in low free cyanide silver plating baths is described. Amongst these propargyl alcohol and 2,5-dimethyl-2,5-hexane diol can act as both levellers and brighteners. Some levelling agents are also effective in low cyanide gold and copper electroplating baths. Current-voltage curves and a.c. impedance measurements distinguish between the electrochemical behaviour of brighteners and levellers. Some indication of the respective mechanisms of action of levellers and brighteners is obtained.

INTRODUCTION

This paper is concerned with the development and understanding of levelling in silver electroplating. Some bright silver baths are known to provide a degree of levelling, but levelling-electroplating *per se*, involving the smoothing of surface microprofiles greater than 1μm, has not previously been developed for silver.

A number of levelling agents has been discovered, although they are less easily found than brighteners. In fact, in our experience, levelling is obtained only in low

tails of the general techniques and methodology are given elsewhere.[7]

AnalaR reagents were used. Solutions were made up using boiled distilled water, de-aerated using cylinder nitrogen (O_2≤0.05%). The bath contained: AgCN 33.5gl^{-1}, KCN 30gl^{-1}, K_2CO_3 33gl^{-1}, at pH 11.2-11.7. The experiments discussed in this paper were made at room temperature (18°C).

Levelling experiments

SURFACE AND INTERFACE ANALYSIS, VOL. 23, 618–622 (1995)

Influence of Bath Additives on the Composition of Electrodeposited Silver Coatings

O. A. Ashiru
Research Institute, King Fahd University of Petroleum and Minerals, Box 589, Dhahran 3126, Saudi Arabia

Several thin-film analysis techniques (energy-dispersive x-ray analysis and Auger, Rutherford backscattering and non-resonance (d,p) reactions) were used to assess the level of impurities incorporated during silver deposition in the presence and absence of additives. The study showed that the elemental constituents of the more strongly absorbed additives, i.e. brighteners, were incorporated with the silver deposits. The levelling agents are less strongly absorbed and thus their constituents were not appreciably incorporated with the silver deposits.

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INTRODUCTION

The presence of impurities co-deposited with electrodeposited metal is an important factor in determining properties such as hardness, microstructure and discolouring rate. The knowledge of such impurities incorporated during electrodeposition may also be useful for the understanding of the development of properties such as levelling and brightening. The origin of such co-deposits is usually from the additives in the plating bath.

The deposits from the cyanide- and iodide-based silver plating electrolytes containing various types of additives were characterized. These baths have been shown to have technological significance and they both

Energy-dispersive x-ray analysis

The investigations were carried out on a Philips 500 scanning electron microscope equipped with energy-dispersive x-ray analysis (EDX). The instrument provides a semi-quantitative microprobe analysis of the deposits, and would identify elements if present above a detectable sensitivity of about $\sim 10^{-14}$ g in a virtual source volume of 1 μm^3.

For comparative purposes, the conditions of analysis were kept constant for each analysis, whereby counting of x-rays was for 30 s under fixed scanning conditions with ×320 magnification. In certain deposits, 'spot' analysis was carried out at higher magnification on specific microstructural features such as nodules or dep-

REINFORCEMENT CORROSION DUE TO CHLORIDE-SULFATE CONTAMINATION AND CARBONATION

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Research Institute
King Fahd University of Petroleum and Minerals
Dhahran, Saudi Arabia

الخلاصة :

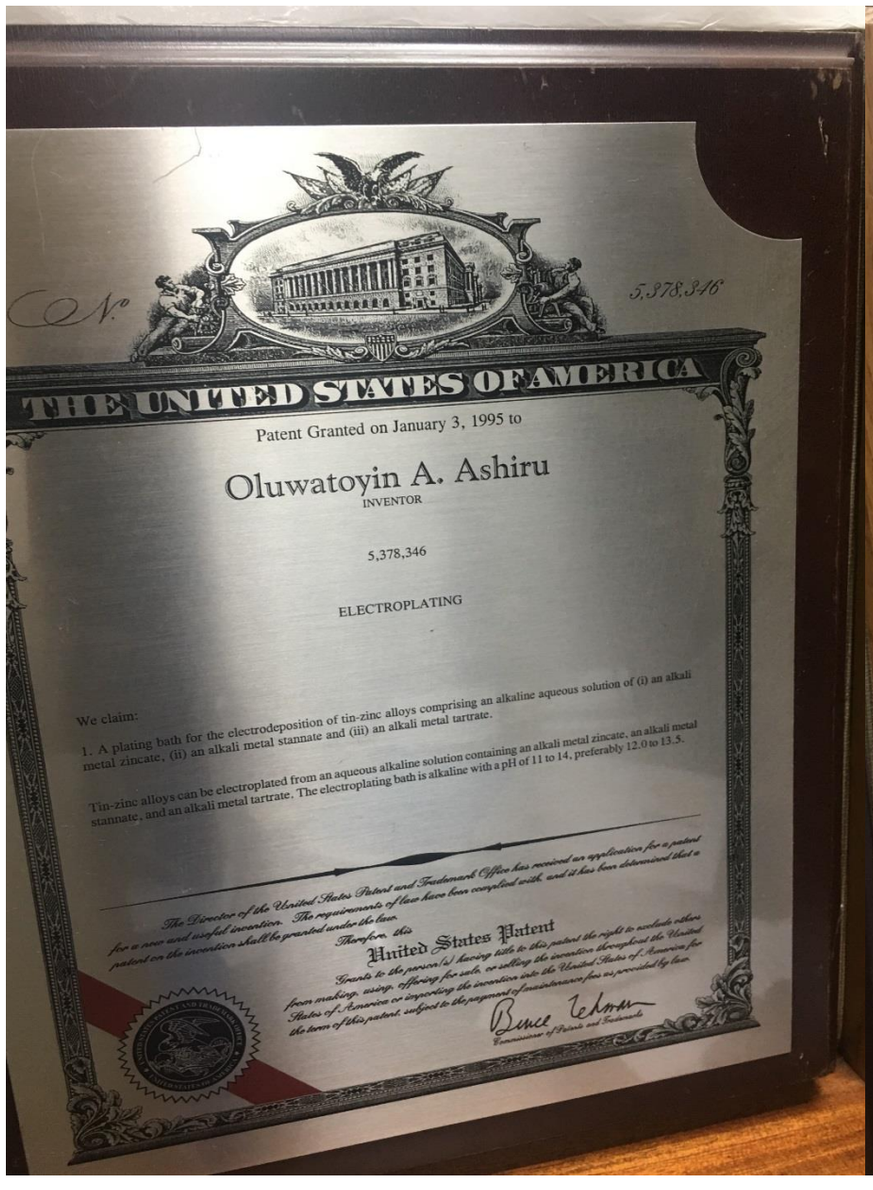
ندرس في هذا البحث تأثير تلويث الخرسانة بالكلوريد – الكبريتات والكربنة على صدأ حديد التسليح. وقد تمّ تلويث عينات خرسانية مسلحة بالكلوريد والكبريتات ثم تعريضها إلى بيئات ذات تركيز عال من ثاني أكسيد الكربون (٣٪) وتمّت مراقبة صدأ حديد التسليح بقياس الجهد التكلي وكثافة التيار التكلي باستخدام طريقتي الاستقطاب الخطي للتيار المتواصل وقياس طيف المقاومة بالتيار المتناوب.

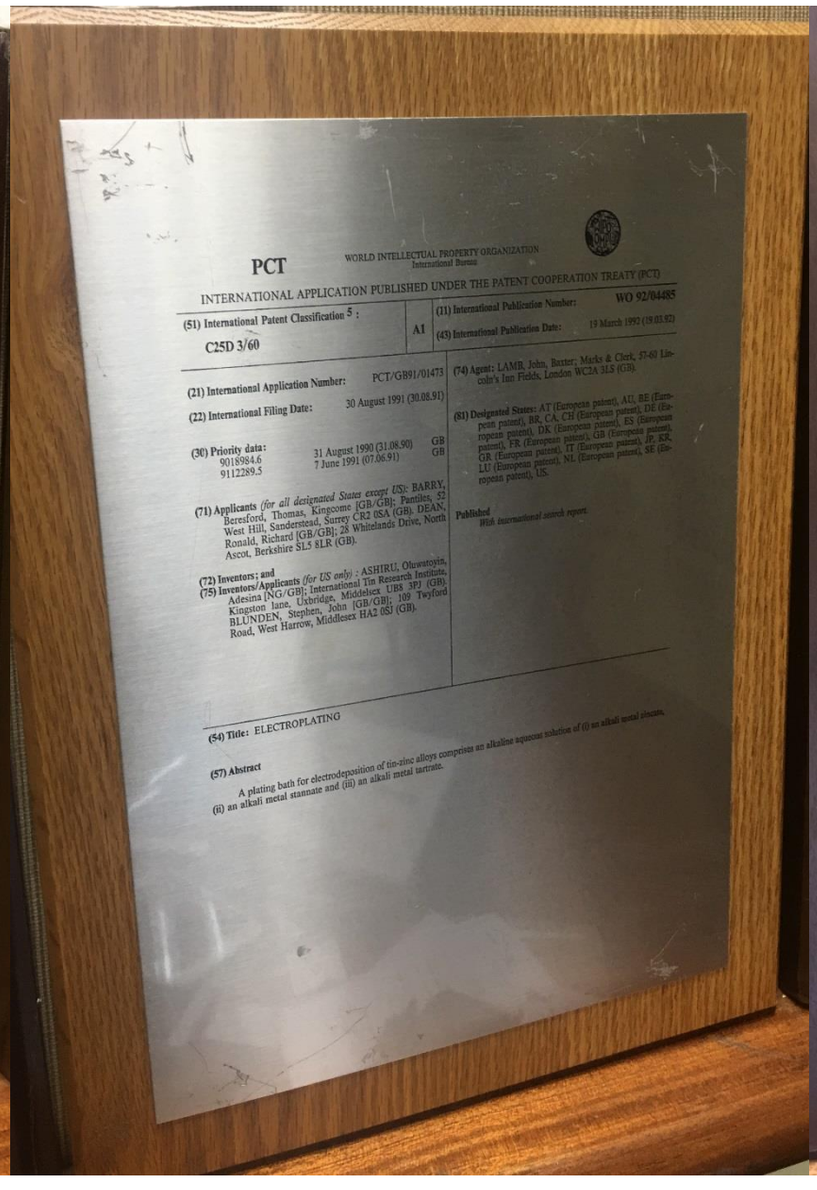
دلت نتائج هذه الدراسة أن كثافة التيار التكلي للحديد في العينات الخرسانية الملوثة أعلى من تلك في العينات غير الملوثة. كما أن كثافة التيار للحديد في العينات الخرسانية غير الملوثة والمتعرضة لثاني أكسيد الكربون كانت أعلى بحوالي ثلاث مرات من تلك في العينات غير الملوثة والتي لم تتعرض لثاني أكسيد الكربون. علماً أن جميع العينات موجودة في نفس الظروف من درجة الحرارة والرطوبة. وتوضح النتائج أن الزيادة في كثافة التيار التكلي للحديد في العينات الخرسانية الملوثة والمتعرضة لثاني أكسيد الكربون كانت أعلى بحوالي مرتين من تلك في العينات الملوثة وغير المتعرضة لثاني أكسيد الكربون. وذلك يتطلب المحافظة على المنشآت الخرسانية المتعرضة للكربنة بمنع تلويث الخرسانة بالكلوريد والكبريتات واستخدام طلاءات واقية عليها.

1994 - 2003
PEER REVIEWED
JOURNALS
AND PUBLICATIONS

1993 - 2000

1 PATENTS ACQUIRED





1997 FULLY COMMERCIALISED WORLDWIDE

Why did we miss this opportunity in Nigeria?

The reasons follow:

LACK OF UNDERSTANDING OF THE IMPORTANCE OF STEM EDUCATION

Science, Technology, Engineering and Mathematics—STEM:

Vital to our future and shapes our everyday experiences.

- **Science** equips us with knowledge about our natural world
- **Technology** covers computers and smartphones, television, radio, and even the first wheel.
- **Engineering** encompasses buildings, roads, and bridges, and also tackles today's challenges like global warming.
- **Mathematics** is the cradle of all creations, it boosts our power of reasoning and problem-solving skills.

Need Policy For Developing Stempreneurs To Add Value By Creating Industry Solutions With Commercial Viability

When STEM meets entrepreneurship innovation happens

Nigeria needs Stempreneurs to develop from a consumer economy to a manufacturing economy

STEM graduates will develop sellable ideas, and build local industries

Harness talents by putting in place suitable policies that will encourage STEM innovations

National Policy on Tertiary Education (2004)

Contribute to national development through **high level relevant, manpower** training

Develop the **intellectual capability**

Acquire skills for **self-reliance** and **good citizenship**

FACT

No nation rises beyond the level of its HUMAN CAPITAL

EXPECTATIONS

Universities are to nurture bulk of nation's HUMAN CAPITAL

Universities are to remain relevant & responsive to the society

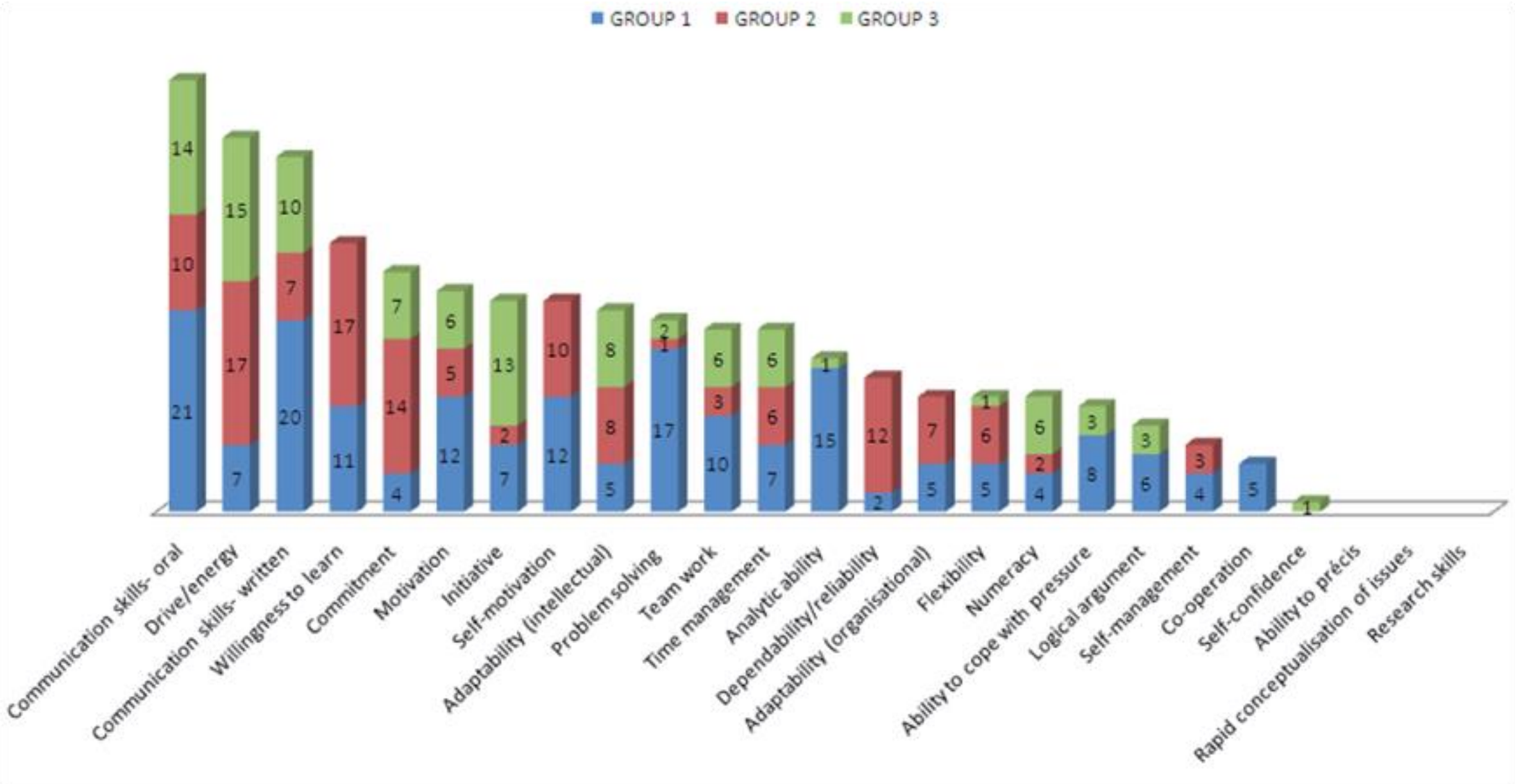
Engineering Education in Universities

138 Universities

- 40 Federal
- 39 States
- 60+ Private

47 offer COREN Accredited Programs

BEYOND THE CLASSROOMS:
EMPLOYABILITY OF NIGERIAN GRADUATES



Credits: brunel.ac.uk

LARGE NUMBER OF GRADUATE ENGINEERS ARE UNEMPLOYABLE

- No employment requirements
  - Thus, unsuccessful in securing or keeping jobs
- Highest rate of dissatisfaction observed by:
  - Consulting Firms
  - Oil and Gas Sectors

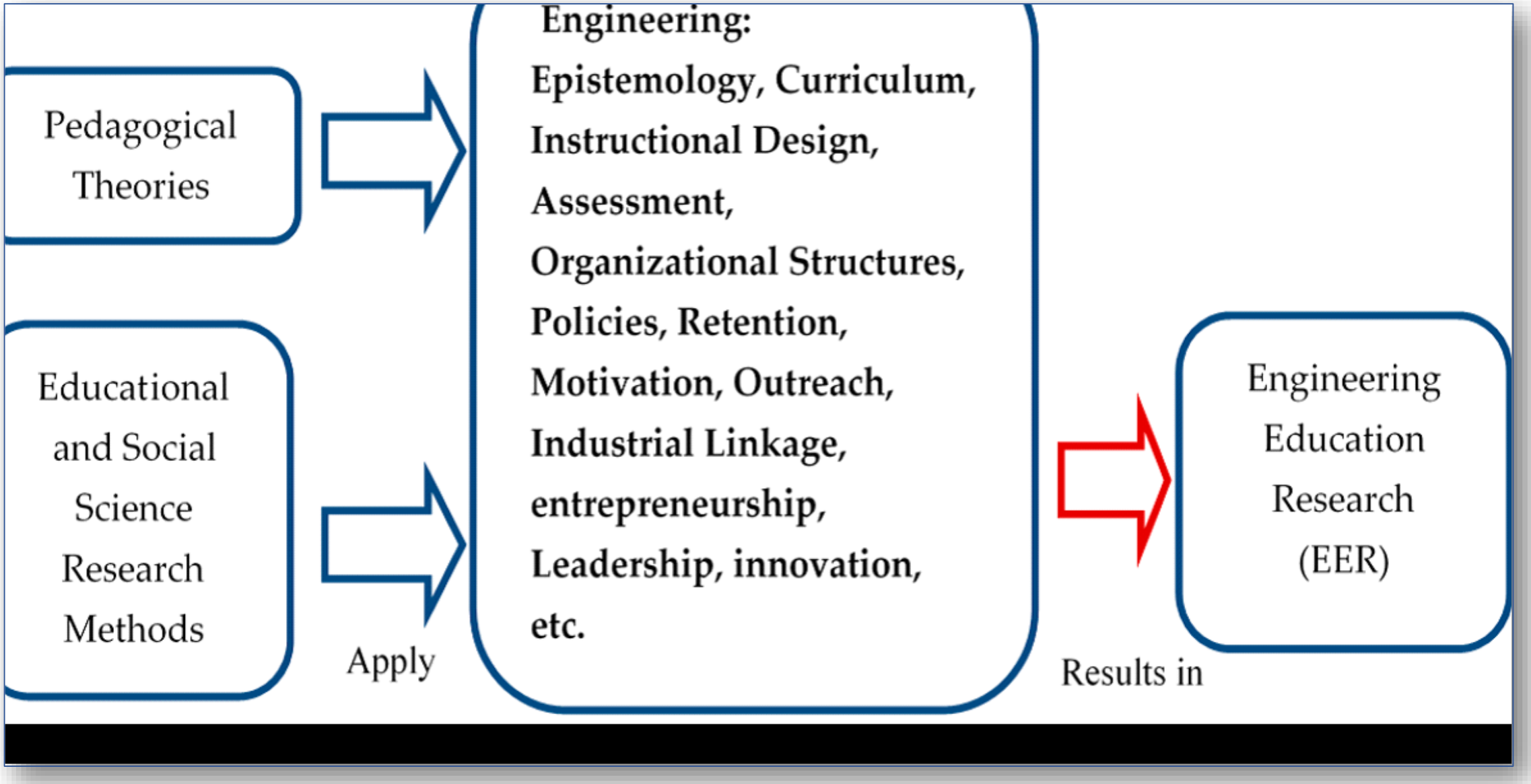
Engineering curriculum of 20th century no longer sufficient to address the engineering challenges of 21st century

- Competencies now needed:
  - Analytical thinking
  - Problem solving
  - Design

WHAT IS MISSING?

- Graduates Inability to Work Independently
- Low Critical and Analytical Thinking Skills
- Education and Skills Mismatch with Labour Market Needs
- Lag in Producing ***Resourceful*** Individuals

Training of Entrepreneur Engineers



Need for Organizational Entity in Engineering Schools for Driving Sustainable Development

- Technology Innovation and Engineering Education/Entrepreneurship (TIEE)
- Innovations to focus on two main pillars of sustainable developments:
  - Transformative engineering and technology human talent sustainable development
  - Technologies, products, services, innovations, and startups for shaping sustainable
  - Socio-economic development

LOCAL CONTENT ACT

Formulated to enhance local content in the oil and gas industry

- To develop **indigenous skills** across the value chain

OUTCOME OF LOCAL CONTENT ACT

Slight growth from 4% in local content to 15% in the last few years

Still has **not** fulfilled **the critical manpower needs** in the sector

CHALLENGES WITH LOCAL CONTENT ACT

Most universities train students without the required practice opportunities in appropriate industries

Difficult to get the best of professionals from Nigeria

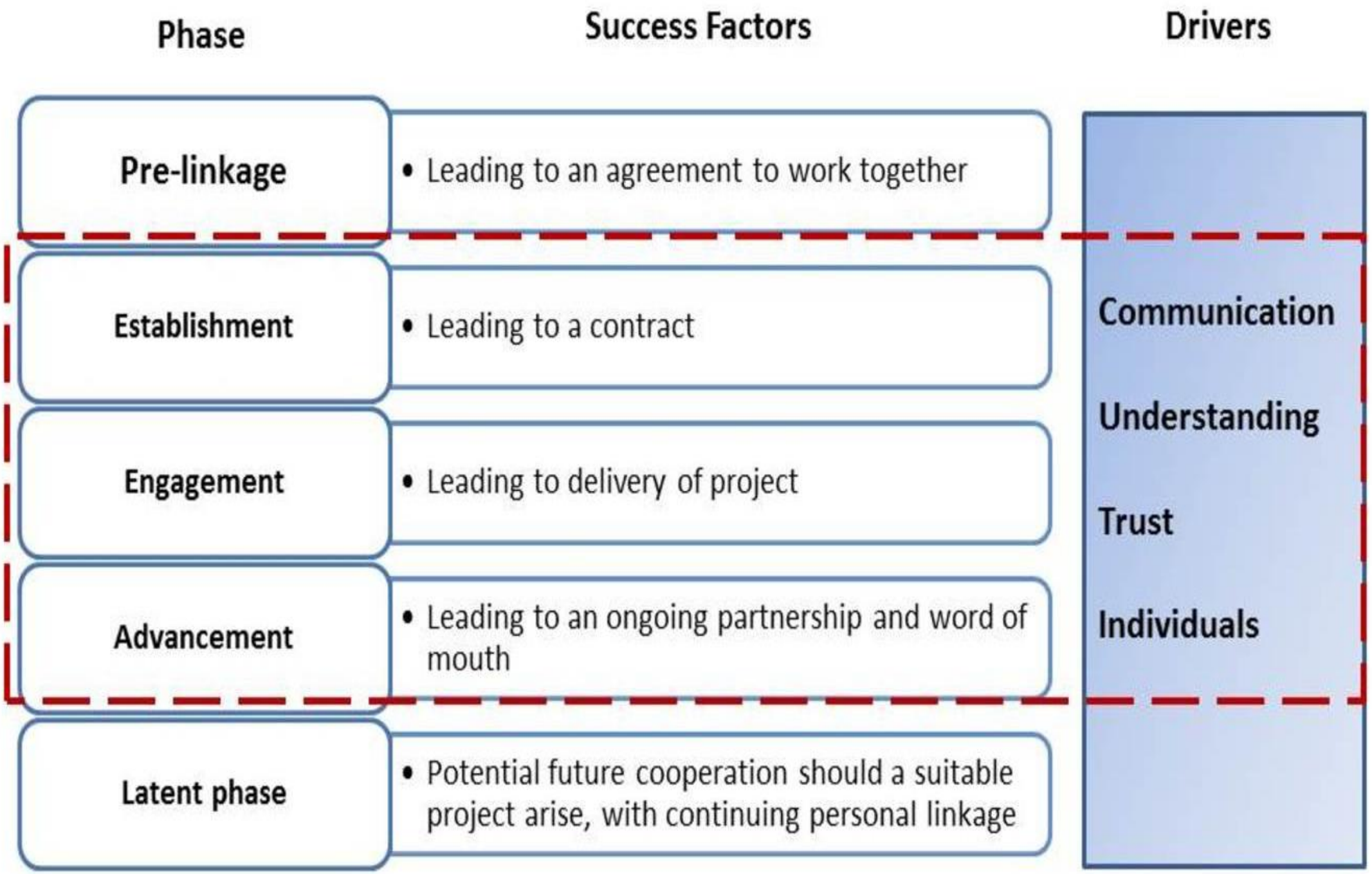
Dire need of Engineers with usable, practicable and modern skills to fill the spaces in the workforce

WHAT IS THE WAY FORWARD?

UNIVERSITY/INDUSTRY COLLABORATION:

BRIDGING THE VOID BETWEEN THEORY AND PRACTICE

Evolution of University-Industry Linkages



INDUSTRY INVOLVEMENT IN CURRICULUM DEVELOPMENT

REVAMPING OF EXISTING INTERNSHIP PROGRAMS

RESEARCH & DEVELOPMENT COLLABORATION

CSR-MOTIVATED DEVELOPMENT SCHEMES


Research Results
Meetings & Workshops
Pre-Competitive Technologies
Solution & Tools
UW Members
Vision
Industry Members
Problems & Challenges
Commercial Technologies
Support & Feedback
Practical Experiences

UNIVERSITY INDUSTRY COLLABORATION (UIC)

USA (EXTENSIVE)

- Successful Technological Innovation
- Huge Economic Growth

NIGERIA (MINIMAL)

- Token, Informal & Individual Efforts
- Negligible Technology Transfer
- Low Economic Growth

FORMS OF UIC

1. CURRICULUM DEVELOPMENT

- Course Planning, Design And Delivery
- Formal Members of Course Advisory Panels
- Encourage and Support inclusion of new areas of specialized skills
- Support Course Contents that are Relevant for Future Employment Prospects
- Ideas and Materials for Students' Projects
- Guest Lectures

2. REVAMPING OF EXISTING INTERNSHIP PROGRAMS

Students' Industrial Work Experience Scheme

(SIWES)

After more than **40 years** has not provided adequate avenues for acquisition of industrial skills and experience

CHALLENGES OF SIWES

Misplacements of Students

- Engineering student intern in for example a fashion house

Lack of Proper Supervision by the Institutions

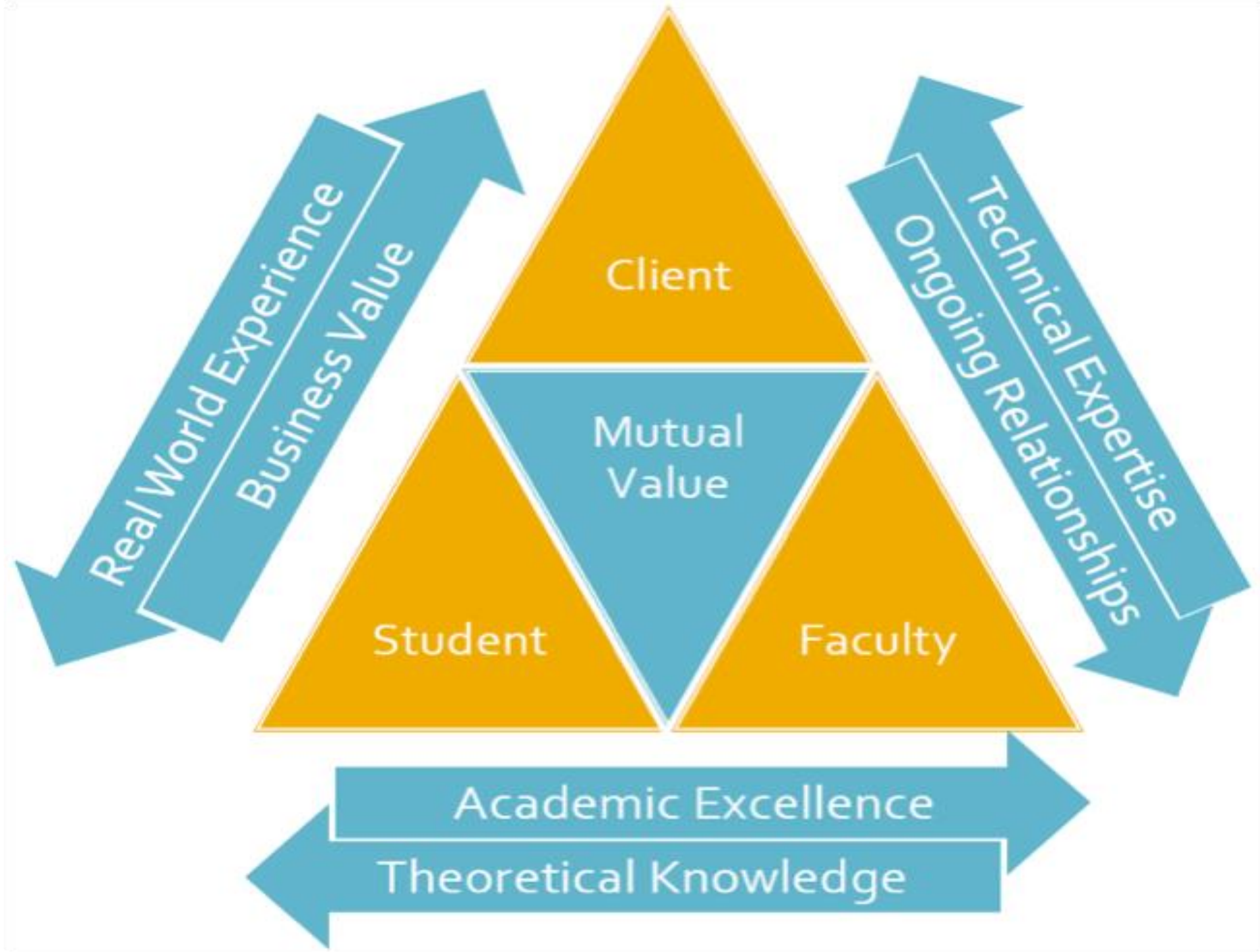
- Students just get logbooks signed off without working

Rejection of Interns

- Due to lack of suitable and sustainable UIC

Internship needs to be focused on hands-on skills on handling equipment and machinery

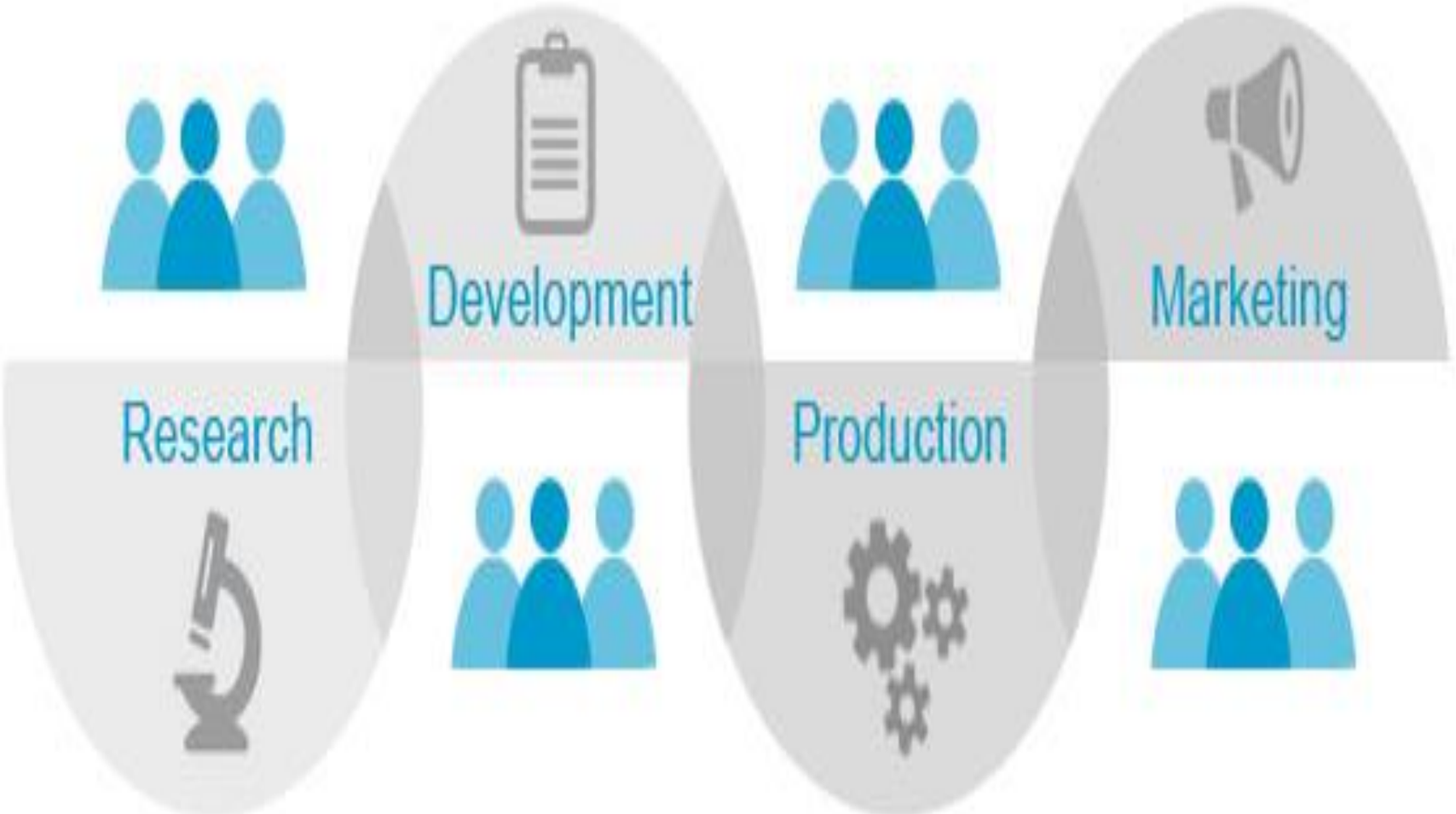
- Close monitoring by university staff and industry staff
- Alumni Support for Internship Placements
- Proper placement of students in industries with the right technologies


Client
Mutual Value
Student
Faculty
Real World Experience
Business Value
Technical Expertise
Ongoing Relationships
Academic Excellence
Theoretical Knowledge

3. RESEARCH & DEVELOPMENT COLLABORATION

R&D Collaboration requires a sustainable system

- University provides support and value for the business objectives of industries
- Industries in turn provide the universities with funding and market-tested skills transfer to help develop the students


Development
Marketing
Research
Production

Smart Aging Square

Local older adults

University faculties

Research

Develop-ment

Commer-cializing

Marketing

University students

Service providers

UIC: MOTIVATION FOR UNIVERSITIES

- Upgraded structures and grants for faculty members
- Spin-off companies that financially benefit researchers and university
- Enhancement of teaching
- Job offers for graduates
- Stimulation of entrepreneurial culture in the institution

UIC: MOTIVATION FOR INDUSTRIES

- Access to new ideas and technologies that create competitive advantage
- Reduction in R&D budget
- Access to highly specialized university facilities
- Access to research and consulting services of the university
- Improved public image
- Less hassle with graduate (ready-to-go) recruitment

KNOWLEDGE EXCHANGE PATHS IN INDUSTRY-UNIVERSITY COLLABORATION

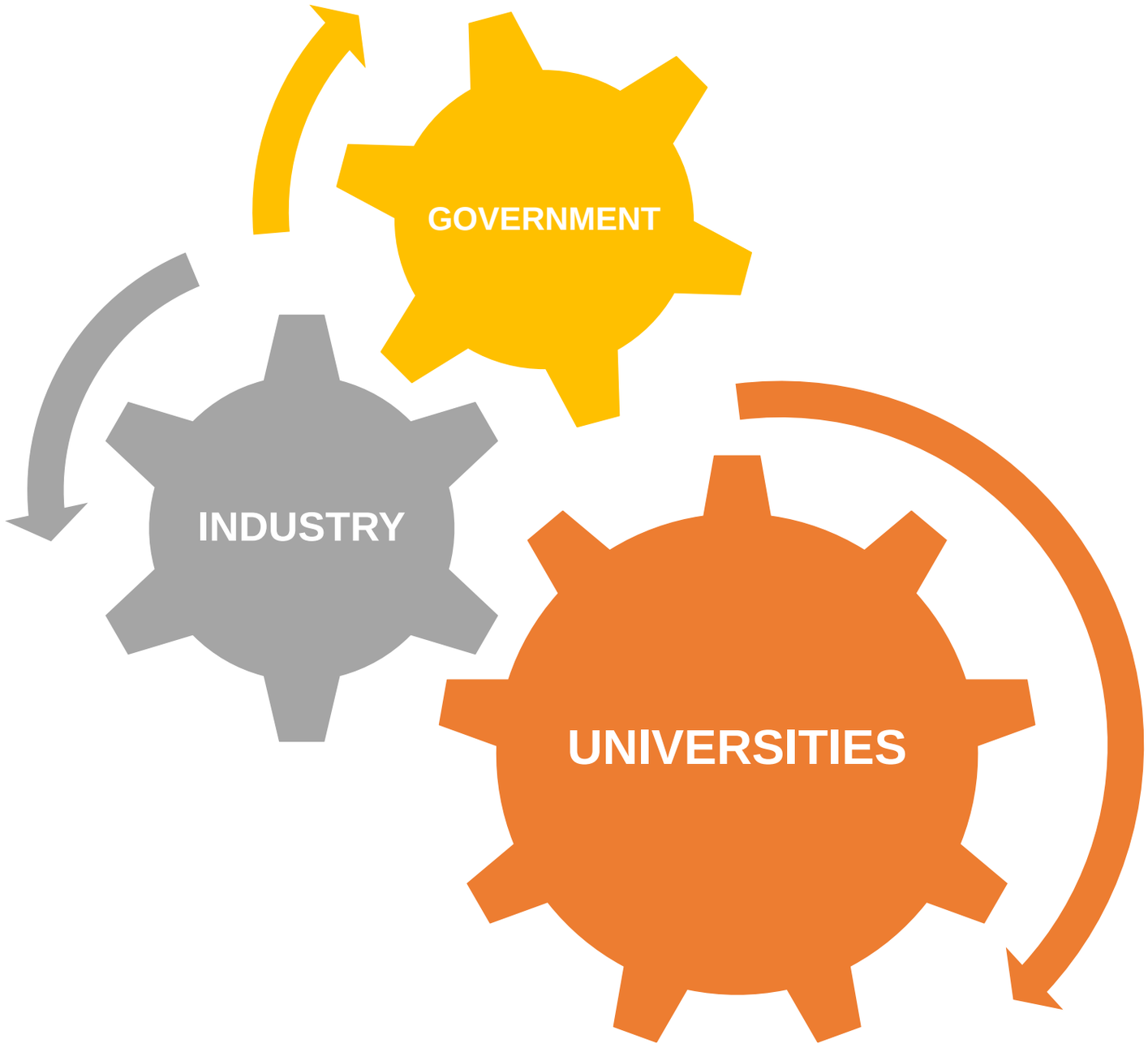
An effective communications framework can help bridge the gap between outcome and impact. It is important to have two-way knowledge transfer between the university researchers and the company's project manager (green arrows), as well as between the project manager and others in the company (blue arrows). In addition, the project manager should keep groups inside the company abreast of progress on the research collaboration, and inform the university team of ideas from the company regarding potential linkages to other company activities (orange arrows).

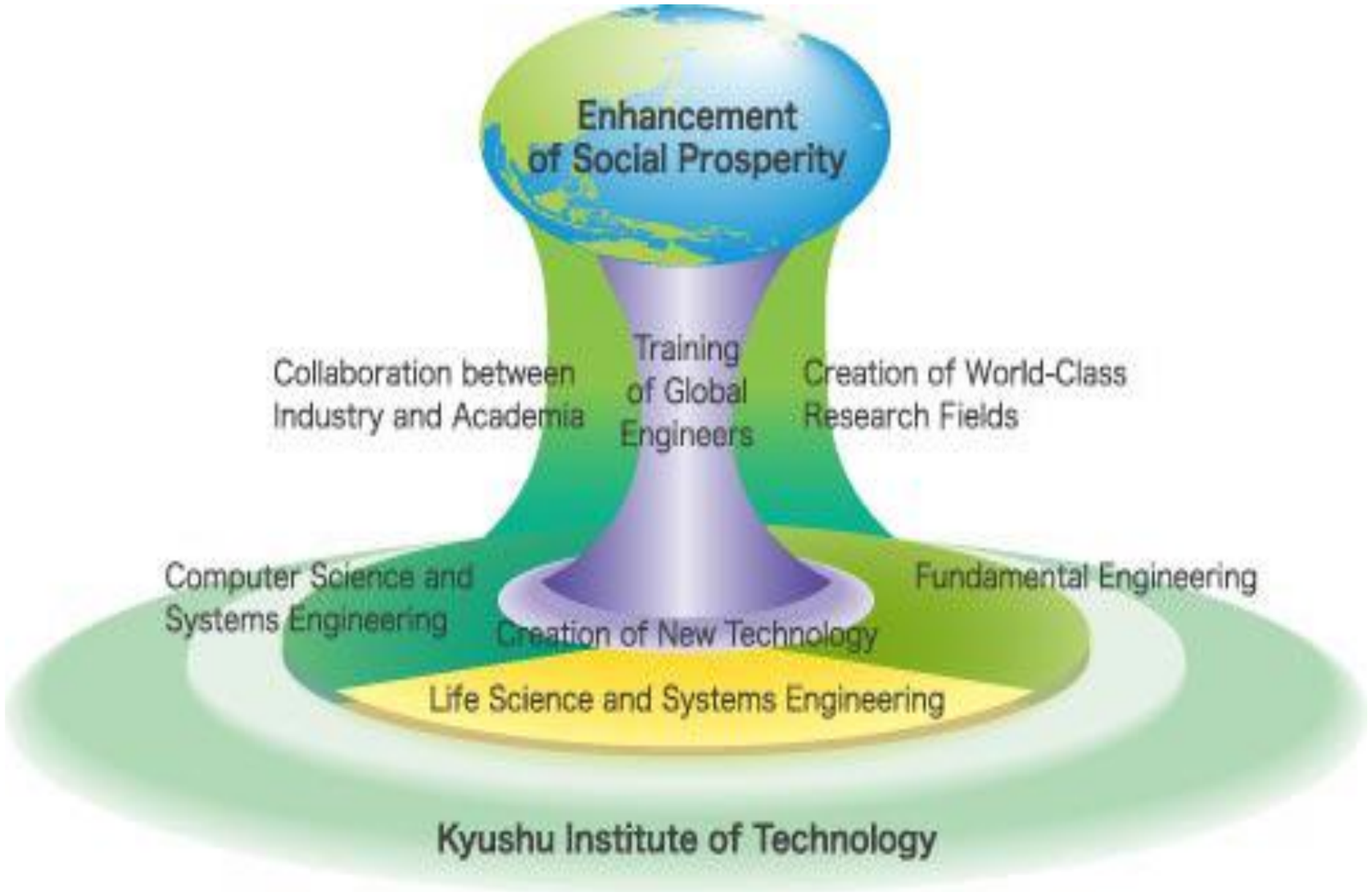
THE GOVERNMENT FACTOR

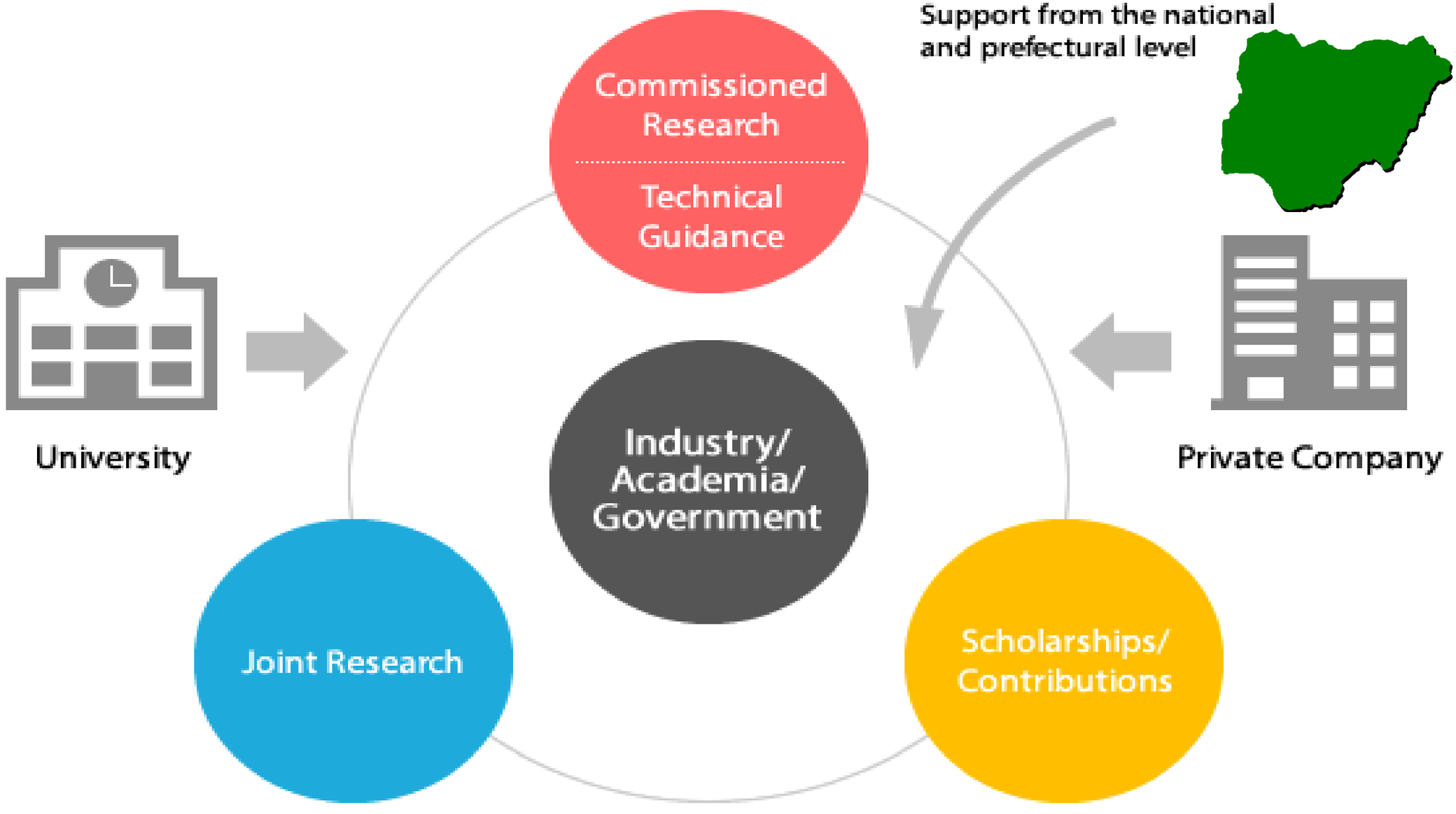
Policy formulations should encourage participating industries

- Tax credits
- Waivers
- Incentives
- Preference profiling on projects

THE MESH




Enhancement
of Social Prosperity
Collaboration between
Industry and Academia
Training
of Global
Engineers
Creation of World-Class
Research Fields
Computer Science and
Systems Engineering
Fundamental Engineering
Creation of New Technology
Life Science and Systems Engineering
Kyushu Institute of Technology

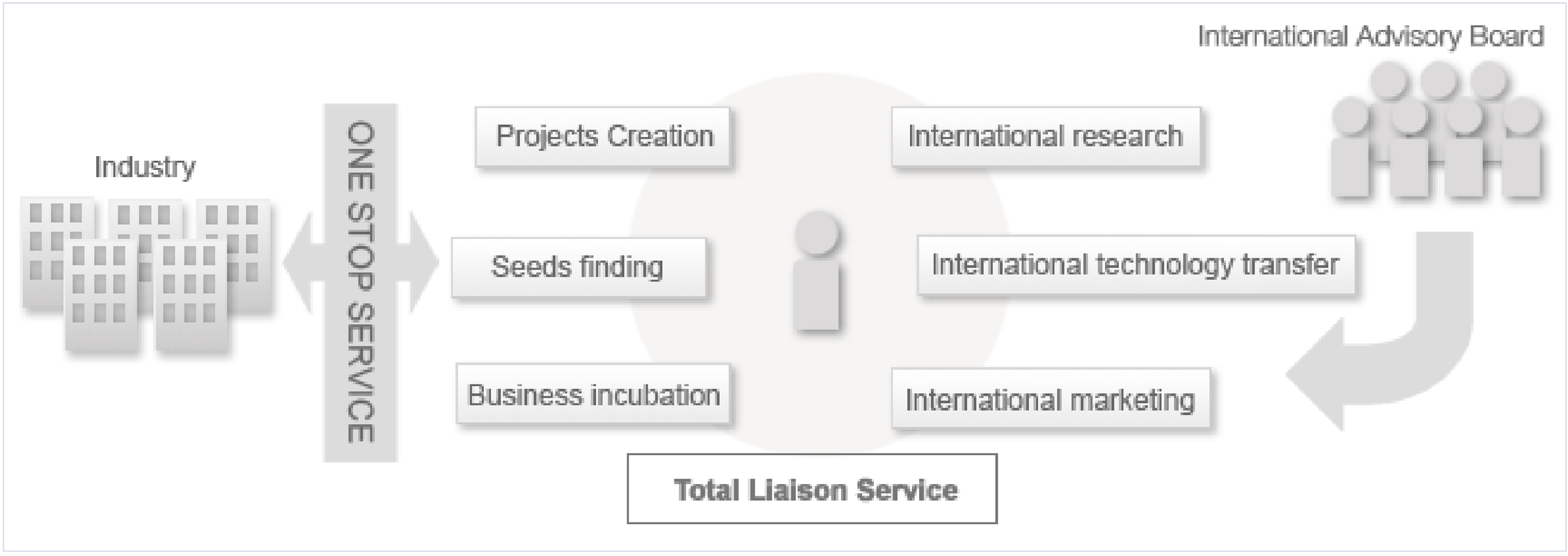

Support from the national
and prefectural level
Commissioned
Research
Technical
Guidance
University
Private Company
Industry/
Academia/
Government
Joint Research
Scholarships/
Contributions

4. CSR-MOTIVATED DEVELOPMENT SCHEMES

CSR projects that focus on undergraduate development schemes

- Crowd-Sourcing Program
  - Undergraduates develop solutions to typical industrial problems
- Innovative Projects Investment
  - Industries invest in the development of novel projects
- Scholarship
  - In specialized courses, e.g. Renewable Energy, Coating Inspection,

Global Approach



CASE STUDIES OF SUCCESSFUL PROGRAMS WORLDWIDE

UNIVERSITY OF Cincinnati

P&G

A collaborative effort that developed a center of expertise in computer simulation called the UC Simulation Center.

Procter & Gamble and the University of Cincinnati: UC Simulation Center

Opened Sept. 22, 2008

Currently staffed with nine students from UC's College of Engineering:

Has seed funding for two years from three different organizations within P&G

UC students work side by side with P&G engineers, providing them with unusual opportunity of developing industry-ready skills and capacities that are in hot demand

UC SANTA BARBARA
UNIVERSITY OF CALIFORNIA

DowMI
UC Santa Barbara

A $25 million annual investment by Dow Chemical Company at UC established the Dow Materials Institute (DowMI)

DOW Chemical Company and University of California, Santa Barbara

Researchers from across UCSB's Chemistry, Materials Science, and Engineering departments work on fundamental challenges to world problems that are of interest to industry and academia

Education and training of students and postdocs and their development in highly interdisciplinary, collaborative teams

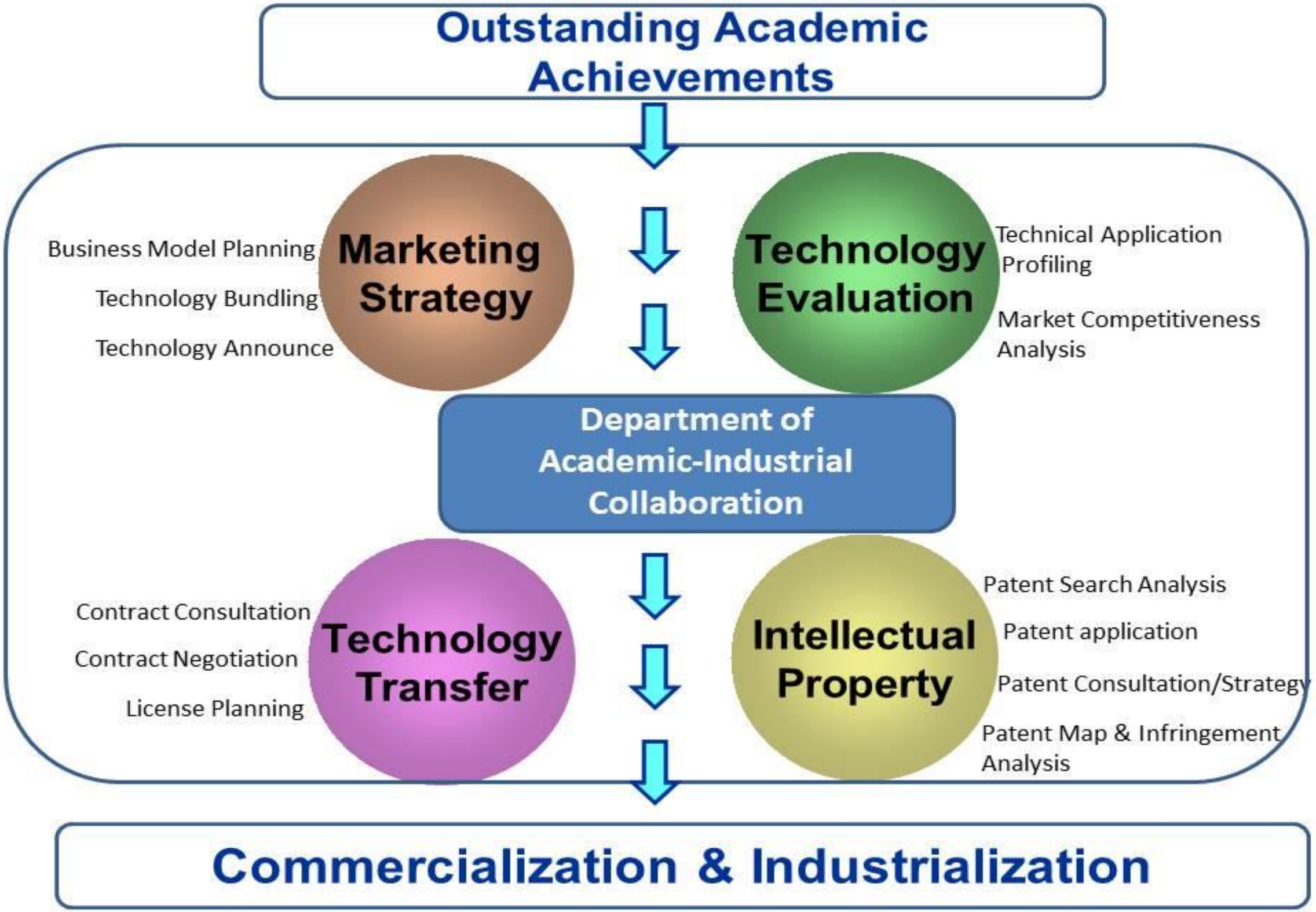
Students are prepared for careers in industry by instilling work practices and safety awareness levels consistent with those found in the private sector

DOW Chemical Company and University of California, Santa Barbara

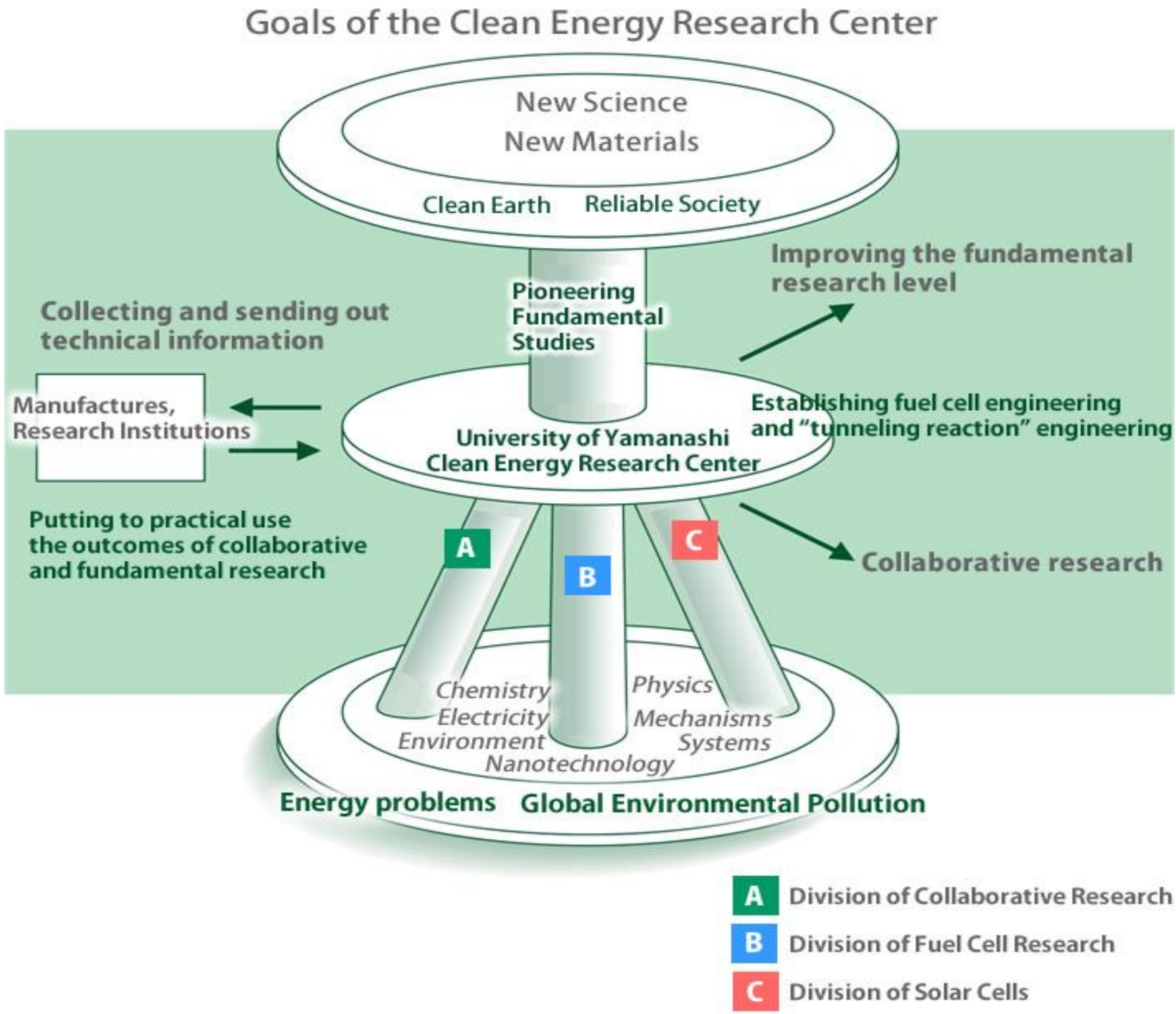
The Dow Discovery Fellowships for outstanding chemical engineering graduate students

Fosters a number of ties with students on campus through efforts such as the Dow-UCSB Safety Initiative

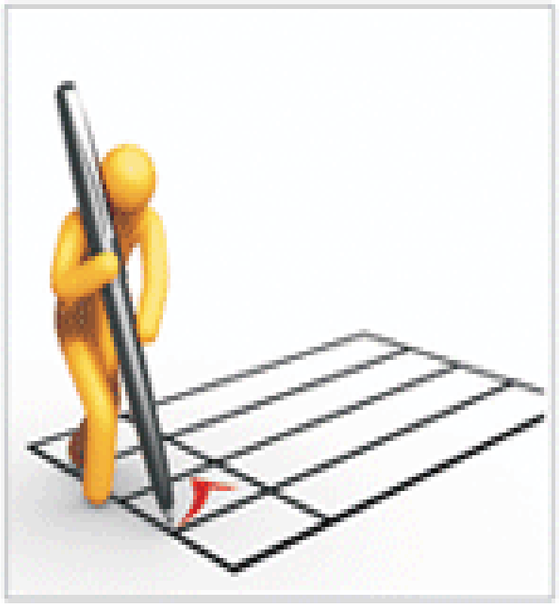
Engaging the campus' entrepreneurial community through its funding of an entrepreneurial program for UCSB students


Outstanding Academic Achievements
Business Model Planning
Technology Bundling
Technology Announce
Marketing Strategy
Technology Evaluation
Technical Application Profiling
Market Competitiveness Analysis
Department of Academic-Industrial Collaboration
Contract Consultation
Contract Negotiation
License Planning
Technology Transfer
Intellectual Property
Patent Search Analysis
Patent application
Patent Consultation/Strategy
Patent Map & Infringement Analysis
Commercialization & Industrialization

University of Yamanashi – Clean Energy Program



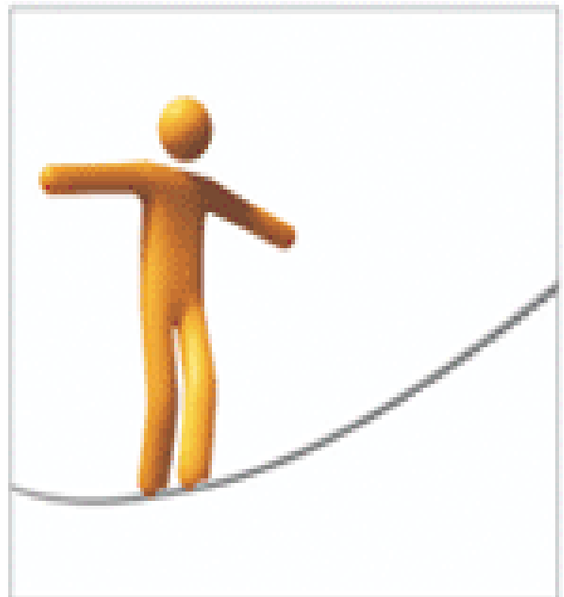
WRAP-UP



Let's **EDUCATE** our students for brilliant futures

Let's **PREPARE** our students for the industry

Let's **ENTHUSE** patriotic fervour & pride for our heritage in our students

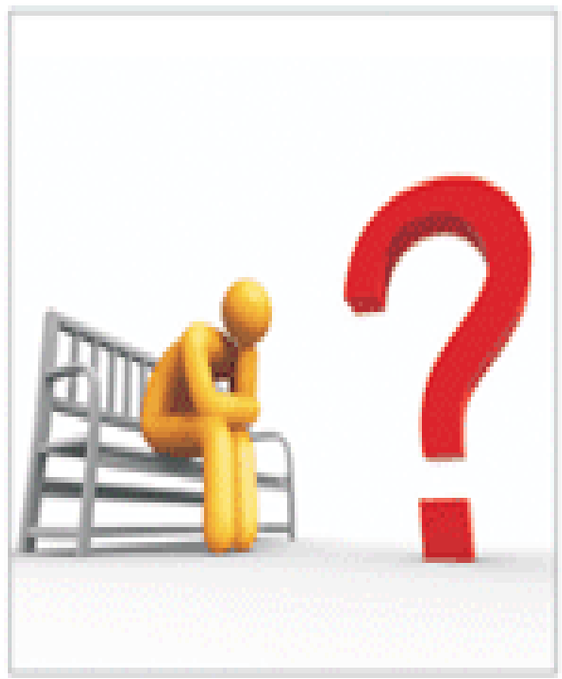


Let's **INSTIL** discipline, integrity and honesty in our students

Let's
EMPOWER
our students with great communication skills

Let's
INCULCATE
team spirit & camaraderie among our students

Let's
FOSTER
civic engagement in our students



Let's
ENCOURAGE
our students to think out of the box

Let's
STIMULATE
scholarly
energy and
diligence in our
students

Let's
TEACH
our students
to become
globally
competitive

Let's
INFUSE
leadership
skills in our
students

Let's
INGRAIN
spirit of
entrepreneur
among our
students

Thank you