

# 1. Construction of Academic Theory on “Module Science” Prof. Atsushi Masuda

Semiconductor modules are composed of ceramics, polymer films, and metals together with semiconductors. Those modules exposed outdoors such as solar cells are degraded by light irradiation, hygrothermal stress, high voltage, etc. accompanied with characteristic change in module materials. Chemical change in module materials occurs not only in the bulk but also at those interfaces. Therefore degradation phenomena are elucidated by microscopic analyses on interaction among module materials and also by various knowledges on material science and semiconductor physics. Novel academic theory on “module science” will be constructed in this study by sharing and arranging the obtained experimental results and accumulated knowledges.

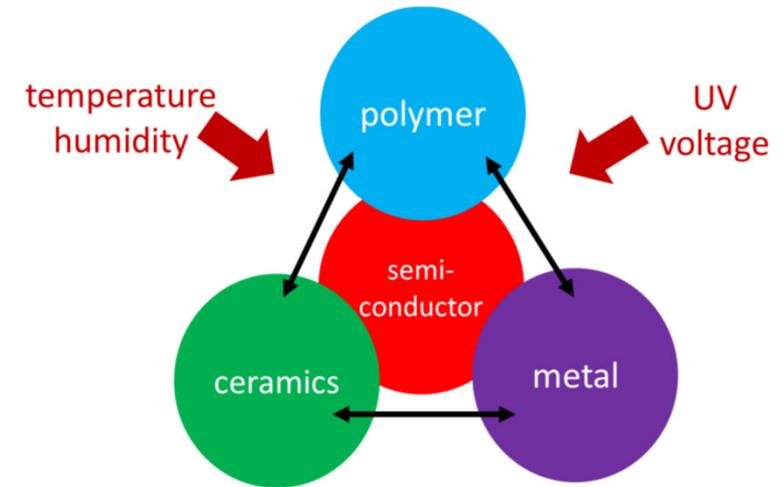


Fig. Concept of “module science”.

## Requirements for students:

- 1) Not only pursuing truth but also constructing novel academic theory.
- 2) Enough knowledges on solar cells and photovoltaics.
- 3) Various knowledges on material science, especially on polymers.
- 4) Taking classes in quantum mechanics, solid state physics, electronic materials, and electronic devices.
- 5) Having a good taste in experiments.

## Requirements for completion:

Presenting the research results in academic conference. Writing an academic paper is also welcomed.

**Others:** Those planning to pursue doctoral degree are welcomed.

## 2. Maximizing techniques for output yield of photovoltaics Prof. Atsushi Masuda

In order to maximize output yield of photovoltaics various indoor and outdoor tests will be performed. Four kinds of photovoltaic modules exposed at Kagoshima Prefecture are analyzed using photovoltaic performance data and weathering data. Change and degradation of module materials are also analyzed for photovoltaic modules exposed outdoors for a long time. Optimized semiconductor materials for absorption layer and photovoltaic module structures will be presented by those analyses. Coating techniques on the cover glass will be also developed for avoiding soiling and anti-reflection. Reliability for the coating is confirmed not only by outdoor exposure but also indoor acceleration test. Based on these experiments and analyses maximizing techniques for output yield of photovoltaics will be developed.



Fig. Photovoltaic modules (left), meteorological instruments (middle), and data acquisition systems (right) installed in Kagoshima Prefectural Institute of Industrial Technology.

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Nagao Masanobu laboratory (Place Branding, Relationship Marketing, Creating Shared Value)

This laboratory study about the following themes.

1. Place Branding
2. SDGs for Business Administration, Creating Shared Value
3. User Innovation

#### Place Branding

Branding is required not only in products but also in local areas. In this laboratory, the following research subjects on this theme are tackled.

- Inquiring Place Images
- Community Design
- Sense of Place and Developing Brand Contents
- Brand Communication

#### **【How to proceed with the project】**

- Project collaboration with local governments and local actors
- Local case studies or thematic consumer behavior studies

#### SDGs for Business Administration, Creating Shared Value

While the promotion of SDGs is advocated in the global scale, the coexistence of economic value and social value is required in all regions related to the business management such as technology strategy, marketing, organization strategy, and investor correspondence.

We explore the ways to balance social contribution and management.

#### **【How to proceed with the project】**

- Project collaboration with companies and/or public institutions
- Case studies or thematic consumer behavior studies

#### User Innovation

This is an era in which tangible needs are depleted. By repeating the exchange with the market, the challenge which uncovers the hidden needs which the customer and enterprise did not recognize is advanced.

This lab investigates the ideal way of the communication in order to receive the support from more people and the field making which deepens the relationship with the customer.

**【How to proceed with the project】**

- Project collaboration with companies
- Case studies or thematic consumer behavior studies

Reference

<https://www.eng.niigata-u.ac.jp/~nagao/en/>

# The Ideal Relationship between Science & Technology and Industries & societies in the Region

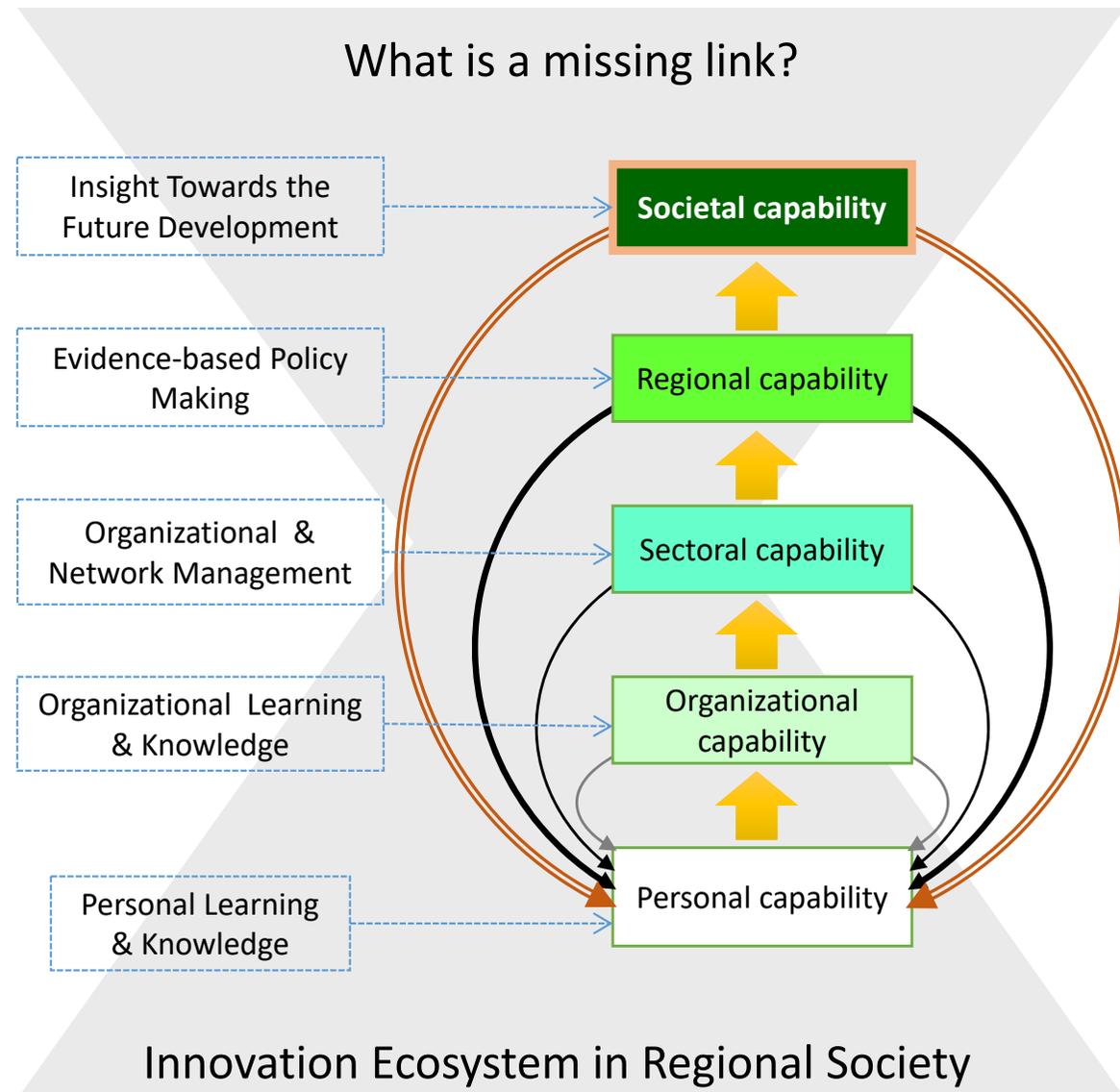
## -- Finding Missing Links for Innovation Ecosystem --

Associate professor Itaru KOURAKATA

Our society has various problems to be solved with autonomous and continuous creation of innovations; so called “innovation ecosystem in a regional society.” Realizing innovation ecosystem needs appropriate and reciprocal cooperation and competition, “coopetition”, between individual persons or organizations, industrial sectors, local or national governments, higher education institutes as a source of human resource and scientific knowledge, and implementation efforts based on science and technology. Uncountable policies and support activities by national and local governments for being “innovative” have been seen so far, however, we have never observed it took root in our society as a system. Therefore, we have to say there are still some “missing links” in the cooperation system mentioned above.

Perhaps this research them cannot leads to purely academic results, although, we will participate to real sectors, persons, organizations practically, applying participatory methods to find the missing links, make up probable proposals, and pursue implementation to build innovation ecosystem in a regional society.

Keywords;  
Innovation, Scientific Capability, Triple Helix, Human-resource Development, Co-op Education, Industry-Academia-Government Cooperation.



# 社会システム工学コース 2022 年度技術経営プロジェクトテーマ概要

## Research Topic for “Project Research in Social Systems Engineering”

担当教員： 准教授 東瀬 朗 ([tose \(at\) eng.niigata-u.ac.jp](mailto:tose@eng.niigata-u.ac.jp))

Advisor: Akira TOSE Ph.D. (Associate Professor)

### ■ 研究テーマ：安全文化診断を活用したハイリスク産業における安全管理体制構築と改善に関する研究

#### ■ 研究の目的と概要：

- 「安全文化診断」を活用し, 各事業所の安全意識を可視化した上で企業全体の安全管理体制の構築及び改善を行う
- 事故・トラブル・品質異常など企業にとって望ましくない事象と従業員の意識の関連を研究し, 未然防止ができる組織づくりを支援する
- 「望ましくない事象」につながる設備・技術面及び管理・運営面の不具合を早期検知するための手法を開発する

#### ■ Research topic:

Development and improvement of safety management systems in high-risk industries by utilizing Safety Culture Survey

#### ■ Objectives and outline:

Develop and improve the safety management system of the entire company by visualizing the safety awareness of each business site using the "Safety Culture Survey".

Study the relationship between the awareness of employees and undesirable events for the company, such as accidents, troubles, and quality abnormalities, and support the company to prevent undesirable events.

Develop methods for early detection of deficiencies in equipment, technology, management, and operations that lead to undesirable events.

### ■ **Practical research on global project-based learning with industrial collaboration dealt with global real-world problems.**

Keywords: Higher education (Global education, Engineering Education, Project-based learning, Cooperative education)

This is to engage in the development, practice, and empirical research of multicultural and multi-disciplinary team-based, project-based learning programs with industry-academia-community collaboration. This pedagogical methodology deals with a real-world problem regarding technology in the global society.

From the 2020 academic year onward, due to the impact of COVID-19, practical research of collaborative online international learning (COIL) has been conducted. COIL is a pedagogical method of team-based, project-based learning for multicultural students. In COIL, the students are required to make a group proposal for problem-solving in the global society, taking into account cultural, societal, and ethical differences between countries.

The practical research has been conducted mainly through the G-DORM [Global Dormitory] project that is managed by the Faculty of Engineering, Niigata University.

Please refer to the website of G-DORM (<https://www.eng.niigata-u.ac.jp/~g-dorm/>).

### ■ **Practical Research on Sustainable Development (SD) and Capacity Building towards SD in Developing Countries and Disaster-Affected Areas.**

Keywords: Social Systems Engineering (Community Development, Disaster Risk Reduction and Recovery)

This is to engage in practical research on community development, disaster risk reduction (DRR), and recovery for sustainable development (SD) as well as on capacity building (for organizations and personnel) towards SD through industry-academia-community collaboration. The research targets grass-roots cases in Japan and abroad, including developing countries and disaster-affected areas. A new topic focusing in recent years is fundraising, which is essential for the management of community and nonprofit organizations. Any researches mentioned above are focused on collaboration (networking) with diverse entities, which is the key to SD.

#### To Motivated Students:

- All of the above cases become practical research (action research) that requires conducting surveys of participatory observation, questionnaires, or interviews and making a proposal for problem-solving or improvement through fieldwork or internships at a company, NPO/NGO, and so.
- Since there may be restrictions on practical research due to social conditions or the circumstances of the field site or internship site, the specific content will be decided through consultation.
- You can consult if there are any other related topics that you would like to work on. Please refer to the following URL about research achievements.  
[http://researchers.adm.niigata-u.ac.jp/html/200001183\\_en.html](http://researchers.adm.niigata-u.ac.jp/html/200001183_en.html)
- Students who are positive to make a presentation at academic conferences, especially international academic conferences are welcomed.