ĐẠI HỌC
BÁCH KHOA HÀ NỘI
HANOI UNIVERSITY
OF SCIENCE AND TECHNOLOGY

BUILDING EXCELLENT RESEARCH GROUPS IN FUNDAMENTAL MATERIALS SCIENCE: EXPERIENCES, OPPORTUNITIES, AND CHALLENGES

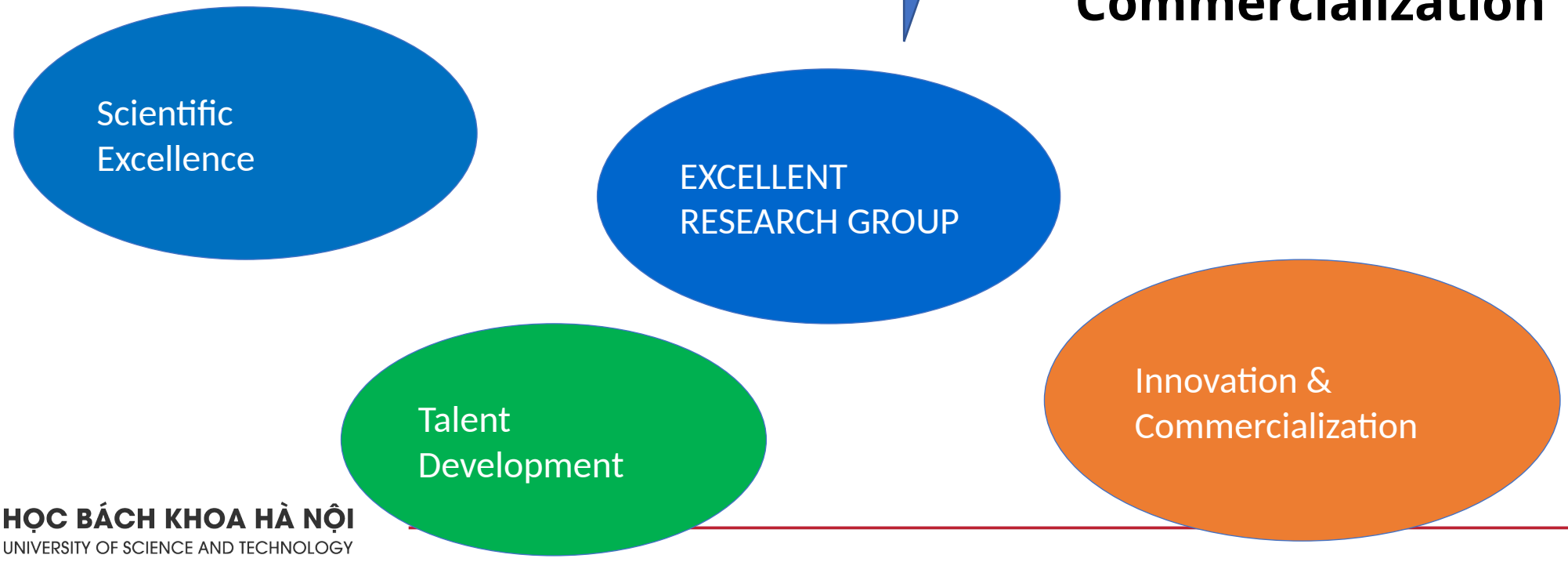
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ONE LOVE. ONE FUTURE.

WHY EXCELLENT RESEARCH GROUP?

An excellent research group serves three interconnected missions:

- ❖ Creating Knowledge
- ❖ Developing Talent
- ❖ Generating Societal Impact



- 🔬 **Publications & Research Excellence**
- 🎓 **Graduate Education & Capacity Building**
- 🚀 **Technology Transfer & Commercialization**

KEY INDICATORS OF EXCELLENT RESEARCH GROUP?

Excellence Dimension	Evidence
Vision & Leadership	Strong PI-led research strategy
Publications	International SCI/SCIE papers
Talent Development	MSc, PhD, and young researcher training
Funding	National, international, and industrial projects
Innovation	Sensor technologies and smart devices
Collaboration	International partnerships
Societal Impact	Technology transfer and real-world applications

SMART SENSORS AND DEVICES LABORATORY (SSD Lab)

https://smartsensors.vn

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SmartSens & Dev Lab

SMART SENSORS AND DEVICES LABORATORY- ITIMS

Thinking – Inventing – Creating



SMART SENSORS AND DEVICES LABORATORY (SSD Lab)

Example of an "Excellent" Research Group

- **Motto in English**: Thinking – Inventing – Creating
- **Research Vision & Strengths:** Advanced smart sensors, devices, nanomaterials, AI-enabled sensing systems
- **Research Areas:** Gas Sensors; Biosensors; Optical & Thermal Sensors; Flexible Sensors; MEMS; AI Sensor Systems

RESEARCH TEAM & LEADERSHIP

School of Materials Science and Engineering | Hanoi University of Science and Technology

Key members

SSD LAB TEAM



Prof. Nguyen Duc Hoa
Lab Head



Dang Thi Thanh Le



Nguyen Van Duy



Chu Manh Hung



Nguyen Van Toan



Chu Thi Xuan

INTERNATIONAL RESEARCH PARTNERS



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Jian Zhen Ou
RMIT University, Australia

IS SSD LAB IS AN “EXCELLENT” RESEARCH GROUP?

Why SSD Lab is an Excellent Research Group

- *Clear research focus*
- *Strong scientific leadership*
- *Internationally recognized publications*
- *Technology-oriented innovation*
- *Industry and societal relevance*
- *Talent development and research training*

High-Impact Research Areas

- *Ultra-sensitive gas sensors*
- *Biosensors and healthcare diagnostics*
- *MEMS-based sensing devices*
- *Flexible and wearable sensors*
- *AI-enabled smart sensing systems*
- *Advanced nanomaterials and 2D materials*

International Publications

Strong publication record in leading journals:

- *ACS Applied Nano Materials*
- *Chemical Engineering Journal*
- *The Journal of Physical Chemistry C*
- *Sensors and Actuators B: Chemical*
- *Journal of Hazardous Materials*
- *International Journal of Hydrogen Energy*
- *Journal of Science: Advanced Materials and Devices*
- *Advanced Functional Materials*

Key members SSD Lab’s have:

>15 patents
***>** 8,000 citations*
> H-index: 50
>100 papers with at least 10 citations

Lab fundings (in 5 years):

- *Lab: 1.8 Million USD*
- *Research funding: 3 million USD*

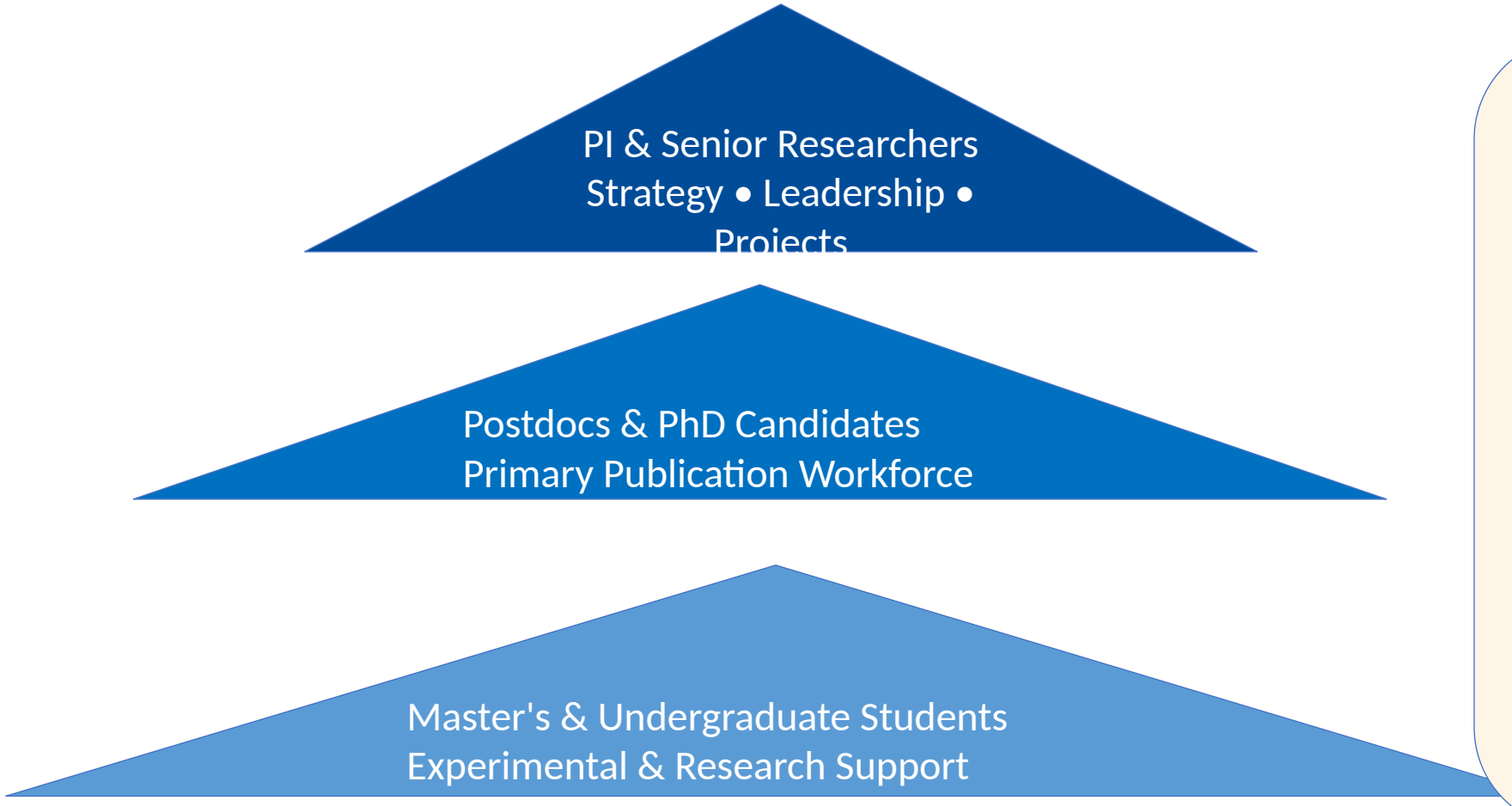
FOUR CORE LESSONS: BUILDING & DEVELOPING EXCELLENT RESEARCH GROUP

ROLE OF THE PRINCIPAL INVESTIGATOR (PI)

- Attracts talent and inspires scientific excellence
- Sets long-term academic goals and embraces scientific risks
- Connects national and international funding resources

DEFINING THE CORE RESEARCH AXIS

- Focus on 1–2 flagship research challenges
- Avoid fragmented investments
- Align internal strengths with global technology trends



RESEARCH CULTURE

- Regular scientific seminars (weekly/monthly)
- Research progress sharing
- Peer review and constructive feedback
- Scientific writing & presentation training

Excellent research groups thrive on a strong talent pipeline and a culture of continuous scientific exchange.

LESSON 2: ORGANIZATIONAL STRUCTURE

EXPERIENCES

Principal Investigator (PI) & Senior Researchers

- **Define strategic research directions**
- **Lead major research projects and collaborations**
- **Secure funding and resources**
- **Mentor the next generation of researchers**

Postdoctoral Researchers & PhD Candidates

- Main driving force behind scientific publications
- Conduct advanced research and innovation activities
- Lead experiments and data analysis
- Contribute significantly to international collaborations

Master's Students & Undergraduate Students

- Support experimental and research activities
- Participate in projects and laboratory work
- Develop research skills and academic competencies
- Form the future talent pipeline of the research group

Excellent research groups are not built solely on brilliant individuals, but on a well-structured talent pipeline and a vibrant culture of continuous learning and scientific exchange.

🏛 **Research Culture That Sustains Excellence**

Regular Scientific Seminars

•Weekly or monthly research seminars

•Sharing research progress and new findings

•Exposure to emerging technologies and global trends





Peer Review & Academic Skill Development

•Internal peer-review and constructive feedback

•Training in scientific writing and publishing

•Presentation and communication skill enhancement

•Fostering critical thinking and academic integrity

ENSURING SUSTAINABLE OPERATIONAL RESOURCES

🏛 National & International Research Funds

NAFOSTED (National Foundation for Science and Technology Development)

Bilateral and international collaborative research programs

VinIF Foundation Competitive research grants

🏛 Government & Institutional Projects

- Ministerial-level research projects
- Provincial-level research programs
- Strategic missions and initiatives of the university

🏭 Industry-Funded R&D Collaboration

- Technical consulting services
- Technology transfer agreements
- Research and development partnerships
- Science and technology service activities

Do not rely solely on recurrent institutional funding. Actively commercialize research outcomes and diversify funding sources to achieve long-term sustainability.

International Collaboration

Strengthening Global Research Networks

- Co-author publications with leading professors and internationally recognized research groups.
- Participate in international research consortia and collaborative projects.
- Expand academic visibility and global partnerships.

Access to World-Class Research Infrastructure

- Utilize advanced laboratories, facilities, and research platforms.
- Enhance research quality and competitiveness.
- Improve scientific impact through higher citation counts and stronger research profiles (H-index, citations).

Academic Integrity

Standardizing Research Data

- Ensure transparency, reproducibility, and reliability of experimental data.
- Follow international standards for data management and reporting.
- Promote responsible and ethical research practices.

Maintaining Publication Quality

- Say **NO** to predatory journals and low-quality publication outlets.
- Prioritize reputable journals indexed in Web of Science and Scopus.
- Uphold the highest standards of scientific ethics and publication integrity.

BUILDING EXCELLENT RESEARCH GROUP

1. Attracting and Retaining Scientific Talent

- Limited competitive salaries and research incentives
- Brain drain and difficulties attracting international researchers
- Insufficient support for young scientists and postdoctoral researchers

2. Developing Research Capacity

- Inadequate research infrastructure and sustainable funding
- Heavy teaching and administrative workloads
- Limited opportunities for interdisciplinary and international collaboration

3. Building a Sustainable Research Ecosystem

- Lack of long-term research strategies and institutional autonomy
- Limited industry–academia collaboration
- Insufficient incentives for scientific excellence, innovation, and technology transfer

Building scientific excellence requires not only talented researchers, but also sustained investment, institutional autonomy, and a supportive research ecosystem.

1. Strong National Policy Support

- Science, technology, and innovation as national priorities
- Increasing investment in research and strategic technologies
- Greater institutional autonomy and research incentives

2. Developing and Attracting Scientific Talent

- Growing pool of young, highly motivated researchers
- Opportunities to attract overseas Vietnamese and international scientists
- Expanding PhD, postdoctoral, and international exchange programs

3. Strengthening Research Ecosystems

- Expanding international research collaboration and funding
- Growing industry demand for advanced technologies and innovation
- Opportunities for interdisciplinary research, technology transfer, and commercialization

Vietnam has a unique opportunity to transform strong national commitment, young scientific talent, and international partnerships into world-class research capacity.

CONCLUSION: TOWARD CENTERS OF RESEARCH EXCELLENCE

- Building internationally recognized research groups
- Expanding global research collaboration networks
- Driving innovation, technology transfer, and societal impact
- Strengthening institutional research capacity and competitiveness

"Strong research groups are the key to enhancing academic reputation and achieving sustainable university autonomy."

🔓 1. Empower Research Groups with Greater Autonomy

Provide greater decision-making authority over:

- Human resource recruitment and management
- Research funding allocation and utilization (long term)
- Laboratory infrastructure and equipment development

⚙ 2. Reduce Administrative Burdens

Streamline research management procedures by:

- Simplifying financial reporting and reimbursement processes
- Reducing unnecessary administrative requirements
- Accelerating project implementation and resource utilization

🏆 3. Introduce Breakthrough Incentive Mechanisms

Strengthen recognition and rewards through:

- Performance-based rewards for high-quality publications
- Competitive incentives for patents and technology transfer
- Reduced teaching loads for key researchers and research leaders

Excellent research groups require not only talented researchers, but also enabling policies that foster autonomy, efficiency, and academic excellence.

Thanks for Your Attention!

Excellent research groups are not built overnight.

They require visionary leadership, talented people, sustainable resources, international collaboration, and an unwavering commitment to academic excellence.