

The Next-Wave Technology

A Mini-Workshop for Senior Students

- Class Website:** <http://newslab.csie.ntu.edu.tw/course/NWT>
Class Hour: Monday 18:00 - 20:00 and Friday 09:30 - 11:30, 2 classes per week
Class Size: Active participants 20 graduate or senior students, unlimited auditors.
Lecture Room: Room 310, CSIE Building
Requirement: This is an intense mini workshop. We do not have too many lessons but lots of discussions. You must be willing to work hard as a team and openly express your ideas.
- Instructor:** Prof. Chi-Sheng Shih (cshih@csie.ntu.edu.tw)
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Motivation and Background

Taiwan's manufacture industries have been the Original Equipment Manufacturer (OEM) and Original Design Manufacturer (ODM) center for various goods in the world for several decades. To maintain the momentum of Taiwan's economics, Taiwan's industries have to migrate from OEM, to ODM, and to Intellectual Property Creator (IPC). The creation of a workforce skilled in creative team work is a key ingredient for the successful transition.

Unfortunately, Taiwan's students do not receive systematic training on creative team work process. Hence, the goal of the mini-workshop *The Next-Wave Technology* is to help the attendants to practice the process of creative thinking and team work. At the end of the mini-workshop, we expect the students to know how to build the process for creative and critical thinking and master the skills for bringing out the best from team members with different professional backgrounds.

Our approach is to use *Creative Thinking Process* to help attendants 1) genuinely appreciate each others' gifts and organize into highly productive research teams; and 2) creatively synthesize promising ideas into high impact projects. In this student centric approach, the advisor does not tell students *what-to-do* but assist them on acquire heuristic on *how-to-realize* their own ideas. Specifically, students will acquire skills on:

- How to design a team research project that will be an amplifier for everyone's creativity, and how to acknowledge everyone's contributions actively and fairly so as to sustain a high team spirit.
- How to develop leadership skills in a R&D environment, and a personal research agenda centered on the intersection of one's own interest, talent, team's goal and societal needs.

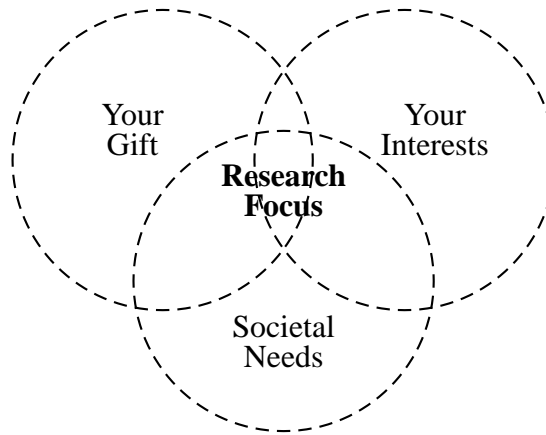


Figure 1: The trinity of finding your research focus

- How to systematically generate a family of promising research problems, identify the high impact ones, realizing them quickly, and present findings informatively, interestingly and insightfully.

The greatest expected result of each attendant is to acquire leadership and creativity skills will benefit them for life. Next will be technical results that might file a technical patent (intellectual property) or even start up a company. There are many creation contests and entrepreneurship contests held by organizations who want to find potential freshmen and good ideas. Applying our projects to these contests is also one of our goals.

Workshop Syllabus

The mini-workshop consists of eleven well-designed meetings. A series of classes are designed to help students know their gifts, build up the teams, find emerging trends, learn the systematic way for creative thinking, and realize the ideas from brainstorming.

The path to success consists of three simple elements. Find what interests you that you can do well, and is needed by the people.

Lui Sha

Meeting 0 Introduce Success Stories.

We will share several successful stories with attendants to let them know why we need to find the next-wave technology and inspire them joining this mini-workshop. The lecturer also introduces what are the basic elements of creativity, how to think creatively, and how to turn the spoon-feed learning into creation making.

The homework for this meeting is, for each student, to prepare a presentation for his/her background, research interests, award, etc. Each student will have a five-minutes presentation in the next meeting.

Meeting 1 Identify your gifts and know new friends.

The lecturer explains the *trinity of finding your research focus* as shown in Figure 1 to attendants. After that, each attendant is required to give a brief of himself/herself, including his/her background, interests, special awards, joined projects, and anything should be known by others.

Meeting 2 Form the team.

This is no lecture in this meeting Each attendant will do a second brief for himself/herself. Note that the brief should cover his/her gift, interests, believed societal needs, and the probably research focus. The research focus could be incoming crises, e.g., the energy crisis, which might evolve a new global trend. After all the presentations, attendants have to exchange ideas with all his/her classmates and find other three members to form a team before the end of this meeting. However, there is a restriction for team building that each team should include a member majoring in business or management.

Meeting 3 Why some of start-ups succeed and some of them fail?

Each team should prepare a real case of a well-known company/product/technology no matter it succeeded or failed. A presentation is given by each team for the introduction and analysis of success/failure.

Meeting 4 Each team presents two potential research topics.

Each team presents two representative candidates for their research topics. They should try hard to combine the potential and strength of each team member and then find the candidates which satisfy societal needs and global trends. After each presentation, discussion and feedback from other teams could improve the initial ideas.

Meeting 5 Experience creative process (I).

Each topic starts from a simple idea and then evolves into a holistic proposal, which opens a new horizon. We will examine this proposal in the following aspects:

- **Find killer applications:** We shall examine the proposal from the marketing perspective. Learn effective heuristics to find a killer application to help define the requirements and to drive the research.
- **Explore the design space and problem space:** One's past experiences and traditions in a field often lead one to overlook alternative problem formulations and to search only part of design space. Learn how to use the ensembles of group experiences, domestic and foreign perspectives, and inter-disciplinary approaches to create.
- **Analyze challenges:** Learn how to categorize the nature of challenges. Is it mainly a fundamental research problem, a technology integration problem, and implementation problem, or a knowledge/skill gap? Learn how to identify the distribution of problems across layers of abstractions and between the interfaces of components in architecture.
- **Identify high value problems:** Identify the problem with the highest ratio of impact/effort. Learn how to analyze the impacts of a proposed research topic and estimate expected efforts from team strength and obstacle analysis.

Meeting 6 Experience creative process (II).

Evaluate pros and cons of the proposed architecture.

- **Quality Attributes:** Analyze the proposed architecture from viewpoints such as interoperability, backward compatibility, performance, robustness, scalability, etc.
- **System Description Table:** We will analyze what are the trade-off, missing components, needed technologies, and research topics in the proposed architecture.
- **Block Diagram:** Each team should draw out the components of the proposed architecture to examine whether there are some important components missed or there is any un-reasonable design.

Meeting 7 Experience creative process (III) and midterm presentation.

Each team should decide which research topic will be the one to keep going. After a series of examinations and refinements, re-organize the proposal and present it in the meeting followed by a series of discussions to absorb more remarkable ideas for the proposal.

Meeting 8 Experience creative process (IV).

Having new inputs and feedbacks from previous meeting, each team refines its proposal and then present the proposal again since creativity includes a series of refinements. The proposal will end up not only for a research proposal, but also a new product line.

Meeting 9 Present final results.

We will invite Venture Capitalists and experts in related fields to review the result of each team, and give comments for each team.

Meeting 10 Conclude all the innovations.

The lecturer will lead attendants to review what are the important steps of developing creative thinking and how to think creatively in a systematic way. Then, conclude this workshop and discuss what attendants can do and plan to do in the next step. For example, they can use the result of this workshop to join competitions, establish companies to create new business with their proposal, etc. We expect that attendants can extend the results from this workshop and will use the acquire skills for their future endeavors.