

Portfolio Intelligence System for Process-Oriented Education for Graduate Students

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Abstract – Graduate education in professional school is highly expected to offer professional courses for the state-of-art knowledge and skills of fast developing fields. Because of the demand-supply gap of high professionals who can teach in school, we proposed and developed course management procedures based on portfolio system, KIT Portfolio Intelligence System, when we started a new program, Graduated Program in Intellectual Creation System in 2004. KIT Portfolio Intelligence System is described in details in the paper. Several years practice of the system at our graduate program and evaluation made by students used in the course suggests effectiveness in developing professional skills in short term.

Index Terms - Process oriented Education, Competency model on demand, Portfolio Intelligence, Action Learning, Carrier Development

INTRODUCTION

The use of portfolio in education has a long history starting from progressive education by J. Dewey. In 1950s there was the movement of essentialism in which discipline-centered curriculum was promoted. Major field where portfolio is applied has been curricula and assessment of development of children at lower levels of education. Recently portfolio evaluation procedure in academia, "Academic Portfolio", is proposed by P. Seldin and J. E. Miller. In this presentation we focus our attentions to the portfolio education system and practices in graduate and professional school.

It is a well-known that there is a huge demand-supply gap in professional education, especially in fast developing fields of business as well as science and technology. The cause of this gap is desperate shortage of teaching staffs in the fields. There exist many professionals in business or R&D front of industry sectors. They have no time to teach in school. One way to solve the problem is to provide an effective support mechanism for them to teach in school.

In the fast developing fields various disciplines are combined with each other and knowledge and skills need to be frequently updated. This implies the module-based education fits to professional education, in which various modules given by teachers with different disciplines are integrated to one course. The process of the experimental

learning that refers to Kolb model (Experimental Learning Model) is also used with the experience, the report and the reflection journal in course works and extracurricular activities.

KIT (Kanazawa Institute of Technology) is well-known in Japan to be aggressive to reform and refine its educational program. In 2004 KIT started a new program, Graduated Program in Intellectual Creation System, which provides course management procedures based on portfolio education system. To support this program we developed 'KIT Portfolio Intelligence System.' This system takes into account both classroom grades and extracurricular activities in the student evaluation. Individual interviews by professors enable mutual verification of their learning processes and results. The curricula of the course are module-based and adaptive to the student's final goal. The system makes possible systematic procedures for evaluating whole course activities step by step using competency models and the improvement (PDCA) cycles.

In graduate programs final evaluation are usually based on these, i.e., the final results of students' accomplishment. This is traditionally the case in Japan. The KIT Portfolio Intelligence, in contrast, focuses on quality evaluation processes that correspond to our professional education goal, in which we highly evaluate the process of understanding and gaining knowledge. Education based on the KIT Portfolio Intelligence is found out quite effective for both students and educators. The KIT Portfolio Intelligence has the following features:

- Graduate Student
 - Objective overall evaluations of students, including both their course works and extracurricular activities,
 - Important information is obtained to confirm and recognize content of knowledge mastered.
- Educational institution
 - Levels of graduate students' understanding can be grasped.
 - Achievement to the educational goal of graduate program can be clarified.

The KIT Portfolio Intelligence allows students not only to engage fully in research activities for one year but also to obtain the following information:

Systematizing process evaluation

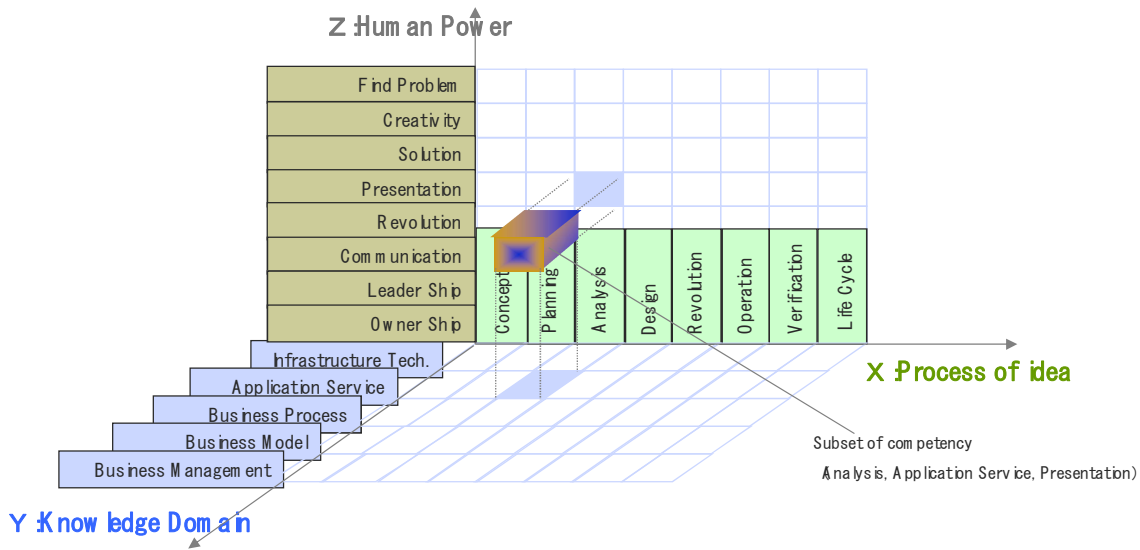


Fig. 1 Competency model on demand

- Acquiring business practice knowledge
- Sharing knowledge
- Systemizing knowledge

The practices in our graduate program suggest that the questions such as "How should students study?" and "How can graduate courses achieve their educational goal?" can be solved by Portfolio Intelligent System.

In this paper, Section 2 describes competency model on demand in portfolio intelligence. Section 3 describes portfolio intelligence file. Section 4 describes the action learning process and its implementation. Section 5 describes evaluation results obtained from the students who used the system in our graduate course.

COMPETENCY MODEL ON DEMAND

1. Cultivation for Human Resource Development (HRD)

The graduate program, i.e., Program in Intellectual Creation System, has a basic plan of Cultivation for Human Resource Development (HRD) (Fig. 1). Skill items to cultivate for HRD have been selected on the basis of education policy of the major.

- Power to create intellectual content
- Power to apply an idea to real world
- Power to manage and protect intellectual contents

HRD trains students to obtain fundamental "Power" not only ready to use in work but also as "core-competence" in life-long working and living skills.

Actual procedures of HRD in our program are as follows: At first, graduate students evaluate themselves to know the current level of "Powers" with EQ (Emotional Intelligence Quotient) test. Then, they select a set of the competency items from three domains, "Human power", "Knowledge domain", and "Process of idea" in order to fit the combination of them for their target in the graduate school (Figure.1). Through the procedures student targets are going to be clarified, and the competency registration model is to be constructed. Subset of competency shown in Figure 1

represents integrated feature of three items in different axis's. The strength and weakness of each student are easily recognized by using the combination of subsets during the self-analysis procedure. It also helps students to set their target of study.

Steps to proceed with above-mentioned HRD in our graduate course are as follows:

1. Teaching along educational targets.
 - To build registration models for competency.
 - To select and receive lectures in Tokyo Toranomon campus
2. Preparing a variety of syllabuses cooperatively created by professional faculty who collected widely from business world, academia and officialdom
 - Full-time professor who have expertise in specific academic field
 - Active visiting professors from business and legal communities
 - Periodical adjustment that aims to blend business practice into learned knowledge
3. Training of human power requested by intellectual creation society

Academic Planning Paper				200
NAME	Taro Kanazawa	NAME(kana)		
STUDENT ID	1001	Course	Business Architect	
Registered Year	April, 2008	Planned Grad. Date	March, 2009	
	GOAL		SUBJECT	
C O M M U N I T Y	1.Learning of the discovering the problem solved power by an investigation decides about a research task or an investigation theme in accordance with that, and an investigation and a study are executed independently, and announcing an outcome to the useful research paper I win newly or the research report put in order systematically together.		Subject of Study	
	2.Practicing knowledge and learning of the operation ability of foundation IT necessary for intellectual creation society		Research of Basic IT management	
	3.Learning of basic modal knowledge of intellectual properties		Research Theme	
	4.Learning of the ability to contrive a new business, understanding a basis of management.			
	5.Learning of the ability to do own inspection of the human power			
	6.Learning of the ability to do an external environment and an internal environment analysis by using a case study and the organization to which a graduate student belongs as a base material, specification—ize a basic strategy and develop a business plan and a marketing plan			
	7.Organization management of an enterprise, promotion of collaboration of a group work and a different group and learning of the skill ability of the project implementation or			

Fig. 2 Academic Planning Sheet

- Self-analysis by using EQ test
 - Practice of action learning
 - Evaluation of learning results using portfolio intelligence file
4. Enough support through communications tools
- Full access to lectures by video on demand and feedback communications systems

II. Academic Planning Sheet

Graduate student set their learning targets and register elective subjects. "Academic planning sheet" will be formed afterward, that describes the relation between learning targets and elective subjects (Figure.2).

PORTFOLIO INTELLIGENCE FILE

In this section, we briefly explain the way to compose portfolio intelligence file in our course. Graduate students attend to their master's seminars, research activities, and electives in which there are four phases, Motivation, Plan, Do, and Check, to form a cycle ("Grow-Up Cycle") of the flow ("MPDC") as shown in Figure 3. The graduate students write their summary that describes the knowledge domain, the process of idea, and the human power.

The ability to evaluate and reflect on study results is quite important because it enables to evolve at any time. The reflection in wider range during the practice of elective sometimes comes across a motivation of research activities. The portfolio summary is filled up as a result of this Grow

Up cycle. The research paper is also written in parallel. As for the portfolio intelligence file, it is the evidence of study in the postgraduate course at the same time though it is his or her individual artifact.

Figure 4 shows the study flow using the portfolio intelligence file mentioned above.

- ② Design of competency model
To develop the competency model, the registration planning and the target planning sheet are filled up through interviews with full-time professors.
- ② Periodic adjustments of teaching contents
Periodic adjustments of syllabuses and teaching contents are promoted with collaborative works between full-time professors and visiting professors.
- ② Lecture
Lectures are based on action learning methods and learning results of the electives and requisite subjects are evaluated jointly by students and visiting professors.
- ② Making portfolio intelligence file
Summary and accomplished goal sheet which are results of learned subjects are filed in the portfolio intelligence file.
- ② Evaluation of research paper and portfolio intelligence file
Professor guides and evaluate summary and accomplished goal sheet at any time, and assesses comprehensively research papers and portfolio intelligence files at the end.

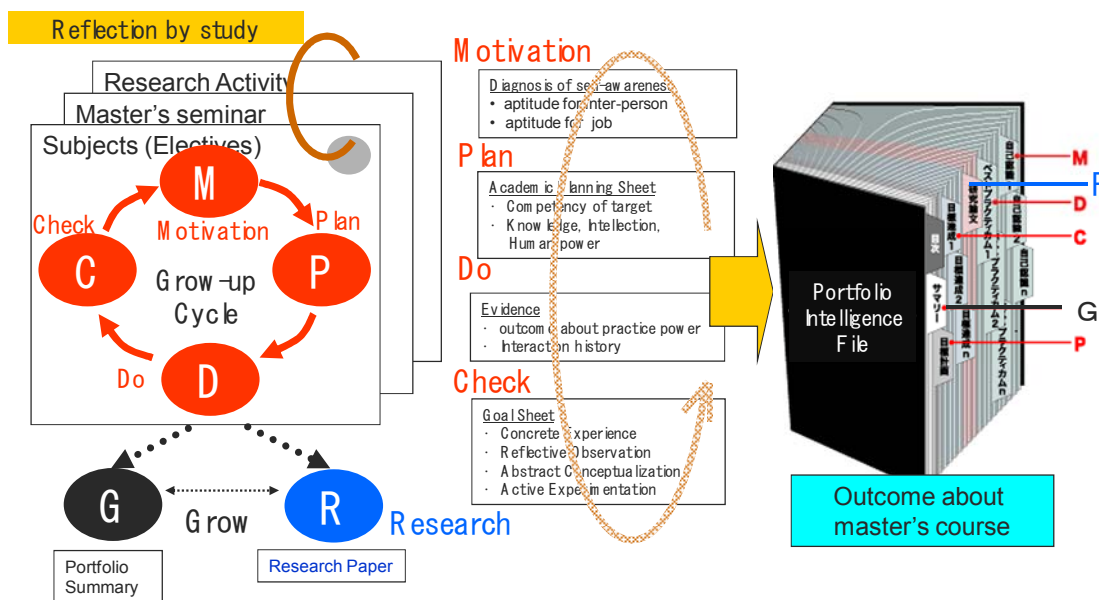


Fig.3 Portfolio Intelligence File

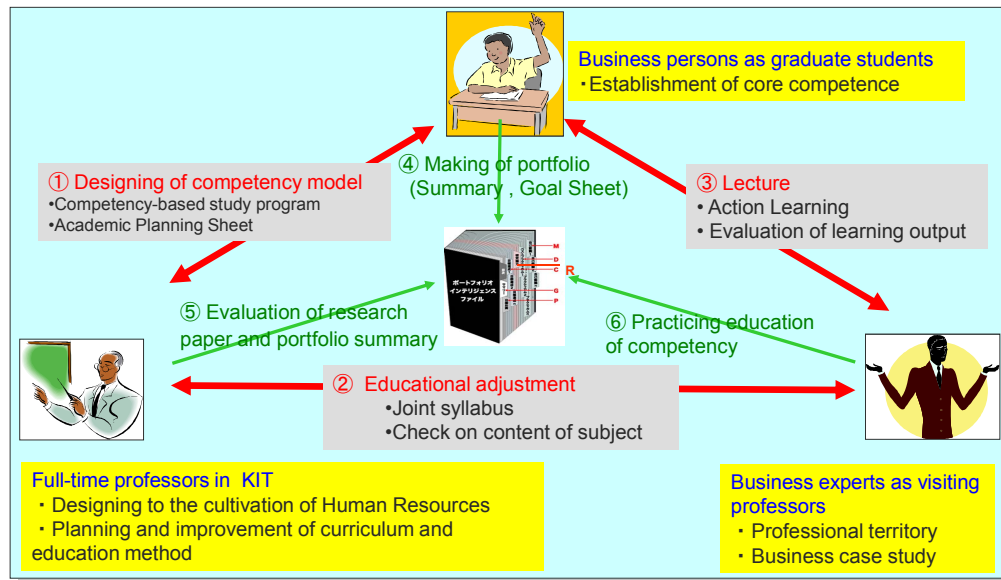


Fig. 4 Relation between portfolio education and learning environment

□ Practical guidance of competency

Practical guidance is provided by professors for establishing students' competency by using case study method.

To maintain these methods, it is important to put on the portfolio desk. The portfolio desk is composed of some professors and some staffs. It's available at any time as a chat channel for the graduate student's portfolio making.

Additionally, the portfolio education seminar is executed by portfolio desk for the graduate student over several-time a year. Moreover, the class questionnaires are collected, they are analyzed, and the portfolio system is improved by some request from graduate students and professors.

ACTION LEARNING PROCESS

I. Action Learning and Experimental Learning Method

Action Learning, originally introduced by R. W. Revans, is a well established program with excellent achievements in corporate trainings and corporate universities. We adopted this method in our system. The reasons are as follows:

- The development of EQ (Emotion Quotient) is enabled
- Correspondence to complication and environmental transformation of social programs
- Promotion of the talent who can accept change and study
- Needs for leader-ship promotion

In Figure 5 our action learning process is described. In our course, modular-based education has been adopted. In

addition, students are guided by the information clearly described in syllabuses in which "Educational methodology", "Material", and "Environment" are described. Processes of the experimental learning that refers to Kolb model are developed with the experience and the report during lectures. Here we describe the model used in our system

1. CE (Concrete Experience)

The competency model that students seek during the course of the experimental learning is going to be described clearly, and the evidences are also described. Concretely, subjective outcomes are filed by writing about the following points.

- Emotional state before experimental learning
- Conception for accomplishment of a goal
- Action for accomplishment of a goal
- Outcome of master skill and knowledge, etc.

2. RO(Reflective Observation)

The content of the experimental learning (CE) is going to be considered and understood from other people's views. Then student describes the results after the reconsideration. Concretely, an objective outcome obtained after the reconsideration of others' stand point is written about the following points.

- Consideration of other graduate student's opinion and team
- Consideration of teacher's opinion
- Reconsideration of outcome of CE

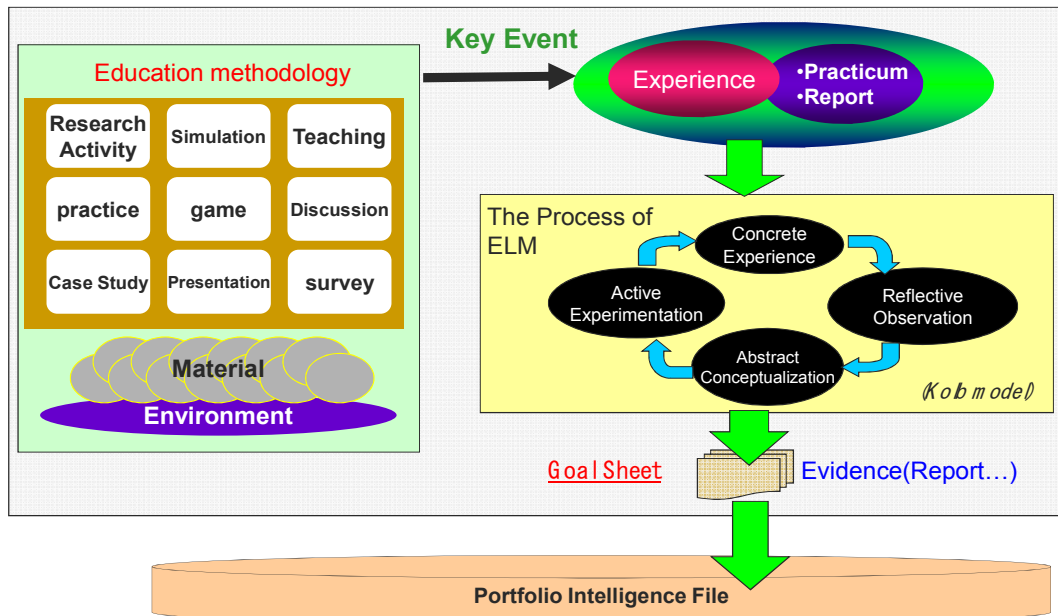


Fig. 5 Action Learning Process

3. AC (Abstract Conceptualization)

The reconsidered result (RO) has to be proven through an academic article and research. Objective ideas, abstracted ideas, and generalized ideas have to be written and checked. Students are encouraged to grasp essential points. Concretely, ideas derived have to be proven by reconsidering through investigation and research.

- The abstract concept is formed.
- To apply this outcome, generalization and formalization must be considered.
- Citation: At least two investigated articles have to be listed.

4. AE (Active Experimentation)

The results studied at the AC (Abstract Conceptualization) phase of experimental learning are applied to consider the next action planning.

- The plan applied to another theme is made by using the outcome achieved from the overall aspect. (Space axis)
- Consideration of application by life. (Time axis)
- In addition, skill or knowledge to be acquired.

The report that describes above-mentioned processes turns out the sheets about goal achievement and becomes the evidence which is stored in the portfolio intelligence file.

II. Component of evaluation for a goal sheet

Here processes of evaluating learning outputs are described.

1. Syllabuses jointly created are explained by professors and students fill up their academic planning sheets for the core competence achievement.

2. The portfolio file is created through action learning processes.

3. The portfolio evaluation report is written as the final evaluation by the professor through the open hearing and interview.

Evaluation baselines about portfolio intelligence are as follows.

(A) The student's portfolio intelligence file has to explain consistency about target, process of acquired abilities (accumulation of the evidence) and the coverage of goal sheet.

(B) Accumulation of evidence which results from learning processes, and research paper which is produced by master research show the depth and the value of the study of the master-level.

(C) "Awareness" to further upgrading and the extension of the self-realization is shown in some goal sheets.

As for (A) and (B), an integrated evaluation is done by the result of the portfolio intelligence file and the open hearing. Especially, the following questions are asked, "How did you study in graduate school?", "What did you acquire from the outcome?"

As for (C), it is an important factor with an influence in further growth after completing the graduate school, and the motivation for the self-improvement is confirmed and it refers to the evaluation about study.

EVALUATION

In order to evaluate how the system works effectively in our graduate program, we conducted a survey in the form of a questionnaire to our graduate students. There are thirty nine respondents to the questionnaire. The data is not enough to make statistical assessment, but we can see the student reactions to some extent. One of the results is shown in Fig. 6.

- To the question, "A prior explanation was enough", 15.4% of students answered "I think so". Positive response totaled 53.9%.
- About effectiveness of portfolio intelligence, the response, "I think so", totaled 30.8%. Including 38.5% of the response, "I think probably so", then 69.3% of students satisfied.

There are some comments from the student as follows;

- Advantage:
 - The experience was easily arranged.
 - The purpose and the current state became clear.
 - Looking back easily during study.
- Disadvantage:
 - Need careful security consideration.
 - Need to unify guidance methods among teachers and staffs.

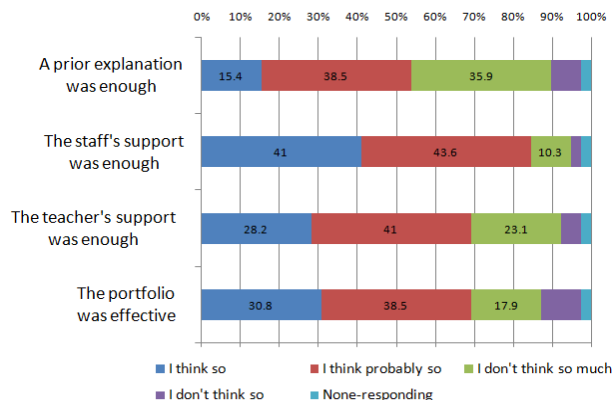


Fig 6 Evaluation about Portfolio Intelligence

CONCLUSION

The educational portfolio system, KIT Portfolio Intelligence System, is introduced in this presentation, which was developed by KIT for our graduate course in 2004. The system has been working successfully under the close collaboration among graduate student, professor and staff, and suggests that the improvement cycle is quite effective in graduate education. In addition, the objective evaluation procedures adapted makes education accountable. We now have a prototype of IT-based system implemented for on-line services, which started in April, 2008. We will report the results of our on-line trial near future.

Many professional skills and knowledge, including problem solving, have to be acquired during graduate courses. We are understanding that students could motivate enhancing their own professional skills by strengthening students' self-awareness of their skill acquisition process, resulting in improving their professional minds.. One of the authors has developed a tool for visualizing an aspect of human cognitive processes. We will utilize this visualizing mechanism in KIT Portfolio Intelligence System in future, which will be expected to encourage students to self-trace their skill improvement, in addition to self-evaluate their skills and knowledge.

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