The Professional Experience Transfer Model from the Prediction of an Intelligent Portfolio Using Service Agents

S. Kittiviriyakarn, P. Nilsook, and P. Wannapiroon

***Abstract*—The purposes of this research were: 1) to analyze predictive factors for professional experience transfer and 2) to develop a professional experience transfer model from the prediction of an intelligent portfolio using service agents. This article first presents an analysis of factors predicting the transfer of professional experience, which consists of 5 main components: 1) Qualification, 2) Conditions, 3) Knowledge, 4) Assessment method, and 5) Professional Standards. The results of an assessment of the quality of professional experience transfer by a sample of 11 experts showed that the average total score for all aspects was high. In the second part of this article, a professional experience transfer model was derived from the prediction of an intelligent portfolio using service agents. This was developed by integrating intelligent portfolio predictions with the service agent into the model. This model consisted of 3 main components: 1) Import Data, 2) Process, and 3) Results. The intelligent service agent filtered and searched for information by following the criteria for professional experience transfer. The results can be applied to higher education diploma levels to enhance professional skills in advanced vocational training according to the curriculum of the Vocational Education Commission. Evaluation of the professional experience transfer model showed that the average score for all aspects was extremely high.**

***Index Terms*—Intelligent portfolio, service agent, professional experience transfer, prediction.**

I. Introduction

The dynamic challenges of the 21st century include external pressures caused by changes in the global economy and social contexts. Such changes are termed the Digital Revolution, also known as the Fourth Industrial Revolution. Working towards achieving the UN Sustainable Development Goals 2030 (SDGs 2030), which Thailand has ratified, includes considering the impact of being a member of the ASEAN Community and the need for skilled manpower in the 21st century, coupled with internal pressures arising from demographic changes that have led to the development of an aging society. Middle-income trap countries, the attitudes, beliefs, values, culture and behavior of the population have changed as a result of globalization and economic growth has caused natural resources to deteriorate and be destroyed rapidly. It has also affected the education system, which still has many problems in terms of quality, the standards of educational management at all levels, and the development of science, English, and technology. This has led to inequalities in educational opportunities, and moral and ethical problems such as insufficient awareness of the importance of discipline and honesty in the minds of Thai people. To meet and support such challenges, it is necessary for Thailand to reform the education system so that it is the main mechanism driving the country. This will take place under the new constitution of the Kingdom of Thailand, the 20-year national strategic framework (2017 - 2036), and the direction of the 12th National Economic and Social Development Plan (2017 - 2021). This will lead the country to stability, prosperity, and sustainability over the next 20 years [1].

The purpose of this research was to develop a professional experience transfer model from the prediction of an intelligent portfolio using service agents. The research process was divided into 2 steps: 1) analyzing predictive factors for the transfer of professional experience, and 2) developing the professional experience transfer model from the prediction of an intelligent portfolio by using service agents. The latter was achieved by means of an appropriate expert assessment.

II. Research Objectives

The purposes of this research were to

1) Analyze factors predicting the transfer of professional experience.
2) Develop a professional experience transfer model from the prediction of an intelligent portfolio using service agents.

III. Literature Review

Electronic Portfolios refer to the systematic compilation of objectives using computer and network technology. These enable students to store and accumulate their work in a variety of different media such as text, sound, still images, and animations. Learners participate in content design, content selection, and evaluation. They also engage in self-assessment that emphasizes reflection and use hypertext to link the selected works according to the criteria set to reflect the development and achievement of learning outcomes [2].

The agent system is something that can be perceived through the detection of sensors in order to operate. And the agent's interaction with the environment. The important characteristic of artificial intelligence agents is that they must use natural language processing (NLP) methods in their work and be able to learn dynamically to solve problems or respond to changing environments. The Reporting Agent was responsible for creating a summary report for each article,

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abstract, shortened article, and specifying the level of recommendations in the summary report. In which the researcher summarizes from the articles selected by all users, counting the number of articles classified according to the level and year, showing the criteria for leveling the recommendations for applying articles to Precog guidelines [3].

In conclusion, the Service Agent is a high-performance cloud computing technology. The agent must be intelligent enough to screen, identify and search for content that meet the conditions determined by the teacher, which must comply with the Rubric criteria At present, there are basic principles that are accepted and new knowledge about information technology in many fields, such as information retrieval, learning machine, semantic web, and ontology. These principles will help develop service agendas so that they are more intelligent, reduce error, and assess whether there is more academic progress in new technical terms. It is also possible to develop the service agent to a level of artificial intelligence that can correctly assess scores on behalf of teachers, similar to a self-assessment teacher.

In conclusion, the Intelligent Portfolio refers to the collection of work into an integrated artificial intelligence system. The service agent is intelligent enough to be able to filter, sort, and search for content that matches the conditions set by the professor, which must comply with the Rubric criteria. The assessor then evaluates the work identified by the service agent. The assessment has been completed. The service agent is responsible for collecting all points and separating individual grades.

The Transfer of Professional Experience has led to the creation of a consistent framework. The eSKM framework incorporated ICT formats and reference standards: ESCO, e-CF, and BOK. This matching framework was developed as part of the eSKM project. The framework focused on the interlinked parts. Prototype tools were developed to assist in working with a large number of components from all three types (ESCO, e-CF, and BOK) to facilitate an analysis of redundant detection methods was similarities. The Future of Work explains in detail the eSKM framework while working on using a support system for applicants and employers that can provide self-assessment functions for job seekers, explain how to match the list of candidates and job descriptions, and provide training to determine career goals and the possibility of testing knowledge and testing methods [4].

Principles of Transferring Professional Experience refer to connecting, filling, and benchmarking mechanisms, linking into the national qualification framework for graduates from educational institutions. Those who have received professional certification must have mechanisms and systems for logging qualifications that are flexible, diverse, capable, and enable experience or performance to be continuously compared or transferred throughout life. They also enable qualifications to be accredited and upgraded according to the national qualifications framework [5].

The Prediction refers to predictive analysis, involving predictions about what might happen based on current information and collecting data using various statistical techniques [6].

This article proposed a professional experience transfer system from the intelligent portfolio prediction using service agents. This was derived from the integration of the transfer of professional experience into electronic portfolios that use service agent technology, as shown in Fig. 1.

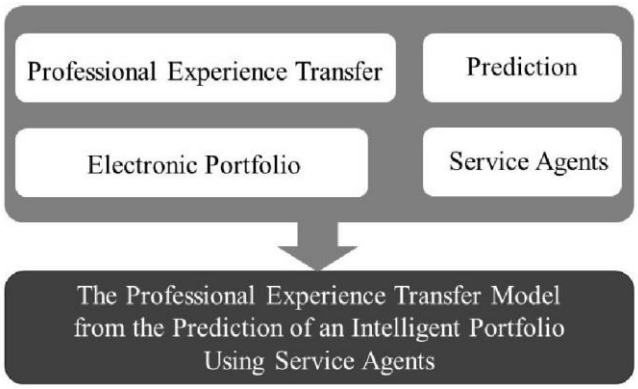

Fig. 1. Components of the transfer of professional experience from the prediction of an intelligent portfolio using service agents.

IV. Research Approach

A. Synthesis of Components of the Intelligent Portfolio

This has been studied by many researchers, as shown in Table I.

As shown, the composition of the Intelligent Portfolio consists of 12 steps: the Browser, Import Data, Process, View, Database, Storage, Metadata, Perceiving, Acting, Actuators, Sensor, and Reporting.

B. Synthesis of Components of the Prediction

This has been studied by many researchers, as shown in Table II.

As shown, the composition of the Prediction consists of 4 steps: the Import Data, Weight, Activation Function, and Result.

Components of the professional experience transfer model derived from the prediction of an intelligent portfolio using service agents, as shown in Fig. 2.

As shown in Fig. 2, professional experience transfer according to the vocational education curriculum is an opportunity for those who have the knowledge and professional experience to apply this and assess and transfer it into credits. The model development professional imports five types of data including Factors relating to Professional Transfer, Board, Step, Method, and Judgement. The process of the transfer of professional experience consists of public relations, Petition, i-Portfolio, and property evaluation. The results of the professional experience transfer system are transferred to credits, and to education.

The professional experience transfer model thus contains the following details.

As shown in Fig. 3 the Import Data of the professional experience transfer model consists of 5 steps: the Factors, Board of Committee, Step, Method, and Judgment.

C. Criteria for Requesting Assessment

Factors refer to the qualifications of the applicant for assessment to transfer professional experience.

TABLE I: SYNTHESIS OF INTELLIGENT PORTFOLIO FILES

Components	A. Gorbunovs (2013) [7]	M. Forte (2013) [8]	S. Dom ínguez-Garc á (2015) [9]	K. Rezgui (2017) [10]	L. Romero (2017) [11]	M. A. Bairral (2012) [12]	S. Wanotayapitak (2018) [13]	J. Dong (2017) [14]	F. Cruz (2016) [15]	S. Pumchalerm (2016) [16]	C. Gao (2014)[17]	C. Wang (2015) [18]	X. Hu (2015) [19]	**Intelligent Portfolio**
Browser	✓	✓	✓	✓	✓	✓	✓							✓
Import Data	✓	✓	✓	✓	✓	✓	✓							✓
Processes	✓	✓	✓	✓	✓	✓	✓							✓
View	✓	✓	✓	✓	✓	✓	✓							✓
Database	✓	✓	✓	✓	✓	✓	✓							✓
Storage	✓	✓	✓	✓	✓	✓	✓							✓
Metadata	✓	✓	✓	✓	✓	✓	✓							✓
Reflection			✓		✓									
Environment	✓				✓	✓	✓							
Perceiving								✓	✓	✓	✓	✓	✓	✓
Acting								✓	✓	✓	✓	✓	✓	✓
Actuators								✓	✓	✓	✓	✓	✓	✓
Sensor								✓		✓	✓	✓	✓	✓
Reporting								✓	✓	✓	✓	✓	✓	✓

TABLE II: SYNTHESIS TABLE OF PREDICTION FILES

Components	T. A. Johansen (2017) [20]	I. I. Sirmatel (2018) [21]	A. Ferrara (2015) [22]	H. Ahmadinejad (2017) [23]	S. Lee (2015) [24]	R. Santos (2016) [25]	A. Rosato (2017) [26]	**Prediction**
Import Data	✓	✓	✓	✓	✓	✓	✓	✓
Weight	✓	✓	✓	✓	✓			✓
Activation Function	✓	✓	✓	✓	✓	✓	✓	✓
Result	✓	✓	✓	✓	✓	✓	✓	✓
Instructions						✓	✓	
Environment							✓	

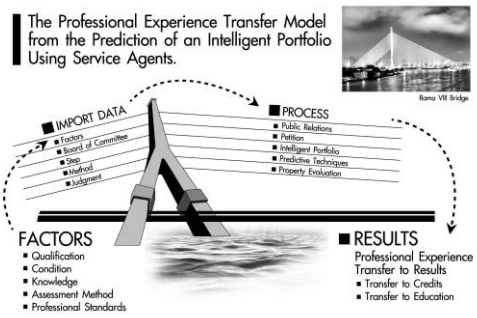

Fig. 2. Components of the development of a professional experience transfer model.

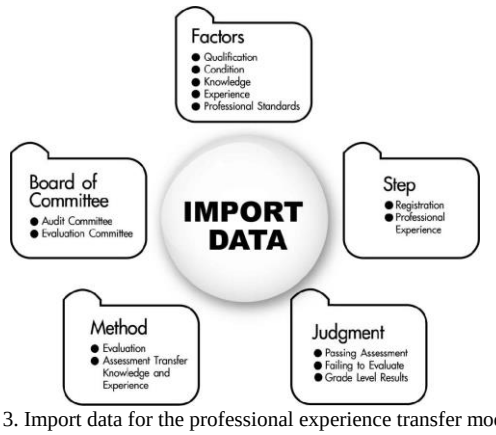

Fig. 3. Import data for the professional experience transfer model.

1) Qualification
   - Graduated with a vocational certificate, worked in a related field, had the ability to study for a High Vocational Certificate, must count working time, had knowledge and experience not less than 3 years.
   - At least 2 years of experience after graduating from high school or equivalent.
   - Graduated from the Diploma of Vocational Education.
   - Graduated from Bachelor of Technology Program or Bachelor's Degree.
   - Grades according to the Diploma course, and the new entrance examination, allowing the school to receive the transfer of results of the course and have a grade level of 2.0 or higher.
   - Registered for courses in the school for not less than 1 semester, to request the transfer of course results.
   - Basic information for consideration to transfer professional experience.
2) Condition
   - Registration for obtaining the assessment, transferring the knowledge and experience for not more than 2 out of 3 of the number of credits according to the structure of the curriculum.
   - Experience in careers and the workplace.
   - Knowledge in the courses before attending a career

- Academic results according to the structure of the Diploma course.

3) Knowledge: knowledge and experience in the course; subject groups requested for assessment are as follows:
   - Evidence of knowledge and experience.
   - A certification of ability.
   - Certificate of the ability of the agency to certify the special ability of the applicant.
4) Experience
   - Evidence of work experience of the same nature for at least 5 consecutive years while working with self-development in education.
   - Evidence of professional work.
   - Evidence of being awarded.
   - Evidence of social work.
   - Evidence that is currently in progress.
   - A certificate showing the results of passing National Skill Standards Testing.
   - A professional standard certificate showing the occupation standard - professional qualifications institution (public organization).
5) Professional Standards
   - Developing core competencies
   - Developing general competencies and professional competencies

Board of Committee means the Audit Committee have knowledge and experience in the course

1) Audit Committee: The committee is responsible for checking the knowledge and experience of the course. It comprises 3 persons, consisting of:
   - As Chairman, the deputy director of the college responsible for the academic or supervisor responsible for the course.
   - The department head or the head of the faculty responsible for that course.
   - The teacher of the course and the secretary whose duty is to examine the evidence and interview the learner to certify their knowledge and experience in the course.
2) Evaluation Committee: Responsible for assessing knowledge and experience in the course. It comprises 3 persons, consisting of:
   - The head of the faculty or the head of the department responsible for the course as the chairman.
   - Teachers in disciplines work branches of other educational institutions from the registration of the Provincial Vocational Education Commission or personnel of the institutional, establishments, professional organizations, and professionals from the registration of the Vocational Education Commission. with permission from the educational institution or original affiliation 1 person was a committee.
   - The teacher of the course is a committee member and secretary. They are responsible for assessing knowledge and experience, according to the performance of the requested course according to the assessment framework, transferring knowledge and course experience. According to the following criteria: 1) Assessed knowledge and experience based on the individual competency of the course. 2) Prepared assessment tools that covered all the content and competencies of the courses that were requested to transfer courses that were only theoretical or practical only providing only theoretical or practical assessments as the case may be if. There were both theory and practice to evaluate both theoretical and practical according to the construction of test plans and guidelines prescribed by the Vocational Education Commission. (3) The number of hours of assessment must not be less than the number of hours per week of that course. (4) The criteria for evaluation shall be based on an evaluation of the course. (5) The educational institution shall maintain documents and evidence for course comparison and transfer of knowledge and experience at every step for examination for three years from the day the school approved the assessment.

Step refers to the process of applying for assessment, and transferring knowledge and experience to comply with the Ministry of Education regulations on education management and evaluation of studies according to vocational certificate courses (vocational certificate), higher vocational certificate programs (High Vocational), or the Bachelor of Technology Program as follows:

1) Registration: Students are registered to request an assessment and transfer knowledge and experience in not more than 2 out of the 3 credits according to the structure of the curriculum.
2) Professional Experience: Learners with professional experience or vocational training in the workplace are already working in that occupation or had knowledge in the courses according to the said curriculum before enrolling. An enrolling but are requesting to study or practice in the workplace requesting a comparative assessment transferring knowledge and experience to exclude studies if the course was not completed. The student who were evaluated did not meet the criteria to request the assessment and could not transfer the knowledge and experience that semester again but registered for that semester or requested an assessment in the next semester.

Method

1) Evaluation considered subject subjects that request for assessment as follows.
   - The hours of operation; training not less than the number of hours of courses in the curriculum.
   - A competency or content that was consistent with subjects, a subject group in vocational certificate level of at least 60%, High Vocational certificate, and Bachelor of Technology not less than 75%.
   - Considered information from initial interviews, job characteristics, workplaces, and experience.
2) Assessment Transfer of knowledge and experience used a variety of methods that covered the course objectives, course performance, and subject content. This will be at the discretion of the assigned committee.

Judgement referred to the evaluation result at a level according to the Ministry of Education Regulations on Educational Management, and assessment of the course.

1) Passing Assessment: Courses with an evaluation level of 1.0 or higher or with a score of not less than 50 percent

were considered assessed.

2) Failing to Evaluate: Courses with a rating of 0 (zero) or a score lower than 50 percent were considered to have failed the assessment and were to be re-enrolled.
3) Grade Level Results: Used grade point values following the regulations of the Ministry of Education on Educational Management, and the evaluation of the program according to the curriculum requested to evaluate the transfer of knowledge and experience.

D. The Process of the Professional Experience Transfer Model from the Prediction of an Intelligent Portfolio Using Service Agents

Fig. 4. The process of the professional experience transfer model from the prediction of an intelligent portfolio using service agents.

As shown in Fig. IV. the process of the professional experience transfer model consists of 5 steps: Public Relations, Petition, Intelligent Portfolio, Predictive Techniques, and Property Evaluation.

The process of analyzing factors predicting the transfer of professional experience consists of the following**:**

Public Relations to inform relevant parties.

- Schedule: The time and date for filing a petition for the transfer of professional experience.
- Procedure: The procedure for transferring professional experience.

Petition: Students submitted a request for assessment.

- Filing a petition: Students submitting a request for a professional experience transfer.
- Receiving a petition: The official was the petitioner for the transfer of professional experience.

Intelligent Portfolio (i-Portfolio)

1) Browser consisted of:
   - User was the student, measurement and evaluation, registration, and the administrator.
   - Local Storage refers to the storage space for preparing import data.
   - Sync Application used for logging in, assigning permissions, and inserting data.
2) Server Side consisted of:
   - Intelligent Portfolio core comprising data import, process, and display
   - Content Application server comprising the database, the data collector, detailed data, criteria for the transfer of professional experience, and agents creating a summary report.

Predictive Techniques: from data preparation to prediction

- Import data: document information, certificate, announcement, and interview
- Weight: instead of the importance given to each import data, the sum of the weighted values caused by multiplying the import data and the weight value.
- Activation function: conditions for interpretation
- Result: the result of the professional experience transfer.

Property Evaluation: Evaluation pending certification.

1) Evidence Evaluation
   - Evaluated documents and evidence for assessment of professional experience transfer according to criteria.
2) Experience Evaluation
   - Information documents that have been evaluated, a score of 70%
   - Test and evaluation, a score of 30%
   - Measurement and evaluation using course evaluation tools
3) Evaluate Performance
   - Recording of operations, a score of 70%
   - Measurement test, the score of 30%
   - Measurement and evaluation using course evaluation tools
4) Pending review
   - To ensure the accuracy of the information, evidence of the transfer of professional experience.

E. Results of the Professional Experience Transfer Model from the Prediction of an Intelligent Portfolio Using Service Agents

Fig. 5. Results of the professional experience transfer model.

As shown in Fig. 5 the results of the professional experience transfer model consist of 2 steps: Transfer Results to Credits, and Transfer to Education.

Transfer to Credits: There are 2 types: passed and not passed. In the case of passing, an exemption is received for that course. In the case of not passing, must be enrolled in that semester on a High Vocational Certificate Program.

Transfer to Education: Accumulated credits of professional experience transfer until completion of the course structure.

1) Accumulation of Credits: Graduates with the Diploma of Vocational Education, certificate in all subjects, all disciplines, all work fields, and must study courses from various subjects. A total of no less than 83 credits and participation in extracurricular activities according to the following structure.
   - Professional Basic Adjustment Course (for students who have completed grade 6), not less than 8 credits
   - Life skills category, not less than 21 credits

- Professional skills category, not less than 56 credits
- Free elective category, not less than 6 credits
- Extracurricular activities (2 hours per week)

2) Qualification Certification: submitted to the committee to certify the qualification of a diploma.

V. Evaluation Results

The results of the quality evaluation of professional experience transfer factors. This was conducted by 11 experts and involved an evaluation of all 5 parts: Qualification, Condition, Knowledge, Assessment method, and Professional standards. The average score of 4.27 was high.

The results comprised the quality evaluation of factors involved in professional experience transfer, as shown in Table III.

TABLE III: Assessment Results for Professional Experience Transfer Factors

Evaluation list	Median	S.D.	Level of appropriateness
A. Qualification	4.49	0.49	High
B. Condition	4.07	0.46	High
C. Knowledge	4.26	0.61	High
D. Assessment method	4.23	0.59	High
E. Professional standards	4.31	0.64	High
The average score on all sides	4.27	0.56	High

The evaluation was conducted by 11 experts and encompassed all 3 parts: Import data, Process, and Results. The average score, 4.68, was extremely high.

The full evaluation results are shown in Table IV.

TABLE IV: Evaluation Results for the Professional Experience Transfer Model from the Prediction of an Intelligent Portfolio Using Service Agents

Evaluation list	Median	S.D.	Level of appropriateness
I. Import data	4.70	0.44	Very high
A. Factors	4.82	0.24	Very high
B. Board of Committee	4.73	0.47	Very high
C. Step	4.59	0.54	Very high
D. Method	4.73	0.41	Very high
E. Judgement	4.64	0.44	Very high
II. Process	4.67	0.55	Very high
A. Public relations	4.73	0.52	Very high
B. Petition	4.73	0.47	Very high
C. Intelligent Portfolio	4.55	0.82	Very high
D. Predictive techniques	4.70	0.53	Very high
E. Property evaluation	4.64	0.42	Very high
III. Results	4.66	0.45	Very high
A. Transfer to credits	4.64	0.50	Very high
B. Transfer to education	4.68	0.46	Very high
The average score on all sides	4.68	0.47	Very high

VI. Conclusion

The results of the quality evaluation of professional experience transfer by 11 experts showed that the opinions of: qualifications (mean = 4.49, SD = 0.49) were at a high level, conditions (mean = 4.07, SD = 0.46) was high, knowledge (mean = 4.26, SD = 0.61) was at a high level, assessment method (mean = 4.23, SD = 0.59) was at a high level, professional standards (average = 4.31, SD = 0.64) was at a high level, and the average score of all aspects (average = 4.27, SD = 0.56) was high. Regarding the evaluation results for the development of the professional experience transfer model by 11 experts, the results showed that the opinions of: import data (mean = 4.70, SD = 0.42) were at a very high level, Process (mean = 4.67, SD = 0.55) was at a very high level, the result (mean = 4.66, SD = 0.45) was at a very high level, the average score on all sides (average = 4.68, SD = 0.47) was at a very high level of appropriateness and in accordance with the policy of the Office of the Vocational Education Commission in preparation of the development plan for 2017-2036. By analyzing and synthesizing the 20-year national strategy (2017-2036), national education plan 2017-2036, and economic development plan National Society No. 12 (2017-2021), relevant agencies and educational institutions can use these as guidelines for developing and driving vocational education management across the country in accordance with the goals and directions of development National Strategy Thailand by defining the vocational education strategy 6 strategies. In part 2 of the strategy, the production and development of vocational training will build the country's competitiveness, Work Plan 10, the development of testing systems measurement and evaluation of learning according to the vocational education standard. The system for transferring knowledge and professional experience to enhance the educational qualifications according to the Qualifications framework [27].

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

S. Kittiviriyakarn conducted the research, analyzed the data, and wrote the paper; P. Nilsook, and P. Wannapiroon the research consulting; all authors had approved the final version.

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