TASK ANALYSIS SYSTEM
FOR DEPARTMENT OF CHEMICAL ENGINEERING FACULTY OF ENGINEERING, MAHIDOL UNIVERSITY

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TASK ANALYSIS SYSTEM FOR DEPARTMENT OF CHEMICAL ENGINEERING FACULTY OF ENGINEERING, MAHIDOL UNIVERSITY

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ABSTRACT

This research was conducted in order to develop a Task Analysis System (TAS) for the Faculty of Engineering, Mahidol University for use as a supporting tool for analyzing assigned tasks and monitoring their progress. The various skills or abilities are factors that supervisors require to finish the tasks that can be set up for work evaluation based models of actual personnel abilities. The results are useful for executives or supervisors as they facilitate monitoring and evaluating the quality of work. At the same time, the workload and working skills of employees can also be checked and used as part of a performance evaluation.

The TAS was developed based on web-based technology and a relational database model. This application allows users to store and quickly access information.

The TAS consists of several sub-systems such as skills/abilities evaluation form creation, task creation, task management, task evaluation and score reporting with charts, etc. The system will collect skills/abilities data for every employee, analyze, then and report in a well-presented form. Moreover, a search mode is also available for executives or supervisors to access the result database more easily. It is also of benefit to all employees by presenting their strengths and weaknesses so that they can improve their capabilities in a particular area.

KEY WORDS: TASK ANALYSIS/ JOB ANALYSIS/ SKILLS/ ABILITIES EVALUATE / DATABASE

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ระบบวิเคราะห์งานของบุคลากร กรณีศึกษาภาควิชาวิศวกรรมเคมี คณะวิศวกรรมศาสตร์

TASK ANALYSIS SYSTEM FOR DEPARTMENT OF CHEMICAL ENGINEERING FACULTY OF ENGINEERING, MAHIDOL UNIVERSITY

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บทคัดย่อ

การวิจัยนี้มีจุดมุ่งหมายเพื่อวิเคราะห์ ออกแบบ และพัฒนาระบบวิเคราะห์งานของบุคลากรภาควิชาวิศวกรรมเคมี คณะวิศวกรรมศาสตร์ มหาวิทยาลัยมหิดล เพื่อใช้เป็นเครื่องมือในการสนับสนุนการทำงานสำหรับการวิเคราะห์งานเพื่อมอบหมายงานให้กับบุคลากรและติดตามสถานะความก้าวหน้า โดยการกำหนดปัจจัยของทักษะหรือความสามารถของบุคลากรในการปฏิบัติงานนั้นๆ เพื่อประเมินคุณภาพงานจากความสามารถของบุคลากรกับงานที่ได้รับมอบหมายตามทักษะหรือความสามารถที่ได้ตั้งไว้ โดยผลลัพธ์ของข้อมูลช่วยให้ผู้บริหารหน่วยงานหรือผู้มอบหมายงานสามารถติดตามสถานะความก้าวหน้าและประเมินคุณภาพการทำงานได้อย่างสะดวกและสามารถดูภาระงานและทักษะในการปฏิบัติงานของบุคลากรได้ อีกทั้งยังสามารถนำมาใช้เป็นส่วนหนึ่งในการประเมินผลการปฏิบัติงานของบุคลากรได้อีกด้วย ซึ่งระบบจะให้บริการผ่านเครือข่ายอินทราเน็ตของคณะวิศวกรรมศาสตร์

ระบบได้ถูกพัฒนาด้วยเทคโนโลยี web-based โดยทำงานร่วมกับฐานข้อมูลเชิงสัมพันธ์ ซึ่งระบบสามารถเข้าถึงข้อมูลที่ผู้ใช้บริการต้องการโดยตรงได้อย่างรวดเร็ว

ระบบประกอบไปด้วยส่วนหลักหลายส่วนด้วยกัน เช่น การสร้างแบบฟอร์มการประเมินทักษะ/ความสามารถ การสร้างงาน การจัดการงาน การประเมินผลการปฏิบัติงานและรายงานแสดงสรุปผลคะแนนการปฏิบัติงานของบุคลากรตามทักษะ/ความสามารถด้วยแผนภูมิรูปภาพ เป็นต้น ระบบสามารถรวบรวมข้อมูลที่ได้จากประเมินทักษะ/ความสามารถของบุคลากรทั้งหน่วยงานนำมาประมวลผลและแสดงผลลัพธ์ในรูปของผลคะแนนและแผนภูมิรูปภาพ ที่มีความชัดเจนต่อผู้ใช้งาน ผู้บริหารหรือผู้มอบหมายงานสามารถสืบค้นข้อมูลผลการปฏิบัติงานตามทักษะ/ความสามารถของบุคลากรที่อยู่ในฐานข้อมูลได้ด้วยฟังก์ชั่นการค้นหา ซึ่งง่ายต่อการเข้าถึงข้อมูล อีกทั้งเป็นเครื่องมือที่ช่วยในการพัฒนาทักษะ/ความสามารถของบุคลากรที่บกพร่องเพื่อพัฒนาขีดความสามารถในด้านนั้นๆ ต่อไป

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CHAPTER I
INTRODUCTION

1.1 Background

Human resources management is an important factor that drive organization. The performance of employee perform a work is an important process influencing the performance of the organization. Currently, the Department of Chemical Engineering, Faculty of Engineering does not have any management tools that help analyzing the tasks to be assigned and monitored their progresses. A supporting system may be utilized to increase performance of the organization and improve the competencies of human resources at the same time.

For this reason, Information Technology is applied to develop an task analysis system on existing network used by the employees in the Department of Chemical Engineering, Faculty of Engineering. The system is a supporting tool when tasks are assigned to employees. It will set factors on skills or capabilities required to finish the tasks and evaluate the quality of the work based on actual or setting personnel abilities. Therefore, executives or supervisors can monitor and evaluate quality of work easily. Workload and working skills of employees can also be checked and used as part of performance evaluation at the same time.

1.2 The Problem Description

The current task assigning system is based on face-to-face method. Therefore, it is quite difficult to track or follow up the works as well as impossible to analyze the tasks by setting the skill factor for employees. Moreover, the administrator/evaluator cannot monitor the work progress or employee skills or capabilities through achievement of the assigned tasks which will not allow the

employee to evaluate the employee capabilities and comparison between each employee.

1.3 Objectives

1.3.1 To study and develop a task analysis system for the Department of Chemical Engineering, Faculty of Engineering.

1.3.2 To create working reports that show the skills or capabilities each employee gain when achieving his/her tasks.

1.4 Scope

1.4.1 The system has been developed to assign tasks to employees based on skills or capabilities and to evaluate the quality of the work based on setting values that are specifically set for the Department of Chemical Engineering, Faculty of Engineering.

1.4.2 The results will be summarized as a report form on a web application.

1.5 Expected Results

1.5.1 Task analysis system that assists the employees of the Department of Chemical Engineering, Faculty of Engineering in assigning and monitoring tasks so that human resources are fully utilized.

1.5.2 Performance evaluation results that are based on skills or abilities of each employee.

1.5.3 A foundation for improving personnel competencies.

CHAPTER II
LITERATURE REVIEW

This chapter involves the literature reviews on planning, technology, and related research. This chapter is classified as following:

2.1 Conceptual of Task and Task Analysis

2.2 Conceptual of knowledge, skills and competence

2.3 Evaluation/Assessment of levels of knowledge, skills and competence (KSC)

2.4 Definitions and Categories of Workplace Basic Skills

2.5 Relevance research

2.1 Conceptual of Task and Task Analysis

2.1.1 Task

Jobs can best be understood as a series of tasks. A task is an action designed to contribute a specified end result to the accomplishment of an objective. It has an identifiable beginning and end that is a measurable component of the duties and responsibilities of a specific job.

Although each job has a title, the actually work that is expected of that job can vary widely. Tasks are the means of describing a job in detail. For example, a doctor is a job title. But the tasks performed by each doctor vary - from operating to performing physicals to providing emergency first aid. The following are characteristics of tasks:

- A task has a definite beginning and end.
- Tasks are performed in relatively short periods of time. They are usually measured in minutes or hours.
- Tasks are observable. By observing the performance of a jobholder, a definite determination can be made that the task has been performed.

- Each task is independent of other actions. Tasks are not dependent on components of a procedure. A task is performed by an individual for its own sake.
- A task statement is a statement of a highly specific action. It always has a verb and an object. It may have qualifiers, such as "measure distances with a tape measure". A task statement should not be confused with an objective that has conditions and standards.

Most problems that deal with doing the job right (performance) are related to the ability to define the tasks that concern each job:

- Workers need to know what they are supposed to do. This increases both autonomy and initiatives by defining the latitude workers have.
- Supervisors need to know what their workers should be doing in order to provide feedback. It must be clear on what is being done and why.
- Managers need to know the Knowledge, Skills, and Attitudes (KSA) they need to interview for. Making the correct hiring decision has extreme impacts throughout the organization.
- Human Resources need to know the KSA so that the pay reference point can be set.
- Trainers need to know the tasks so that they can create the learning objectives in order to improve job performance.
- The organization at a whole needs to know what tasks need to get accomplished so that their goals and mission may be met.

Lacking an understanding of the work to be done leads to issues with performance, supervision, selection, pay, training, and goal achievement. This in turn leads to poor morale. And if the morale in your organization is not at its peak, then you will not be able to remain competitive.

2.1.2 Task Analysis

A task analysis defines a job in terms of Knowledge, Skills, and Attitudes necessary to perform daily tasks. It is a structured framework that dissects a job and arrives at a reliable method of describing it across time and people by composing a

detailed listing of all the tasks. The first product of a task analysis is a task statement for each task on the list.

When writing the task statement, start each task with a verb, indicate how it is performed, and state the objective. For example: "Loads pallets using a forklift." One way of getting a comprehensive list is to have the employees prepare their own list, starting with the most important tasks. Then, compare these lists with yours. Finally, discuss any differences with the employees, and make changes where appropriate. This helps to ensure that you have accounted for all tasks and that they are accurate. It also gets them involved in the analysis activity.

Task or needs analysis should be performed whenever there are new processes or equipment, when job performance is below standards, or when requests for changes to current training or for new training are received. An analysis helps ensure that training is the appropriate solution.

Once the task statement has been defined, the task analysis will then go into further detail by describing the:

- task frequency
- difficulty of learning
- importance to train
- task criticality
- task difficulty
- overall task importance

This in turn provides you with the information for identifying the KSA required for successful task performance. The analysis might also go into further detail by describing the task steps required to perform the task.

There are a wide variety of methods for performing a task analysis, such as observations, interviews, and questionnaires.

2.2 Conceptual of knowledge, skills and competence

2.2.1 Knowledge

Jonathan Winterton(2005) Knowledge is sometimes viewed as if it was a concrete manifestation of abstract intelligence, but it is actually the result of an interaction between intelligence (capacity to learn) and situation (opportunity to learn), so is more socially-constructed than intelligence. Knowledge includes underpinning theory and concepts, as well as tacit knowledge gained as a result of the experience of performing certain tasks. Understanding refers to more holistic knowledge of processes and contexts, and may be distinguished as know-why, as opposed know-that.

A distinction is often made between general knowledge, which is essential irrespective of any occupational context or so fundamental as to be considered basic 'life'. knowledge, and knowledge that is specific to a sector or particular group of occupations and only likely to be encountered in such context. Weinert (1999: 24), for example, distinguishes:

general world knowledge (generally measured by vocabulary tests that are part of many intelligence measurements, and overlapping considerably with what is defined as crystallized intelligence), and more arbitrary specialized knowledge. This specialized knowledge is necessary for meeting content specific demands and solving content-specific tasks. In contrast to general intellectual abilities, one can consider arbitrary knowledge as a demand-specific competence.

Collin (1997: 297) cites Gardner's association of know-how with tacit knowledge and know-that with propositional knowledge. Another way of expressing this distinction is between declarative knowledge (knowing what), and procedural knowledge (knowing how). From this perspective, it is often argued that the acquisition of declarative knowledge (explicit factual knowledge) must precede the development of procedural knowledge, which relates to the utilization of knowledge in context. Gagne's (1962) model of hierarchical knowledge fits with this approach, identifying the knowledge set necessary for understanding, learning and performing well on a criterion task. This is then traced back to each subordinate set of psychological knowledge, providing a description of knowledge that is increasingly elementary and general.

Each knowledge and learning hierarchy therefore rests on primary mental abilities, with the implicit assumption of a general learning transfer capacity and

'logic of knowledge acquisition'. In all domains there is some logic that the acquisition and comprehension of new knowledge demands facilitating cognitive prerequisites and specific knowledge and skills. Given this interaction between knowledge and skills, their separation in a typology is not entirely unproblematic. Indeed, for Klieme et al (2004: 70), higher competency levels are characterised by the increasing 'proceduralisation' of knowledge, so 'at higher levels, knowledge is converted to skills'.

2.2.2 Skill

Skill was characterised by Pear (1927) as being concerned with the quantity and quality of motor output: .skill is the integration of well-adjusted muscular performances. (Pear, 1948: 92). While for Pear the emphasis was on manual, motor skills, his contemporary Hans Renold in 1928 defined skill as .any combination, useful to industry, of mental and physical qualities which require considerable training to acquire. (More, 1980: 15). While Renold was therefore introducing a cognitive dimension alongside the manual, his emphasis on training ignores the fact the skills may equally be acquired through practice, without training. Usually the term skill is used to refer to a level of performance, in the sense of accuracy and speed in performing particular tasks (.skilled performance.). Skilled performance has long been a subject of psychological enquiry, and is of obvious interest to employers. Bryan and Harter (1897; 1899), who undertook one of the earliest systematic studies of (practical) skills acquired in the work environment (by telegraph operators at Western Union), demonstrated that skill acquisition involves a series of stages associated with reaching plateaux of performance and that improvements continue well beyond the achievement of an adequate level. Swift (1904) adopted a similar approach in researching skill among typists, and later also telegraphers (Swift, 1910). Motor skill acquisition has continued to occupy the attention of researchers, increasing understanding of the role of perception, feedback and other factors (Newell, 1991; Schmidt, 1975; 1988).

The classic 'learning curves' apparent in this early work of Bryan and Harter are a recurrent feature of skills research. In Cox's (1934) study of manual skill, which was not defined but involved both physical psychomotor abilities and mental

cognitive abilities, performance in terms of speed and accuracy was measured in experiments with repetitive assembly operations. Parallel learning curves were apparent for subjects developing proficiency through practice and for those who also received training; the performance of the latter group was higher than among those not receiving training. Cox (1934: 238-9) argued that the relatively short initial phase of deep slope in the practice curves was associated with the cognitive aspects of manual operations, while the longer more gradual descent was associated with the motor aspects. Subsequent studies demonstrated that plateaux and regressions do not always occur and when they do that there is no justification in associating them with particular types or stages of learning (Fuchs, 1962; Keller, 1958). The early finding that (diminishing marginal) improvement in performance appear to continue indefinitely has generally been confirmed in later research, which led to the conclusion that learning can be described as a linear function of the logarithms of times and trials (Crossman, 1959; Snoddy,1926) and ultimately to the .power law of practice. (Newell and Rosenbloom, 1981). Another strand of skills research has concerned transfer of training, particularly the extent to which proficiency and experience in one task facilitates performance in another. In general, transfer of motor skills has only been found to occur where the 11 tasks have particular elements in common, undermining the argument for developing general abilities that will improve performance in a variety of activities (Adams, 1987; Gagné, Foster and Crowley, 1948). This observation has been shown to apply equally to the transfer of cognitive skill (Singley and Anderson, 1989). One conclusion of Cox.s studies was that .skill developed by the mere repetition of one manual operation confers little advantage in the performance of other operations that may be subsequently undertaken. (Cox, 1934: 176).

Proctor and Dutta (1995: 18) in what is arguably the most authoritative text on skill acquisition and performance, define skill as .goal-directed, well-organized behavior that is acquired through practice and performed with economy of effort.. Each element of the definition is important: first, skill develops over time, with practice; second, it is goal-directed in response to some demand in the external environment; third, it is acquired when components of behavior are structured into coherent patterns; and finally, cognitive demands are reduced as skill develops. Inevitably, in

order to measure skill, most researchers use speed and/or accuracy of performance, two variables between which there is inevitably a degree of trade-off. In further articulating their conception of skill, Proctor and Dutta (1995) distinguish perceptual skills, response selection skills, motor skills and problem-solving skills. Perceptual skills are concerned with the ability to make distinctions and judgments; more complex situations require attentional control for processing but many tasks that initially require attention become automatized. Skill in selecting the appropriate response can be developed with practice; reaction time is affected by the number of alternatives and can be accelerated by providing advance information, thereby reducing the alternatives. Motor skills are the manual aspects of performance such as speed and accuracy of physical movements or dexterity. Problem-solving skills, while dependent upon intellect and mental models, can be acquired and developed through practice.

2.2.3 Competence

Michael A. Hoge, Janis Tondora, and Anne F. Marrelli (2005) A fundamental challenge in the application of competency approaches is to establish consensus regarding an operational definition of the concept. The published literature contains numerous definitions that outline the core elements of competency (Athey & Orth, 1999; Lucia & Lepsinger, 1999; Marrelli, 1998; Mirabile, 1997; Spencer, McClelland, & Spencer, 1994; Spencer & Spencer, 1993). These elements, and the language used to describe them, vary among authors. The same term may be used by different competency theorists and practitioners to describe two or more different capabilities. The particular terms used are not important in themselves; what matters is consistency within an organization or community of practice in the use of the terms. Offering and adopting a clear definition of an individual competency in a work environment is much more important than focusing on whether, in an abstract way, it is the "correct" definition (Marrelli, 1998).

We present a definition of the competency construct and four elements of competency based on a synthesis and distillation of previously published works and our practical experience in the application of competencies in the workforce.

A competency is a measurable human capability that is required for effective performance. It is comprised of knowledge, a single skill or ability, or personal

characteristic – or a cluster of these building blocks of work performance. Successful completion of most tasks requires the simultaneous or sequenced demonstration of multiple competencies.

Competency experts often refer to the elements of competency as the KSAPs: knowledge, skills, abilities, and personal characteristics. Each of these elements is described below.

Knowledge:

Knowledge is awareness, information, or understanding about facts, rules, principles, guidelines, concepts, theories, or processes needed to successfully perform a task (Marrelli, 2001b; Mirable, 1997). The information may be concrete, specific, and easily measurable or more complex, abstract, and difficult to assess (Lucia & Lepsinger, 1999). Knowledge is acquired through learning and experience. Examples include: knowledge of the federal, state, and local regulations governing patient care; knowledge of the diagnostic characteristics of a disorder; and knowledge of a practice guideline.

Historically, training and education programs have placed heavy emphasis on imparting knowledge. From a competency perspective, it is important that knowledge considered essential for a task or job be identified as explicitly as possible. Consistent with McClelland's original set of premises, the knowledge imparted also should have a link to meaningful, work-related outcomes. Therefore, the assessment of knowledge as an element of competency should take into consideration the impact of that knowledge on individual job performance.

Skills:

A skill is a capacity to perform physical or mental tasks with a specified outcome (Marrelli, 1998). Similar to knowledge, skills can range from highly concrete and easily identifiable tasks, such as completing a patient registration form, to those that are less tangible and more abstract, such as facilitating a team meeting in order to achieve consensus on a treatment plan (Lucia & Lepsinger, 1999). Other examples of skills include: formulating a diagnosis, administering a medication through injection, and following a structured interview protocol. Spencer and Spencer (1993) refer to knowledge and skills collectively as "surface" competencies as they tend to be the easiest elements of competency to develop through training.

Abilities:

An ability is a demonstrated cognitive or physical capability to successfully perform a task with a wide range of possible outcomes (Marrelli, 1998). It is often a

constellation of several underlying capacities that enable us to learn and perform. Examples of abilities include: thinking analytically; problem solving; making projections based on current data; managing or evaluating a treatment program; and synthesizing and integrating information from several sources, as in preparing a review of the literature on the effectiveness of a treatment. Abilities are more complex than skills and difficult and time consuming to develop, as they typically have a strong component of innate capacity. For example, analytical thinking comes more naturally to some people than to others. Although, most persons can develop a level of analytical thinking over time, for some it can be a long and difficult process.

Personal Characteristics:

There are numerous other human characteristics that influence and may be required for effective performance. These include values, attitudes, traits, and the behaviors that are manifestations of these human characteristics. Distinguishing these characteristics and associated behaviors as distinct from skills and abilities is somewhat arbitrary, as these characteristics may be essential to effective performance and, at least to some extent, may be taught and learned. The reason that they are often considered separately relates to their emotional/affective quality or emphasis on personality, as opposed to the cognitive and physical quality of skills and abilities.

2.3 Evaluation/Assessment of levels of knowledge, skills and competence (KSC)

Jonathan Winterton(2005) Most attempts to assess levels of KSC assume that the underlying characteristics (whether knowledge, skills or behavioural attributes) are associated with job performance (Herman and Kenyon, 1987; Nitardy and McLean,2002), whether this is just adequate achievement of work objectives (Green, 1999) or high performance (Mirabile,1997). Since competence (in the broader sense of KSA manifest in the work context) is specific to an occupation, it is by definition, related to the technical aspects of performance (Stewart and Hamlin, 1994: 4) and assessment of competence should be grounded in performance in the workplace (Norris, 1991: 4). This is the philosophy of the UK NVQ/SVQ system,

although the extent to which assessment is in reality grounded in the workplace has been questioned (Canning, 2000; Field, 1995; Purcell, 2001).

Boon and van der Klink (2002: 4) define competence even more broadly, including 'innate abilities, emotions, attitudes, skills and knowledge, and the motivation and ability to apply in certain context'. Gangani, McLean and Braden (2004: 1111) similarly include 'the skills, knowledge, behaviors, personal characteristics, and motivations associated with success in a job'. This adds to the conceptual confusion, since motivation is clearly not a part of competence. A person is said to be 'competent' if they have the requisite KSC, but whether or not they are motivated is a function of a whole range of external and internal factors. Performance can be viewed as a function of KSC, interacting with motivation (the individual's predisposition to perform) and organization (the work conditions facilitating, or hampering, performance).

As Weinert (1999) notes, while motivational incentives in the environment are important in learning and the development of competence, motivation should not be considered a part of competence:

> The developmental status and potential for actualizing a specific cognitive competence is thus always also a function of motivational readiness for systematic learning. Extending the competence concept to include a motivational dimension complicates the defining, measuring and operationalising the competence construct, even as it adds to its theoretical and pedagogical attractiveness of such an approach.(Weinert, 1999: 20).

In considering the assessment of KSC, there is also the question of progression and development, and this can be extrapolated to reference levels. In everyday language, if an individual is 'competent', they can adequately perform the task or job in question, but they are not necessarily demonstrating any particular expertise in executing that role. As Tate (1995b: 82) notes, 'the word "competent" suffers from the connotation of bare sufficiency or adequacy, as opposed to expertise'. In this respect, the UK notion of threshold competence may be contrasted with the US approach where competence is against the yardstick of the best performers. The term 'incompetent' is usually applied to a person who is inept at the tasks they perform, and likely to remain so, whereas 'not yet competent', the terminology of the UK VQ

framework, implies that the individual is expected to attain competence as a result of further development and training. Burgoyne (1988a) questioned this dichotomy and it is perhaps more realistic to consider a continuum of degrees of competence, with a threshold of competence where the individual meets the defined standards, but has scope for developing further skills, knowledge and understanding. Several authors have incorporated a developmental dimension in their definitions of competence, recognizing the need for continual renewal and adaptation in developing competence (Eraut, 1994; Nitardy and McLean,2002; Norris, 1991; Wood and Powers, 1987). This developmental dimension is reflected in the range indicators associated with competence at different VQ levels and with the use of competence frameworks for forecasting future skills needs (Daniels,Erickson and Dalik, 2001; Winterton and Winterton, 2002b; Winterton *et al*, 2000).Such an approach is also consistent with an organization's 'continuous improvement' strategies and the notion of individual progression through lifelong learning.

2.4 Definitions and Categories of Workplace Basic Skills

2.4.1 SCANS Skills

A SCAN is an acronym for the Secretary's Commission on Achieving Necessary Skills, which was created by the U.S. Department of Labor to study the skills needed in the American workplace. The SCANS competencies span the chasm between the worlds of school and the workplace.

The 27 SCANS skills are divided into two categories:

- Foundation Skills ─ skills people bring to a job, also known as transferable skills.
- Functional Skills ─ skills specific to the functions workers perform doing their job.

Foundation Skills:

I. Basic Skills

- **Reading** - Locates, understands, and interprets written information in prose and documents including manuals, graphs, and schedules to perform tasks. Learns from text by determining the main idea or essential message.

- **Writing** - Communicates thoughts, ideas, information, and messages in writing. Composes and creates documents such as letters, directions, manuals, reports, proposals, graphs, and flow charts with language, style, organization, and format appropriate to the subject matter, purpose, and audience.
- **Arithmetic** - Performs basic computations using basic numerical concepts, such as whole numbers and percentages, in practical situations. Uses tables, graphs, diagrams, and charts to obtain or convey quantitative information.
- **Speaking** - Organizes ideas and communicates oral messages appropriate to listeners and situations. Participates in conversations, discussions, and group presentations. Speaks clearly.
- **Listening** - Listens carefully and understands and responds to listener feedback. Receives, interprets, and responds to verbal messages and other cues such as body language.

II. Thinking Skills

- **Creative thinking** - Uses imagination freely. Combines ideas or information in new ways. Makes connections between seemingly unrelated ideas, and reshapes goals in ways that reveal new possibilities.
- **Decision-making** - Specifies goals and constraints. Generates alternatives, considers risks, and evaluates and chooses best alternative.
- **Problem solving** - Recognizes that a problem exists. Identifies possible reasons for the differences and creates and implements a plan of action to resolve them. Evaluates and monitors progress and revises plan as indicated by findings.
- **Knowing how to learn** - can adapt and apply new knowledge and skills to both familiar and changing situations. Is able to use ways of learning, such as note taking and organizing information. Becomes aware of false assumptions that may lead to wrong conclusions.

III. Personal Qualities

- **Responsibility** - Exerts effort and perseverance toward attaining goals. Works to become excellent at doing tasks by setting high standards, paying attention to details, working well even when assigned an unpleasant task, and displaying a high level of concentration.

- **Social skills** - Demonstrates understanding, friendliness, adaptability, empathy, and politeness in new and ongoing group settings. Asserts self in familiar and unfamiliar social situations. Relates well to others. Responds appropriately. Takes an interest in what others say and do.
- **Self-management** - Assesses own knowledge, skills, and abilities accurately; sets well-defined and realistic personal goals. Monitors progress toward goal attainment and motivates self through goal achievement. Exhibits self-control and responds to feedback unemotionally and no defensively. A "self-starter."
- **Integrity/honesty** - Can be trusted. Recognizes when faced with making a decision or acting in ways that may break with commonly held personal or societal values. Understands the impact of violating these beliefs and codes in respect to an organization, self, or others. Chooses an ethical course of action.

Functional Skills:

IV. Resources

- **Manages time** - Selects important, goal-related activities and ranks them in order of importance. Allocates time to activities and understands, prepares, and follows schedules.
- **Manages money** - Uses or prepares budgets, including making cost and revenue forecasts. Keeps detailed records to track budget performance and makes appropriate adjustments.
- **Manages material and facility resources** - Acquires, stores, and distributes materials, supplies, parts, equipment, space, or final products in order to make the best use of them.
- **Manages human resources** - Assesses people's knowledge, skills, abilities, and potential. Identifies present and future workload. Makes effective matches between individual talents and workload. Monitors performance and provides feedback.

V. Systems & Technology

- **Understands systems** - Knows how social, organizational, and technological systems work and operates effectively within them. Makes suggestions to modify systems to improve products or services, and develops new or alternative systems maintenance and quality control.

- **Uses technology** - Judges which set of procedures, tools, or machines will produce the desired results. Understands the overall intent and the proper procedures for setting up and operating machines, including computers and their programming systems. Prevents, identifies, or solves problems in machines, computers, and other technology.

VI. Informational Skills

- **Acquires and evaluates information** - Identifies need for data. Obtains it from existing sources or creates it and evaluates its relevance and accuracy.
- **Organizes and maintains information** – Organizes processes and maintains written or computerized records and other forms of information in a systematic fashion.
- **Interprets and communicates information** - Selects and analyzes information and communicates the results to others using oral, written, graphic, pictorial or multimedia methods.

VII. Interpersonal Skills

- **Participates as a member of a team** - Works cooperatively with others and contributes to group effort with ideas, suggestions, and effort. Resolves differences for the benefit of the team and takes personal responsibility for accomplishing goals.
- **Teaches others** - Helps others obtain necessary information and skills. Identifies training needs and supplies job information to help others see its use and relevance to tasks.
- **Serves clients, customers** - Works and communicates with clients and customers to satisfy their expectations. Actively listens to clients and customers to avoid misunderstandings and identify needs. Communicates in a positive manner, especially when handling complaints or conflict.
- **Exercises leadership** - Communicates thoughts, feelings, and ideas to justify a position; encourages, persuades, convinces, or otherwise motivates an individual or groups; responsibly challenges existing procedures and policies
- **Works with cultural diversity** - Works well with men, women, and those with a variety of ethnic, social, or educational backgrounds. Bases impressions on individual performance, not on stereotypes.

2.4.2 Turning Skills into Profit (1999)

Employers who participated in The Conference Board's ***Turning Skills into Profit (*1999)** study of 25 workplace education programs across the United States identified the following as key **Workplace Basic Skills**:

Literacy Skills

- improved understanding and ability to use 'documents' such as safety instructions, assembly directions or map
- improved understanding and ability to use 'numbers' by themselves or in charts and tables
- improved understanding and ability to use 'prose writing' such as reports, letters and manuals

Other Basic Skills

- improved ability to listen to understand, learn and apply information and analysis
- better ability to communicate by using English in the workplace
- improved capacity to think critically and act logically to evaluate situations, solve problems, and make decisions
- improved ability to use computers and other technology, instruments, tools and information systems effectively

New Attitudes

- greater willingness and ability to learn for life
- more positive attitude toward change

Working with Others

- better ability to build and work in teams
- improved understanding and willingness to work within the culture of the group

2.4.3 The Secretary's Commission on Achieving Necessary Skills (SCANS)

Identified five workplace competencies and a three-part foundation of skills and personal qualities that are needed for solid job performance:

- **Resources** – how to allocate time, money, materials, space and staff
- **Interpersonal Skills** – work on teams, teach others, serve customers, lead, negotiate, and work well with people from culturally diverse backgrounds
- **Information** – acquire and evaluate data, organize and maintain files, interpret and communicate, and use computers to process information
- **Systems** – understand social, organizational, and technological systems; they can monitor and correct performance; and they can design or improve systems
- **Technology** – select equipment and tools, apply technology to specific tasks, and maintain and troubleshoot equipment
- **Foundation Skills** – competent workers in the high-performance workplace need:
- **Basic Skills** – reading, writing, arithmetic and mathematics, speaking and listening
- **Thinking Skills** – the ability to learn, to reason, to think creatively, to make decisions, and to solve problems
- **Personal Qualities** – individual responsibility, self-esteem and self-management, sociability, and integrity

2.4.4 The National Skills Standards Board

Identified a common language for describing academic and employability skills:

Academic Knowledge and Skills Categories:

- reading, writing, mathematics and science

Employability Knowledge and Skills Categories:

- listening, speaking; using information and communications technology; gathering and analyzing information; analyzing and solving problems; making decisions and judgments; organizing and planning; using social skills; adaptability; working in teams; leading others; building consensus; and self and career development

2.4.5 The Conference Board of Canada

Employability Skills - as identified by The Conference Board of Canada, are the skills, attitudes and behaviors that you need to participate and progress in today's dynamic world of work:

Fundamental Skills - skills needed as a base for further development

- Communicate
- Manage information
- Use numbers
- Think and solve problems

Personal Management Skills - personal skills, attitudes and behaviors that drive one's potential for growth

- Demonstrate positive attitudes and behaviors
- Be responsible
- Be adaptable
- Learn continuously
- Work safely

Teamwork Skills - skills and attributes needed to contribute productively

- Work with others
- Participate in projects and tasks

2.4.6 CASAS Competency List

The CASAS Competency List focuses on learners' goals for adult and secondary level learners:

Basic Communication

- Communicate in interpersonal interactions
- Communicate regarding personal information

Consumer Economics

- Use weights, measures, measurement scales and money
- Apply principles of comparison shopping in the selection of goods and services

- Understand methods and procedures used to purchase goods and services
- Understand methods and procedures to obtain housing and related services
- Apply principles of budgeting in the management of money
- Understand consumer protection measures
- Understand procedures for the care, maintenance, and the use of personal possessions
- Use banking and financial services in the community

Community Resources

- Use the telephone and telephone book
- Understand how to locate and use different types of transportation and interpret related travel information
- Understand concepts of time and weather
- Use postal services
- Use community agencies and services
- Use leisure time resources and facilities
- Understand aspects of society and culture

Health

- Understand how to access and utilize the health care system
- Understand medical and dental forms and related information
- Understand how to select and use medications
- Understand basic principles of health maintenance

Employment

- Understand basic principles of getting a job
- Understand wages, benefits and concepts of employee organizations
- Understand work-related safety standards and precautions
- Understand concepts and materials related to job performance and training
- Effectively utilize common workplace technology and systems
- Communicate effectively in the workplace
- Effectively manage workplace resources

- Demonstrate effectiveness in working with other people
- Understand how social, organizational, and technological systems work, and operate effectively within them

Government and Law

- Understand voting and the political process
- Understand historical and geographical information
- Understand and individual's legal rights and responsibilities and procedures for obtaining legal advice
- Understand information about taxes
- Understand governmental activities
- Understand civic responsibilities and activities
- Understand environmental and science-related issues

Computation

- Demonstrate pre-computation skills
- Compute using whole numbers
- Compute using decimal fractions
- Compute using fractions
- Compute with percents, rate, ratio and proportion
- Use expressions, equations and formulas
- Demonstrate measurement skills
- Interpret data from graphs and compute averages
- Use statistics and probability
- Use estimation and mental arithmetic

Learning to Learn

- Identify or practice effective organizational and time management skills in accomplishing goals
- Demonstrate ability to use thinking skills
- Demonstrate ability to use problem solving skills
- Demonstrate study skills
- Understand aspects of and approaches to effective personal management

Independent Living Skills

- Perform self-care skills
- Perform home-care skills
- Use support resources to assist in maintaining independence and achieving community integration

2.5 Relevance research

Cook (1999). The basic purpose of the implementation of a program to evaluate task oriented performance is to achieve an acceptable level of overall performance. To reach the desired level of consistency, the department needs to document the program and adopt that program as part of the department's administrative guidelines. "Rules and procedures are a vital part of control and are an essential component of the management process. In any organization, control is necessary to minimize risk and ensure predictable outcomes during standard operations".

McLagan (1997). The Educational Psychology approach focuses on specifying the full range of competencies required for successful job performance; the differentiation of superior performers from others is not seen as crucial. The emphasis is on developing people so they will be successful. Knowledge and skills that easily can be taught and developed are perceived as important, as well as more complex abilities and personal characteristics that are more difficult to develop. Important applications of competencies in Educational Psychology are in identifying the competencies workers need in order to become effective performers and creating performance management, training, and other development programs to help them build these competencies.

Jiang (1994). Surveyed business and industry recruiters to determine the skill expectations of employers of new college graduates and if the skill expectations are changing. Respondents used a questionnaire to rate the importance of the skills from 1 (not important) to 3 (most important). Communication, management, and motivation skills were identified as most important for the information systems (IS) and the non information systems graduates. Business and organizational knowledge and computer skills were rated as least important for both graduates. People skills

were ranked least important for IS graduates and analytical skills were least important for non-IS graduates.

Moses (1988). collected skills, knowledge, and work attitudes data from Lansing employers and incumbent, first year entry-level office employees. Specifically, the researcher sought to determine if significant differences existed between the perceptions of the groups according to the size of the business office and the type of business organization. The results indicated significant differences did exist between the perceptions of the groups in the areas of word processing, data processing, keyboarding/typing, work attitudes, and computations. Also, significant differences were found among the respondents based on the sizes and types of business offices.

Methaporn (2007). A Work Load Assignment and Performance Measurement System in Collection & Debt Enforcement. Present Work Load Assignment System is positioned as importance strategy of Department of Policy's Company. So, there is an idea to develop a mechanism system to support this business. In the current system, users have to manual assign work load data from systems to service agent and this process use waste time. That is a reason why this project tries to improve the process by semi-automatic system to support the Collection & Debt Enforcement Department by using a single system.

The result of this independent study project is the system that can help operation support office to assign work load and measure performance easier and can use useful time of work to produce other transactions too. The benefit of this project can improve performance of Collection & Debt Enforcement Department to support its agent, and the system helpful reduces cost of training.

Kriangsak (2007). Development of IT Project Personnel Workload Tracking System, The Case of Thai Airways International Pcl. This project brings information technology to ease and improve process of time and workload tracking of Thai Airways International, Information Technology Services Group's personnel contributing in development and implementation of new information technology projects, existing systems maintenance through system modification requisition system and helpdesk incident management system, and some special assignment in research and development attempts. The developed system will provides means in

standardized the information gathering of newly established projects, the contributions of each workers in each work areas, in order to feedback higher management be able to have better view of work management and resources allocation.

As a result, this independent study provides Workload Tracking System or WLT, the prototype information system that visualizes the on-going workload pursued under each work group and laid down the foundation for future improvement or enhancement to cope with full project or portfolio management

Jurairat (2003). The purpose of this research was to investigate the desirable characteristics of human resources officers according to the executives' opinion of Nestle (Thailand) Ltd. By using Delphi Technique. The sample consisted of 17 officers: 6 human resource executives and 11 corporate affair executives. The research instrument was the questionnaire of the desirable characteristics of human resources officers according to the executives' opinion of Nestle (Thailand) Ltd. The median, interquartile range, quartile deviation, mode, mean, and standard deviation were used to analyze the data. The degrees of the opinions' congruence or agreement were determined by the interquartile range.

The results of the research study were as follows: The opinions of the human resource executives and the corporate affair executives were high on the following desirable characteristics of human resources officers:

1. Human resource management task knowledge and abilities in recruitment, training, employee relations, compensation, and benefits maters.

2. Task thinking abilities: analytical and initiative thinking abilities.

3. Personality characteristics: self-confidence, well groomed, active and enthusiasm, polite, interpersonal adjustment abilities, diligence, attempting to acquire knowledge and skills, and task endurance.

4. Work Attitudes: high attitude in recruitment, training, employee relations, compensation, and benefit matters. The data also showed the congruency between the opinions on the desirable characteristics of human resources officers of the human resource executives and the corporate affair executives.

CHAPTER III
RESEARCH METHODOLOGY

3.1 Steps and Research Methodology

This chapter describes materials and method used in this research. The materials are both hardware and software using this research. For methodology, the System Development Life Cycle (SDLC) is an organized approach used to develop the system and illustrated the developing steps.

3.1.1 Data and Information Gathering

Collect data and Information of existing system to analyze and design the system by

- To study the problem, requirement and suggestion from project administrator and staffs of Department of Chemical Engineering Faculty of Engineering, Mahidol University by interview.
- To study about relevant theories and research for the Knowledge of Task Analysis System
- To study software program and tool which use to develop the web based Task Analysis System
- Gather all activities (document, project, etc.) from the Department of Chemical Engineering Faculty of Engineering, Mahidol University.

3.1.2 Requirement Analysis

All data and information that made understanding problem and defining user requirement are analyzed to identify new system specification.

3.1.3 System Analysis and Design

This Phase will use data from study, document ad interviewing to design system. This system consists of:

1) System Analysis Phase: In the system analysis phase, involved the identification of requirements and features of new system. The aim of this phase is to analyze and defines system to be built. Attributes, table and relationship of table will be define, then Data Flow Diagram, which comprise a structural technique to chart graphically the input, process and output of the system, will be created. The E-R diagram that used to represent the conceptual design of database systems are also to identified relationships of tables.

2) System Design Phase: Database designs bases on relational model of the data contained in tables. The structure of the database is determined during this step, database design provides a data model that supports any transaction require on the data, Primary keys are identified for each table and relationship between table will be identified either. After the design, the database will be normalized.

3) User Interface design requires understanding of human factor and interface technology. Input and Output screens. Which communicated with users, will be designed.

3.1.3.1 E-R Diagram

E-R Diagram can be created during analysis phrase. The Task Analysis System for department of chemical engineering faculty of engineering, mahidol university try to design in relational database that shown in Figure 3.1

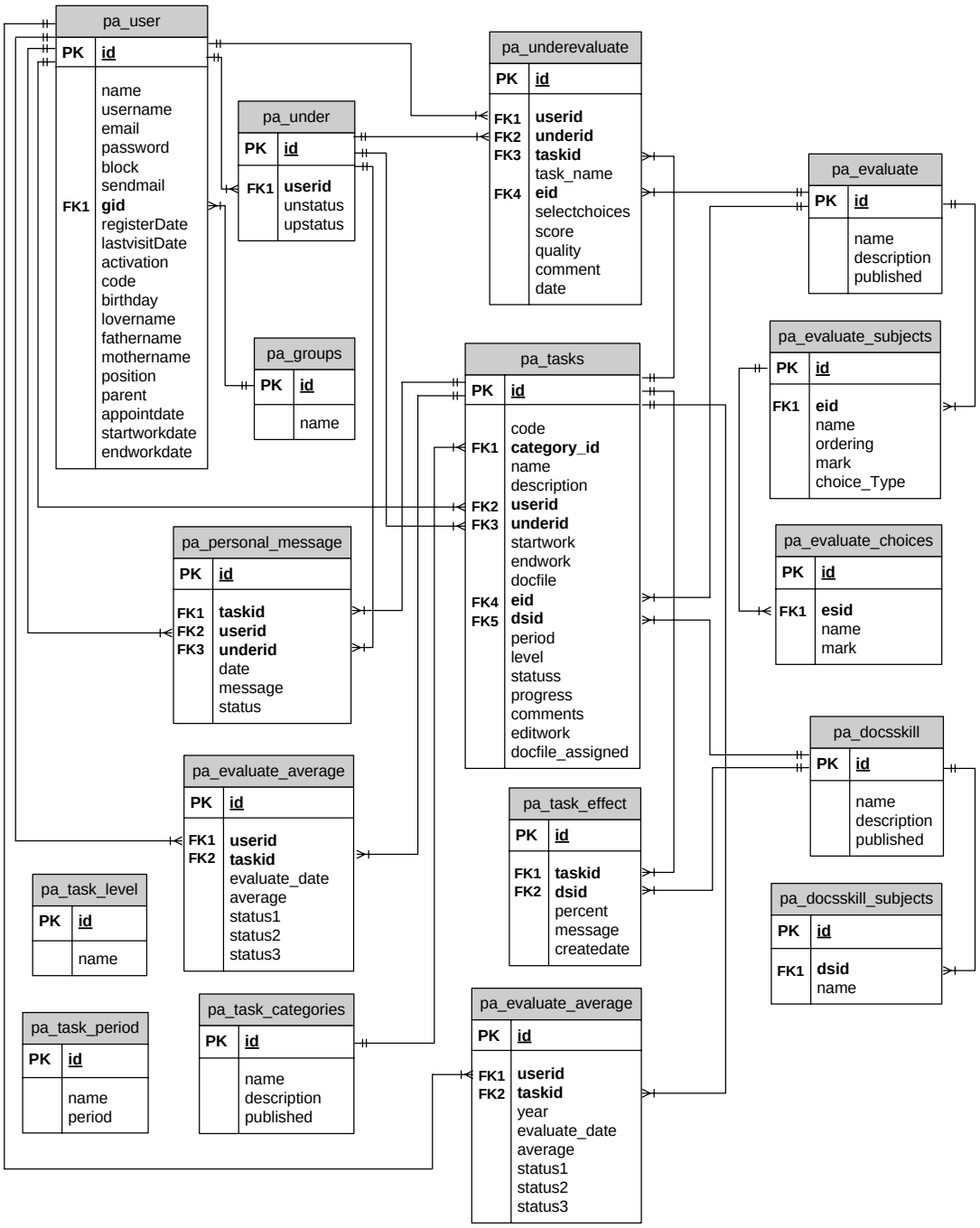


Figure 3.1: An Entity-Relationship (E-R) Diagram of system

3.1.3.2 Data Flow Diagram

The data flow diagram of the Task Analysis System for department of chemical engineering faculty of engineering, Mahidol University has been studied and analyzed data as follow:

Context Diagram

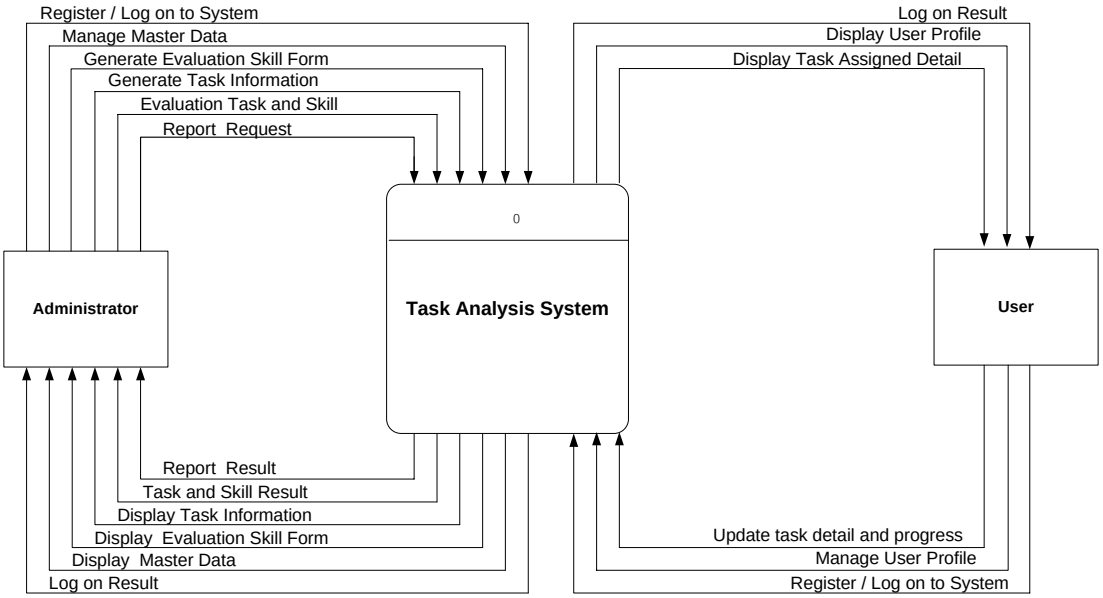


Figure 3.2: Context Diagram of Task Analysis System

- The administrator logon to the system with the username and password. The system will be verified the authorization to be access the system.
- The administrator manages master data to the system.
- The administrator generates evaluation skill form to the system.
- The administrator generates task information to the system.
- The administrator evaluation task and skill.
- The administrator request for report.
- The user logon to the system with the username and password. The system will be verified the authorization to be access the system.
- The user manages user profile.
- The user updates task detail and progress.
- The system displayed report.

Data Flow Diagram Level 0

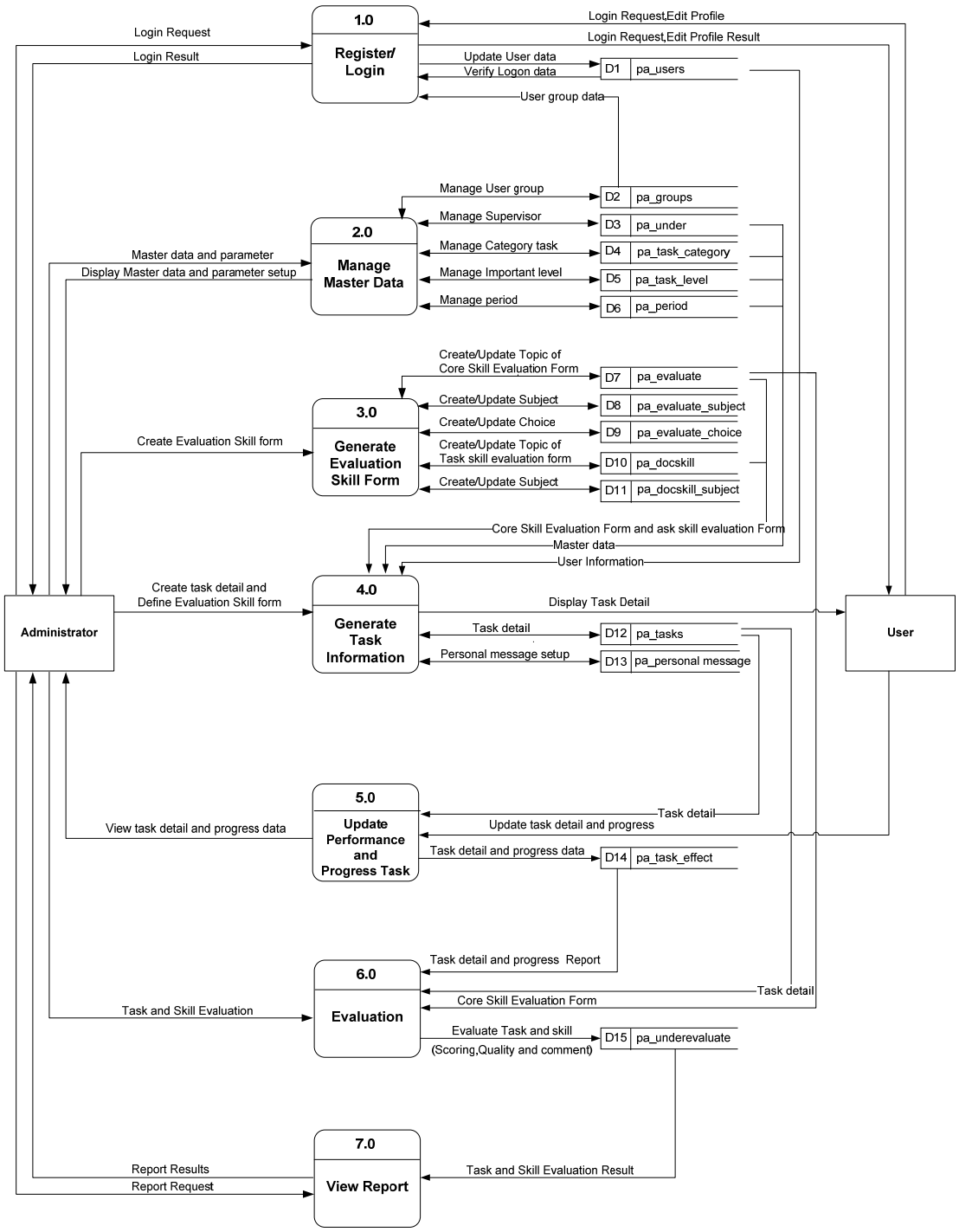


Figure 3.3: Data Flow Diagram Level 0 of Task Analysis System

Level 0: Data Flow diagram presents data source which consists of 7 processes

Process 1: Register/ Login

Process 2: Manage Master Data

Process 3: Generate Evaluation Skill Form

Process 4: Generate Task Information

Process 5: Update Performance and Progress Task

Process 6: Evaluation

Process 7: View Report

Login/Register Process Data Flow Diagram Level 1

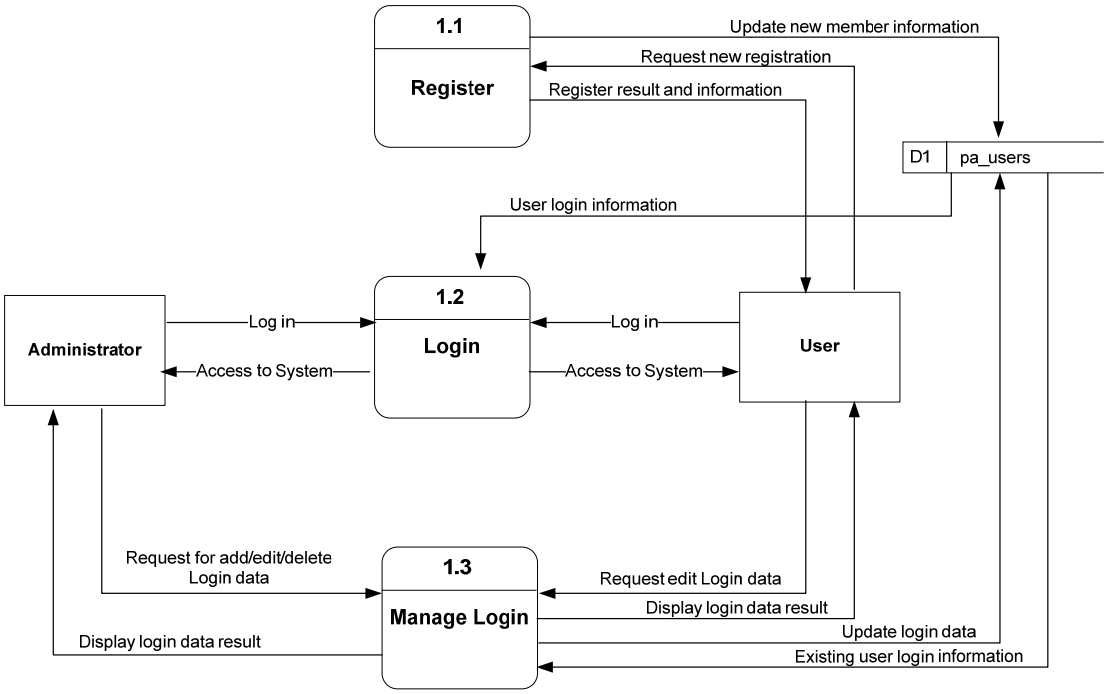


Figure 3.4: Data Flow Diagram Level1 of Register/Login Process

Process 1.1: Register process

- The user request for new registration.
- The system displays the register results.
- The system updates the register information to database.

Process 1.2: Login process

- The user request login to the system.
- The administrator login to the system.

- The system verifies login information to access the system.

Process 1.3: Manage Login process

- The user request for edit login to the system.
- The administrator request for add, edit and delete login data.
- The system retrieves the existing data and updates the new data to the database.

Manage Master Data Process Data Flow Diagram Level 1

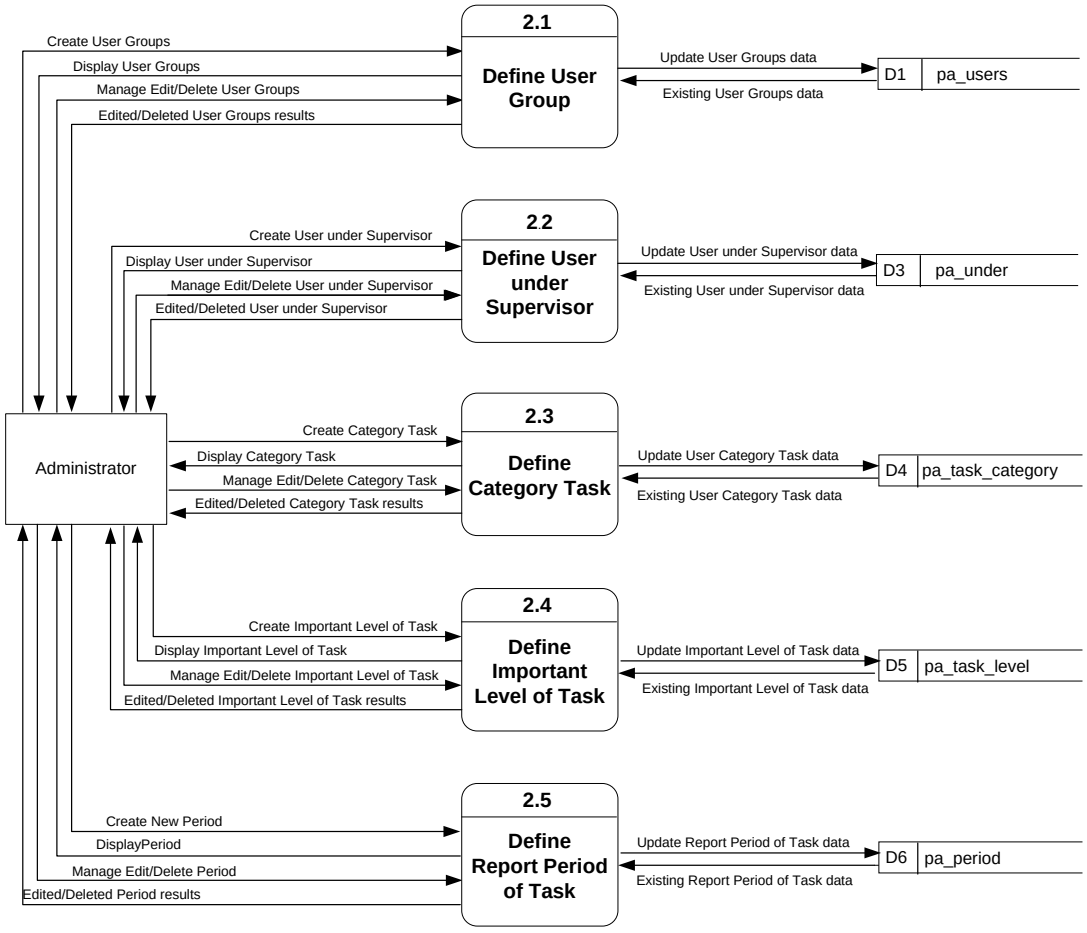


Figure 3.5: Data Flow Diagram Level1 of Manage Master Data Process

Process 2.1: Define User Group process

- The administrator creates user groups.
- The administrator edits or deletes user groups from the existing data in the system.
- The system displayed user groups which already been updated into the system.
- The system retrieved the existing data and updates the new data to the database.

Process 2.2: Define User under Supervisor process

- The administrator creates user under supervisor.
- The administrator edits or deletes user under supervisor from the existing data in the system.
- The system displayed user under supervisor which already been updated into the system.
- The system retrieved the existing data and updates the new data to the database.

Process 2.3: Define Category Task process

- The administrator creates category task.
- The administrator edits or deletes category task from the existing data in the system.
- The system displayed category task which already been updated into the system.
- The system retrieved the existing data and updates the new data to the database.

Process 2.4: Define Important Level of Task process

- The administrator creates important level of task.
- The administrator edits or deletes important level of task from the existing data in the system.

- The system displayed important level of task which already been updated into the system.
- The system retrieved the existing data and updates the new data to the database.

Process 2.5: Define Report Period of Task of process

- The administrator creates report period of task.
- The administrator edits or deletes report period of task from the existing data in the system.
- The system displayed report period of task which already been updated into the system.
- The system retrieved the existing data and updates the new data to the database.

Generate Evaluation Skill Form Process Data Flow Diagram Level1

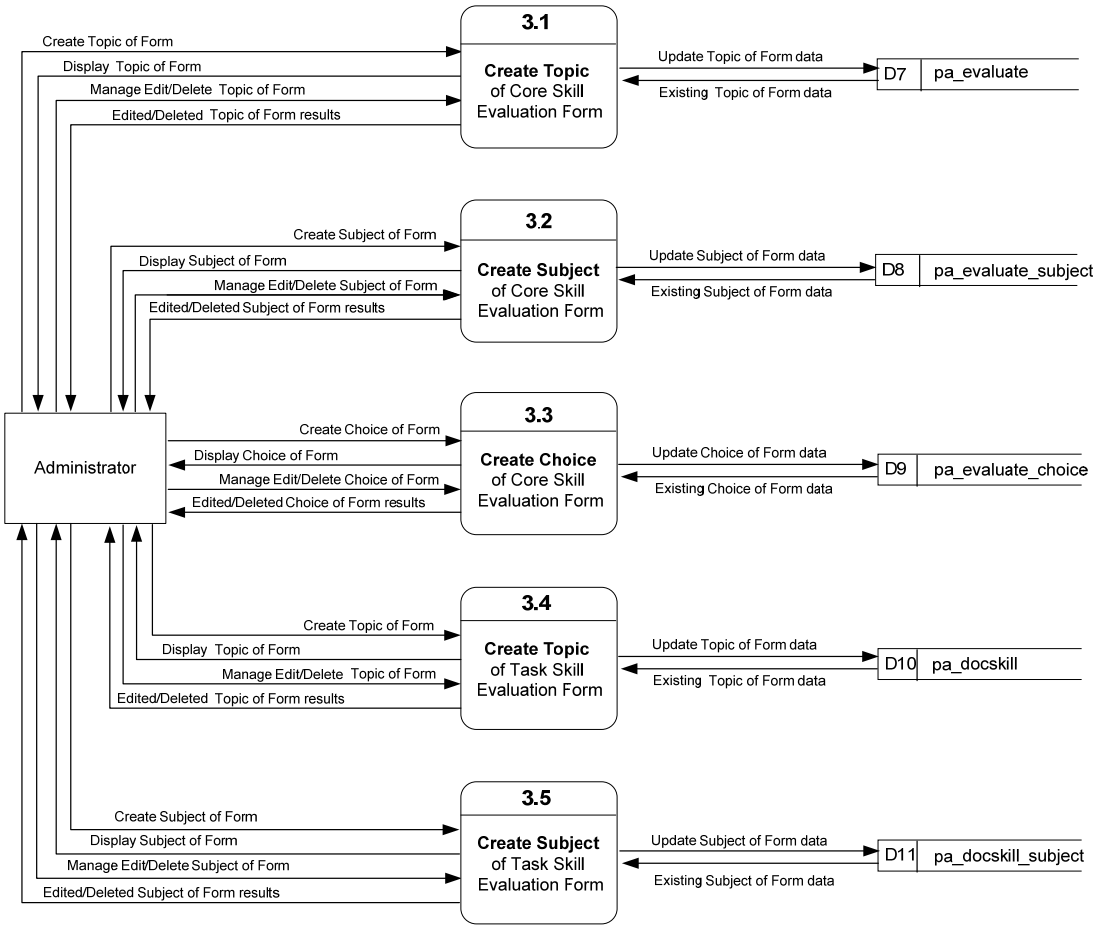


Figure 3.6: Data Flow Diagram Level1 of Generate Evaluation Skill Form Process

Process 3.1: Create Topic of Core Skill Evaluation Form process

- The administrator creates topic of core skill evaluation form.
- The administrator edits or deletes topic of core skill evaluation form from the existing data in the system.
- The system displayed topic of core skill evaluation form which already been updated into the system.
- The system retrieved the existing data and updates the new data to the database.

Process 3.2: Create Subject of Core Skill Evaluation Form process

- The administrator creates subject of core skill evaluation form.
- The administrator edits or deletes subject of core skill evaluation form from the existing data in the system.
- The system displayed subject of core skill evaluation form which already been updated into the system.
- The system retrieved the existing data and updates the new data to the database.

Process 3.3: Create Choice of Core Skill Evaluation Form process

- The administrator creates choice of core skill evaluation form.
- The administrator edits or deletes choice of core skill evaluation form from the existing data in the system.
- The system displayed choice of core skill evaluation form which already been updated into the system.
- The system retrieved the existing data and updates the new data to the database.

Process 3.4: Create Topic of Task Skill Evaluation Form process

- The administrator creates topic of task skill evaluation form.
- The administrator edits or deletes topic of task skill evaluation form from the existing data in the system.
- The system displayed topic of task skill evaluation form which already been updated into the system.
- The system retrieved the existing data and updates the new data to the database.

Process 3.5: Create Subject of Task Skill Evaluation Form process

- The administrator creates subject of task skill evaluation form.
- The administrator edits or deletes subject of task skill evaluation form from the existing data in the system.

• The system displayed subject of task skill evaluation form which already been updated into the system.

• The system retrieved the existing data and updates the new data to the database.

Generate Task Information Process Data Flow Diagram Level1

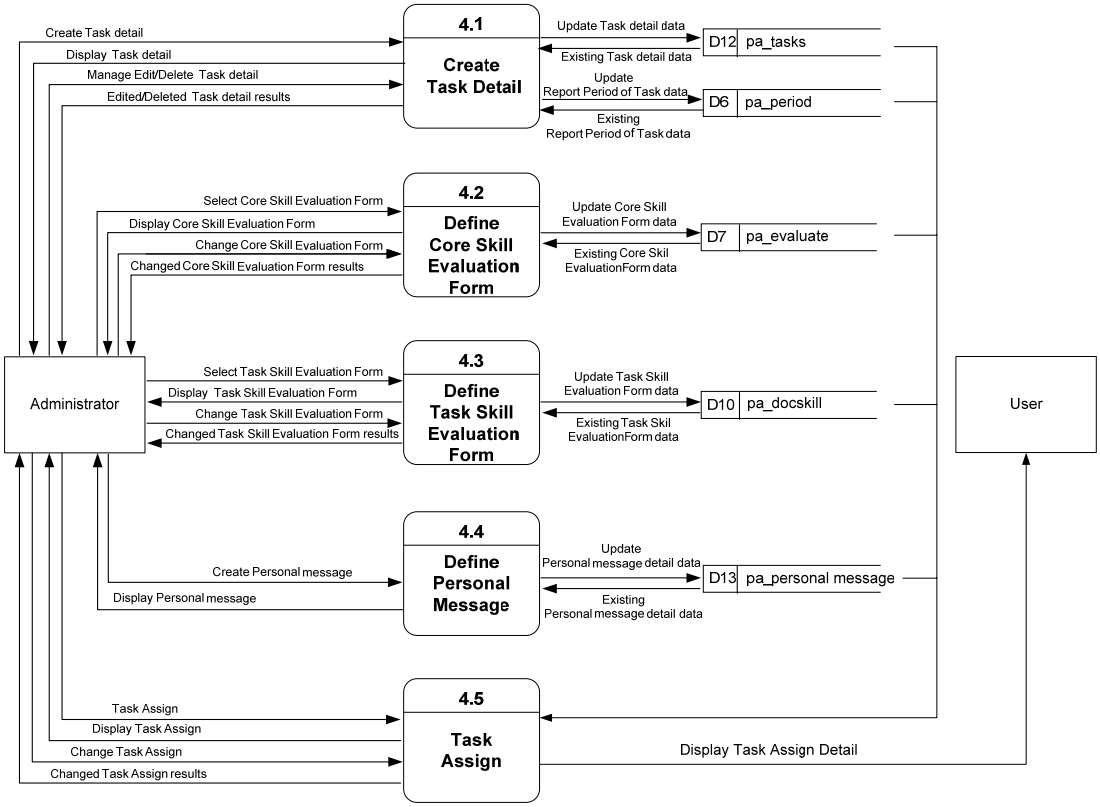


Figure 3.7: Data Flow Diagram Level1 of Generate Task Information Process

Process 4.1: Create Task Detail process

• The administrator creates detail of task.

• The administrator edits or deletes detail of task from the existing data in the system.

• The system displayed detail of task which already been updated into the system.

- The system retrieved the existing data and updates the new data to the database.

Process 4.2: Define Core Skill Evaluation Form process

- The administrator selects core skill evaluation form from the existing data in the system.
- The administrator change Core Skill Evaluation Form.
- The system displayed all the changes of existing data.
- The system retrieved the existing data and updates the new data to the database.

Process 4.3: Define Task Skill Evaluation Form process

- The administrator selects task skill evaluation form from the existing data in the system.
- The administrator change Task Skill Evaluation Form.
- The system displayed all the changes of existing data.
- The system retrieved the existing data and updates the new data to the database.

Process 4.4: Define Personal Message process

- The administrator define personal message.
- The system displayed personal message.

Process 4.5: Task Assign process

- The administrator assigns task.
- The administrator changes task assign.
- The system displayed task assign data.
- The system retrieved the existing data and updates the new data to the database.

Update Performance and Progress Task Process Data Flow Diagram Level1

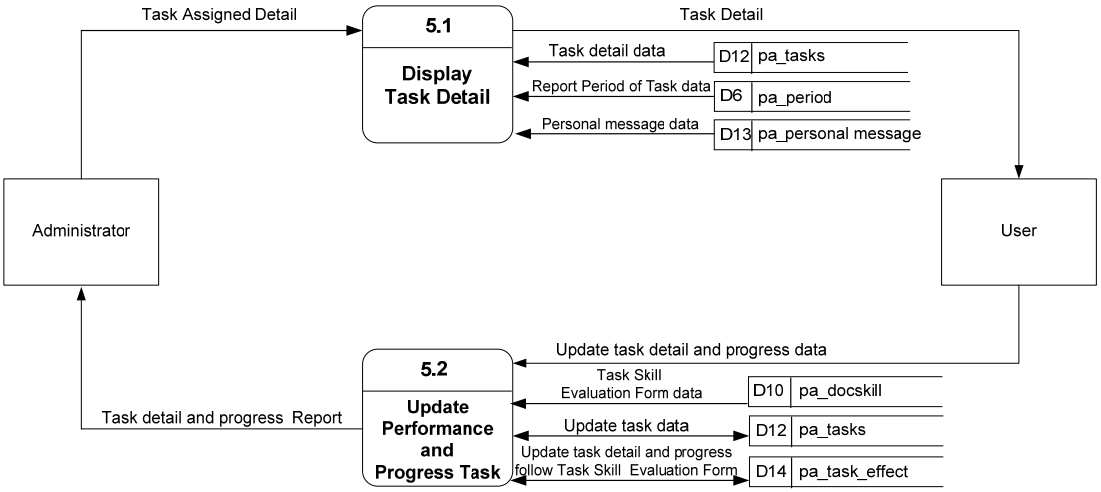


Figure 3.8: Data Flow Diagram Level1 of Update Performance and Progress Task Process

Process 5.1: Display Task Detail process

- The administrator assigned task detail.
- The system displayed task detail data.

Process 5.2: Update Performance and Progress Task process

- The user updated task detail and progress data into the system
- The system displayed task detail and progress report.

Evaluation Progress Task Process Data Flow Diagram Level1

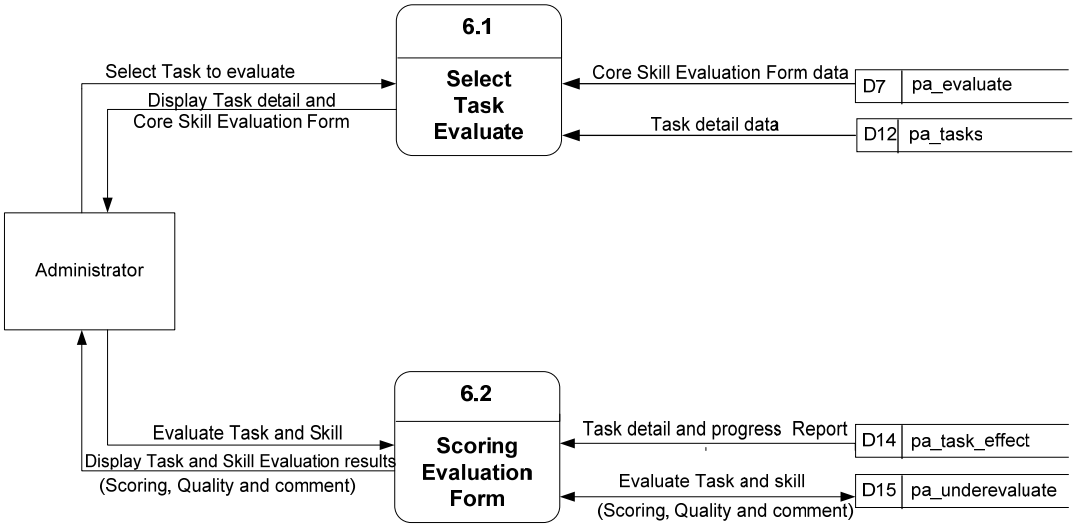


Figure 3.9: Data Flow Diagram Level1 of Evaluation Process

Process 6.1: Select Task Evaluate process

- The administrator selected task detail data from the existing data in the system.
- The system displayed task detail and core skill evaluation form.

Process 6.2: Scoring Evaluation Form process

- The administrator evaluates task and skill.
- The system displayed task and skill evaluation result (scoring, quality and comment).

View Report Progress Task Process Data Flow Diagram Level1

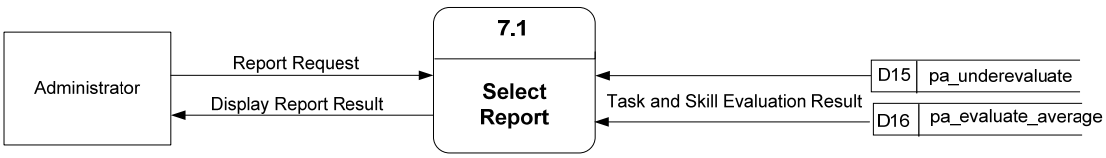


Figure 3.10: Data Flow Diagram Level1 of View Report Process

Process 7.1: Select Report process

- The administrator requests report.
- The system displayed report result.

3.1.4 System Development

All the information in analysis and design phase will be used to develop a Task Analysis System for Department of Chemical Engineering Faculty of Engineering, Mahidol University.

3.1.5 Testing

After the development of this application is completed, it is required to test it for finding errors. The debugging process will be used if there is error occurred.

3.1.6 Implementation

Implement the system.

3.1.7 Results

After Implementation and Testing, the result is the complete application that works properly.

3.2 Research Tools

3.2.1 Hardware Specification (Minimum requirement)

Server

- CPU : Pentium IV 2.0 GHz.
- Memory : 1 GB.
- Hard Disk : 80 GB.
- Monitor : VGA
- Peripheral : Mouse and keyboard
- Network Device : 10/100/1000 Ethernet NIC

Client

- CPU : Pentium IV 1.6 GHz.
- Memory : 512 MB
- Hard Disk : 40 GB.
- Monitor : VGA
- Peripheral : Mouse and keyboard
- Network Device : 10/100/1000 Ethernet NIC and Internet connection for public access.

3.2.2 Software Specification

Server

- Operating System : Microsoft Windows Server 2008
- Database Server : MySQL
- Web Server : Apache

Client

- Operating System : Microsoft Windows XP Service Pack3
- Web Browsers : Microsoft Internet Explorer 7.0

Development Tools : PHP, EditPlus, Macromedia Dreamweaver, Adobe Photoshop

3.3 Research Schedule

The study consumes time as table below

Table 3.1 Research Schedule

Plan	Month							
	Dec	Jan	Feb	Mar	April	May	June	July
1. Preliminary planning and gather related information								
2. Determine function specification								
3. System Analysis and design								
4. System Development								
5. Test and Document								

CHAPTER IV
RESULTS

The task analysis system development is composed of two main functions; administrator and users interfaces.

4.1 Administrator Interface

The administrator interface is mainly designed for the task analysis system administrator/evaluator to manage user, create evaluation form, and other form mainly used in this application. The feature in this application interface as shown in the menu bar is composed of:

A = Home

B = Member

C = Evaluation of skills / abilities Form

D = Task Category

E = Important Level

F = Report

There are 4 windows in the main screen as follows;

1. The menu bar area which used to control the system menu.
2. The logon status window which displayed the current access or logon user.
3. The task menu which used to create tasks and view all tasks.
4. The system displayed topic and detail of task received and the assignments.

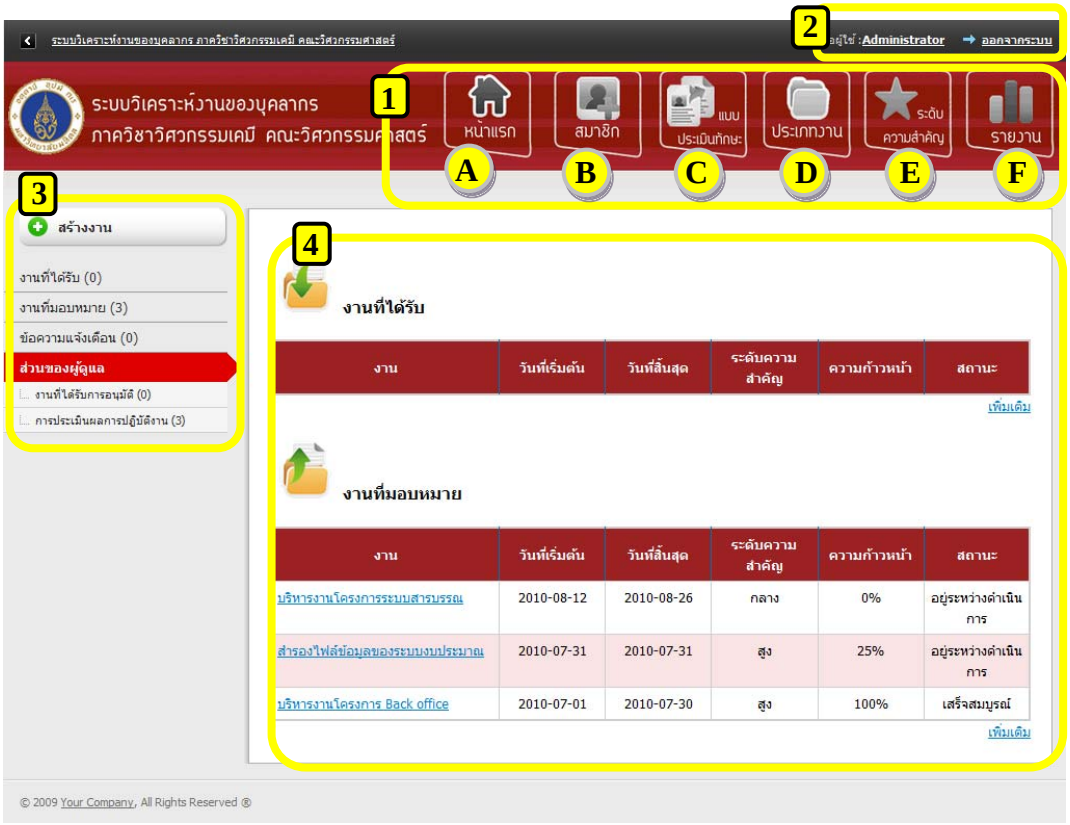


Figure 4.1 The main page of log on as an administrator

4.1.2 Create Evaluation of skills / abilities Form

In the function “Evaluation of skills / abilities Form” the administrator/ evaluator (only) can create new form to define the evaluation skill factors which composed of two major parts i.e. Core Skill Evaluation and Task Skill Evaluation Form

The “Core Skill Evaluation Form” is an input form for major evaluation criteria such as knowledge, skills, and abilities that can be observed and measured, as shown in figure 4.2 and 4.3. The process to develop the core skill evaluation form is composed of following steps;

A = Creating Topic of Core Skill Evaluation Form and detail of evaluation which can be defined the publishing status as publish or unpublished.

B = Creating Subject for each topic as predefined in step “A” and defining the factors for evaluation (Name, Set score, Type of choice).

C = Creating Multiple Choices for Core Skill Evaluation Form and define score of each choice.

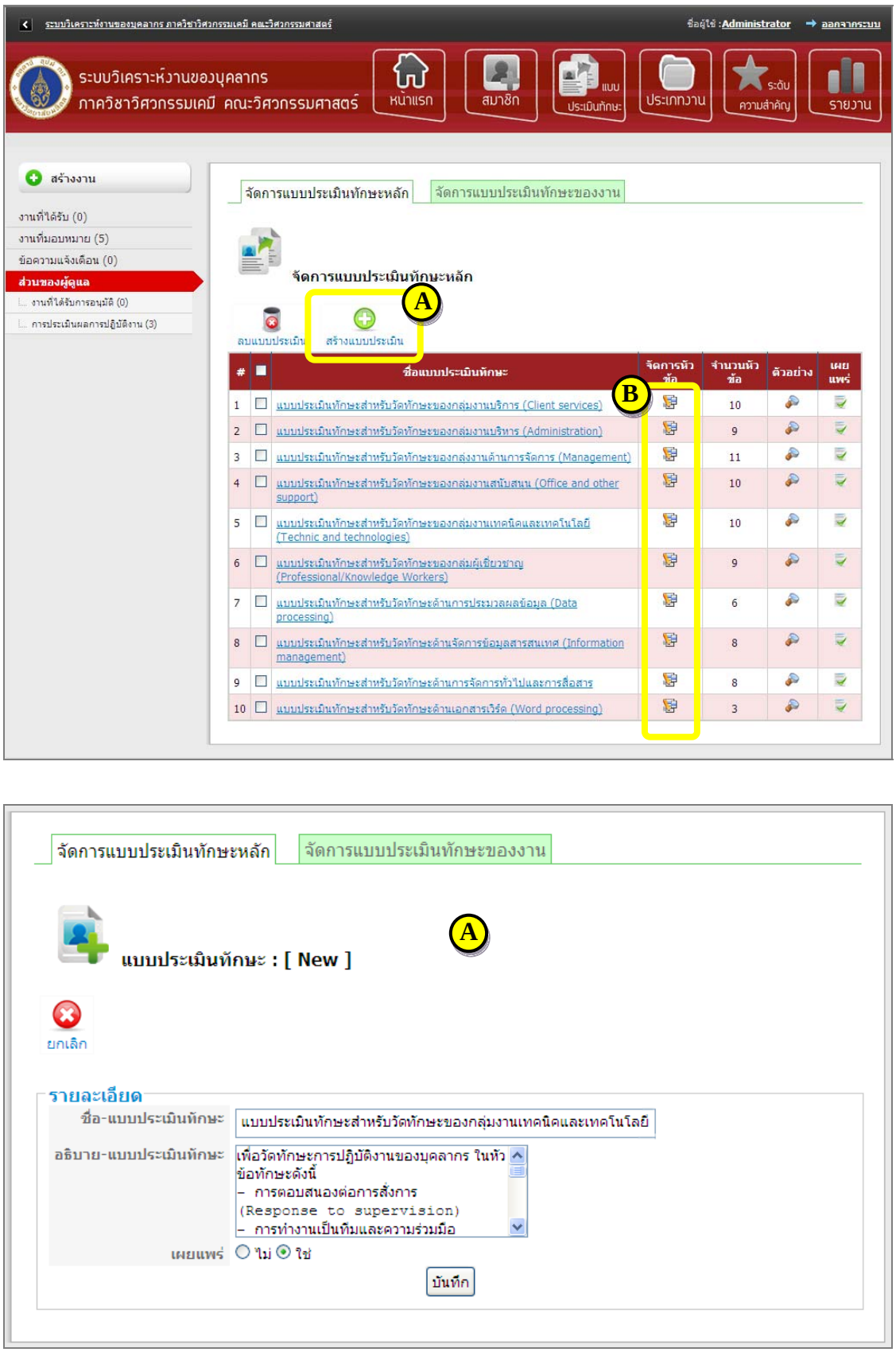


Figure 4.2 The page for create topic “Core Skill Evaluation Form”

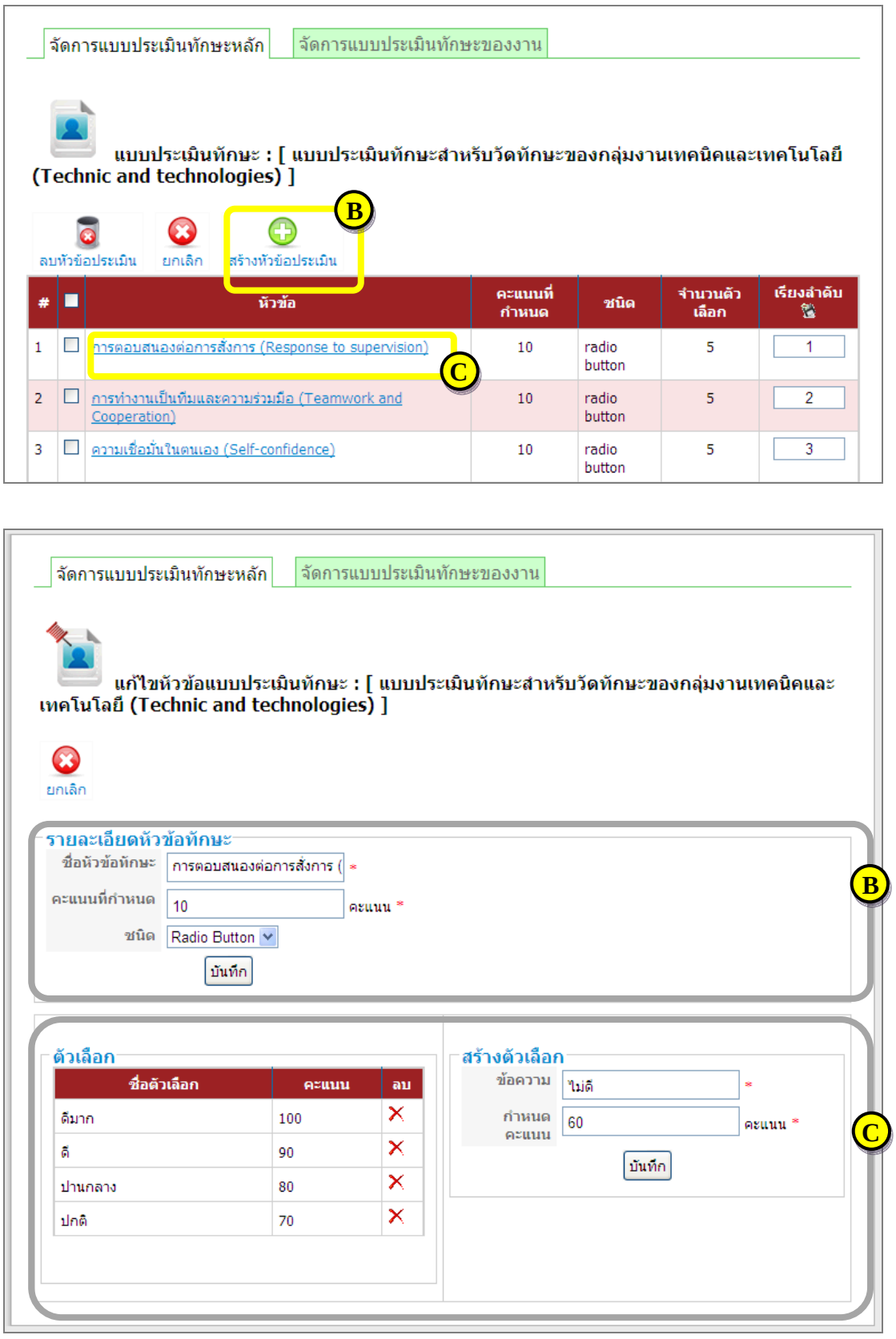


Figure 4.3 The page for create subject and choice “Core Skill Evaluation Form”

"Task Skill Evaluation Form" skill and ability evaluation for each task, as shown in figure 4.4 and 4.5. These composed of;

A = Creating Topic of Task Skill Evaluation Form and detail of the topic this also including the status of the topic whether publish or unpublished.

B = Creating Subject for topic of Core Skill Evaluation Form and define the factors for updating process .

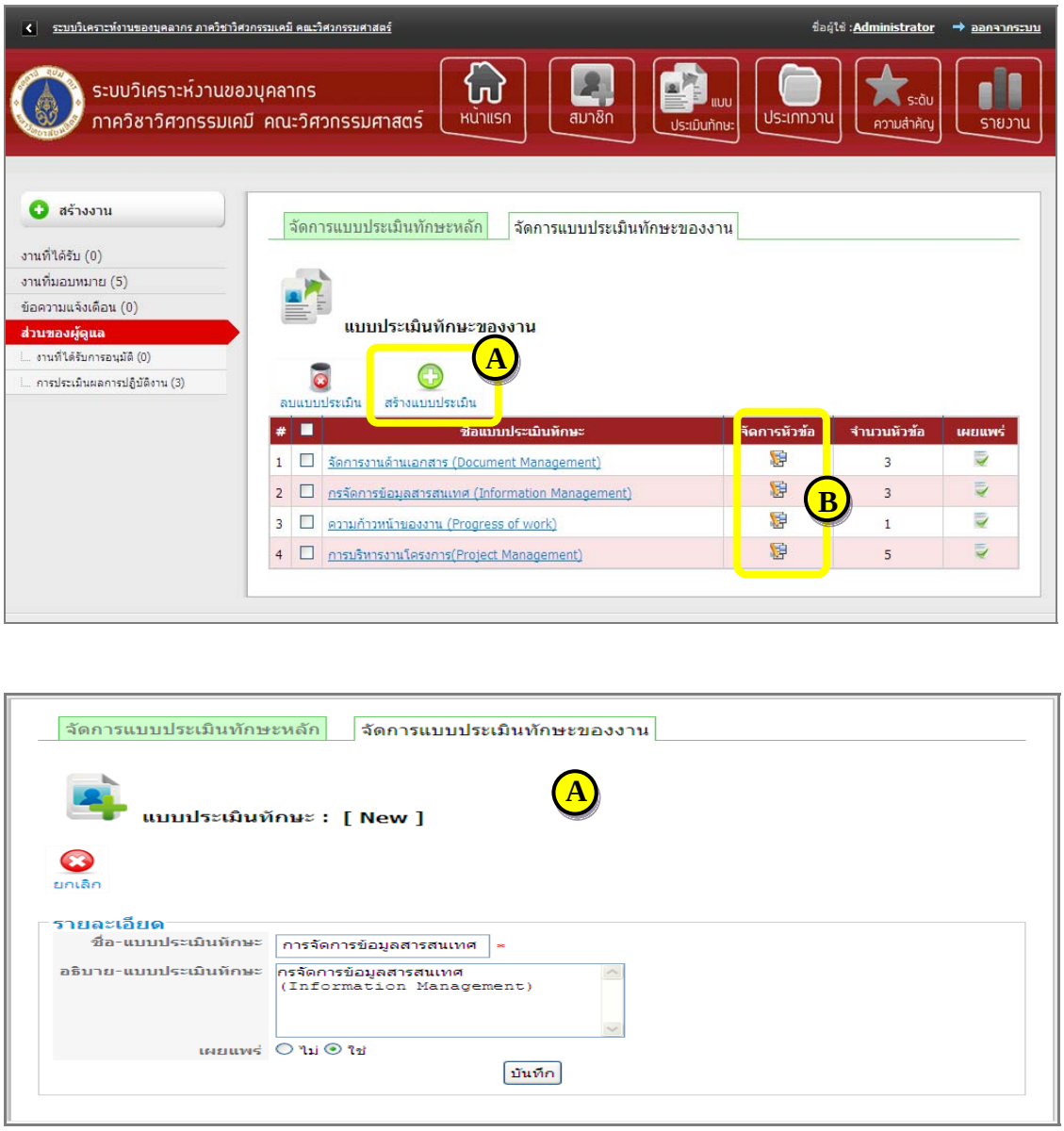


Figure 4.4 The page for create topic "Task Skill Evaluation Form"

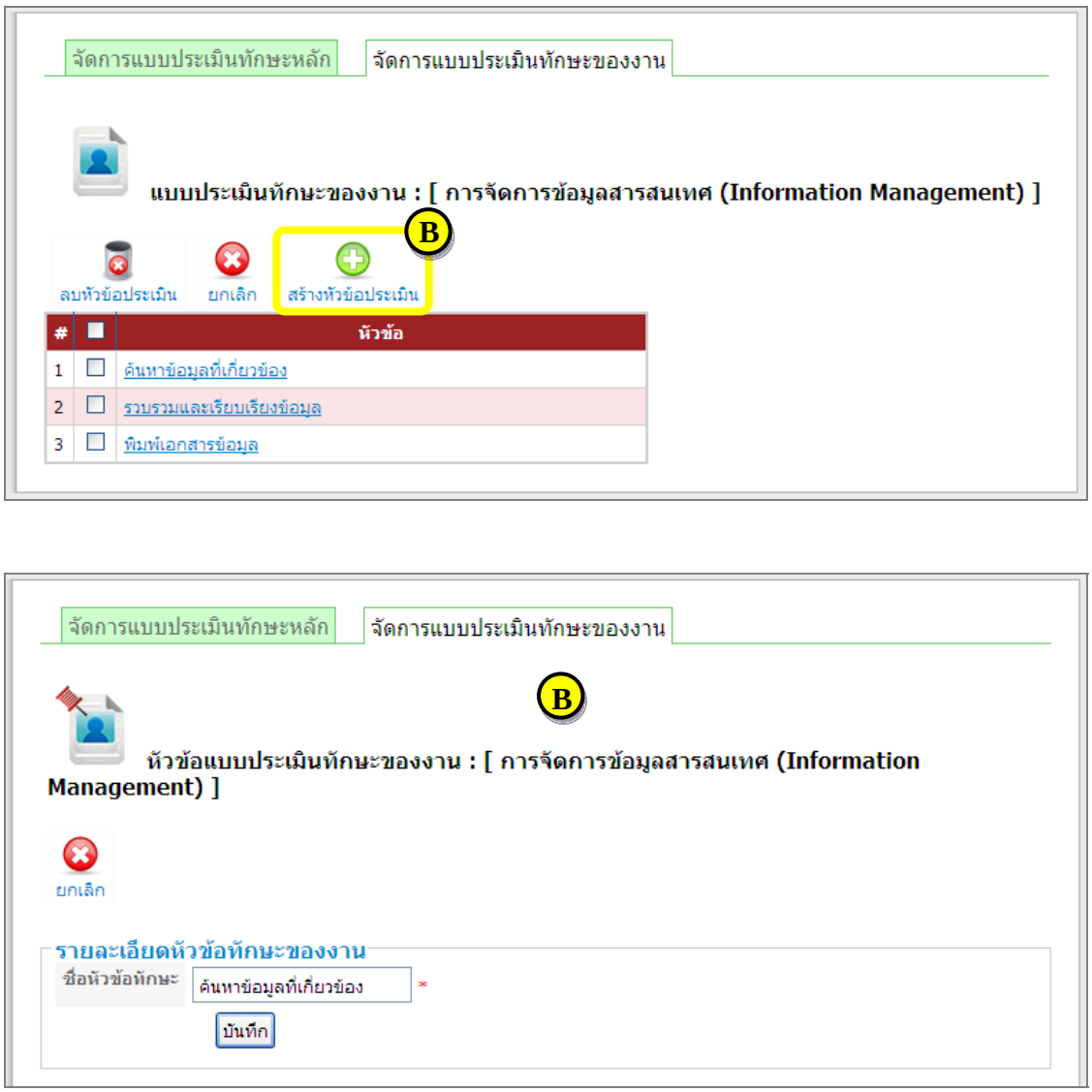


Figure 4.5 The page for create subject “Task Skill Evaluation Form”

4.1.3 Create Task

In the function “Creating Task” the administrator/evaluator or user can choose “Create Task” from left menu, as shown in figure 4.6. These composed of;

A = Define number command and name of task.

B = Selection the “Evaluation of skills / abilities Form” that are available in the system both two parts. (Core Skill Evaluation Form and Task Skill Evaluation Form).

C = Selection the “category” that are available in the system and detail of task.

D = Selection the assignment and receiver task.

E = Define the period of task.

F = Define the important level of task.

G = Define the report period of task.

H = Define the personal message for send to receiver task (Detail, Day and Time).

I = Attached file for task.

Figure 4.6 The page for create task

4.1.4 Task Monitoring

This task monitoring feature is used to help administrator/ evaluator to monitoring the progress and status of task, as shown in the figure 4.7-4.9. These composed of;

A = Display detail of progress and status of task

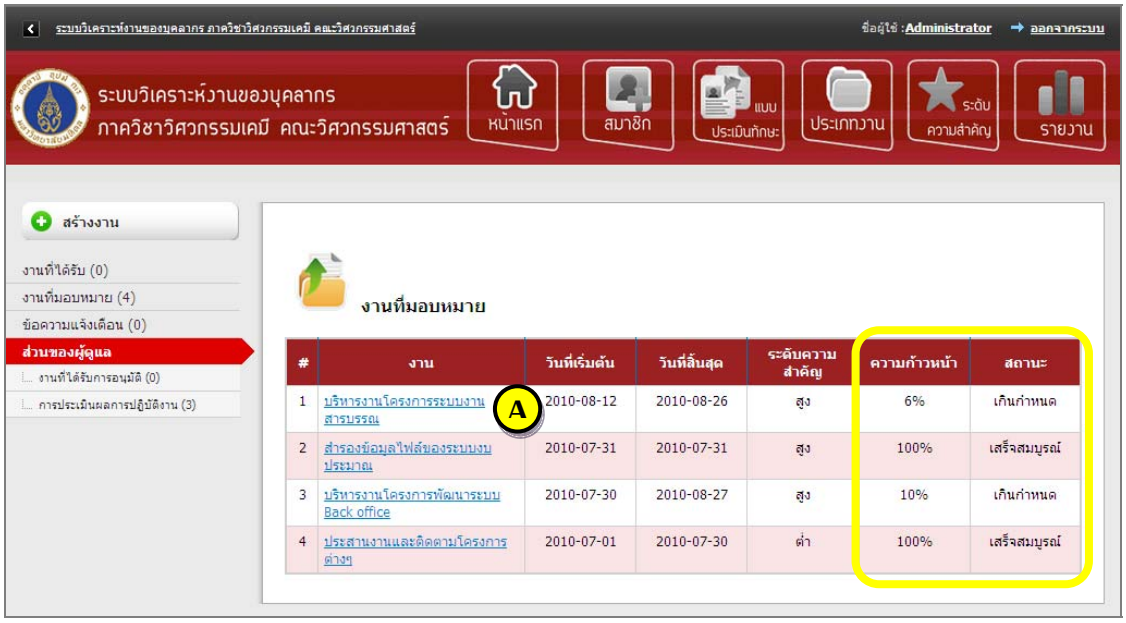


Figure 4.7 The page of task monitoring

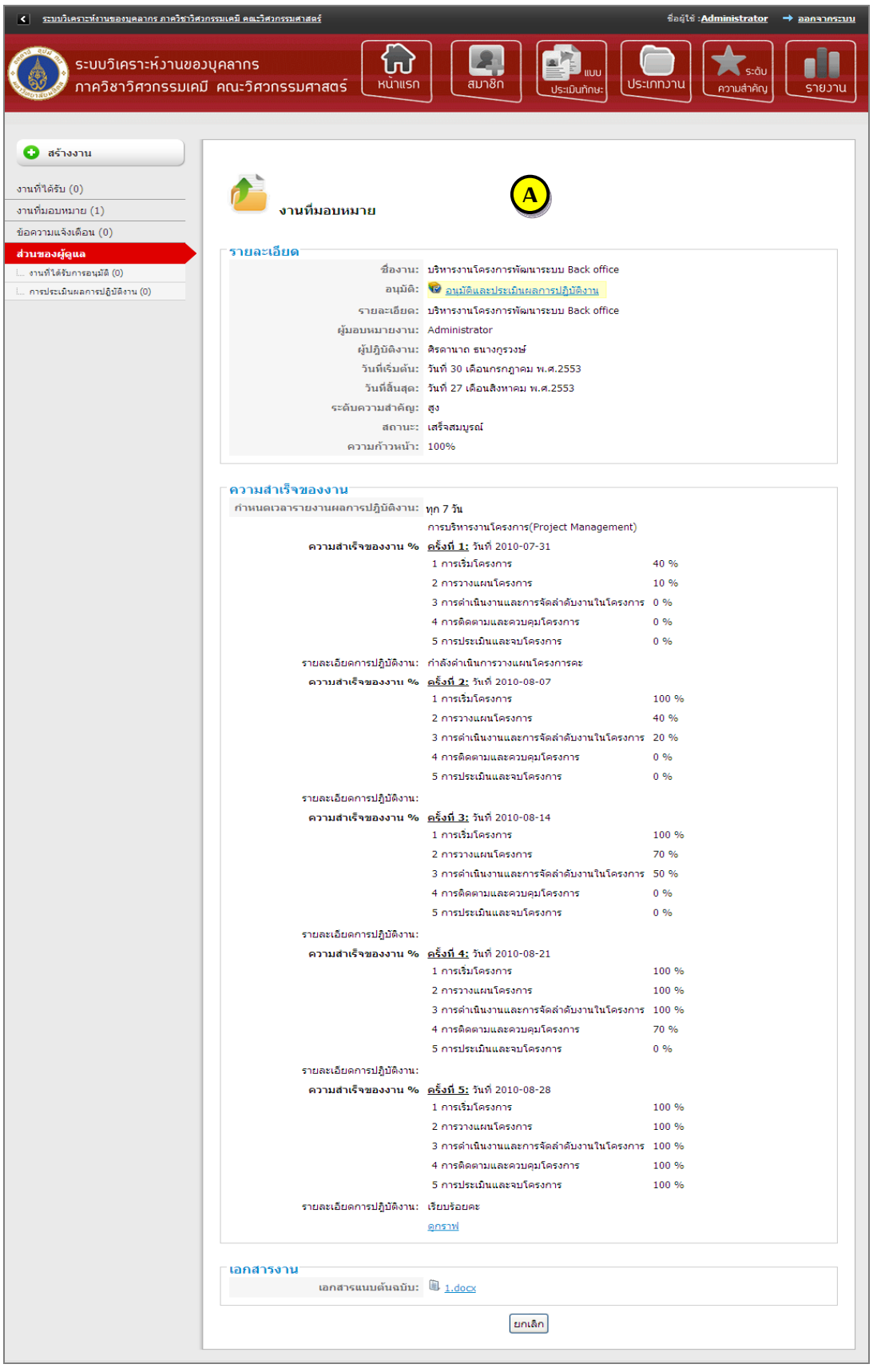


Figure 4.8 The page of detail of progress and status of task

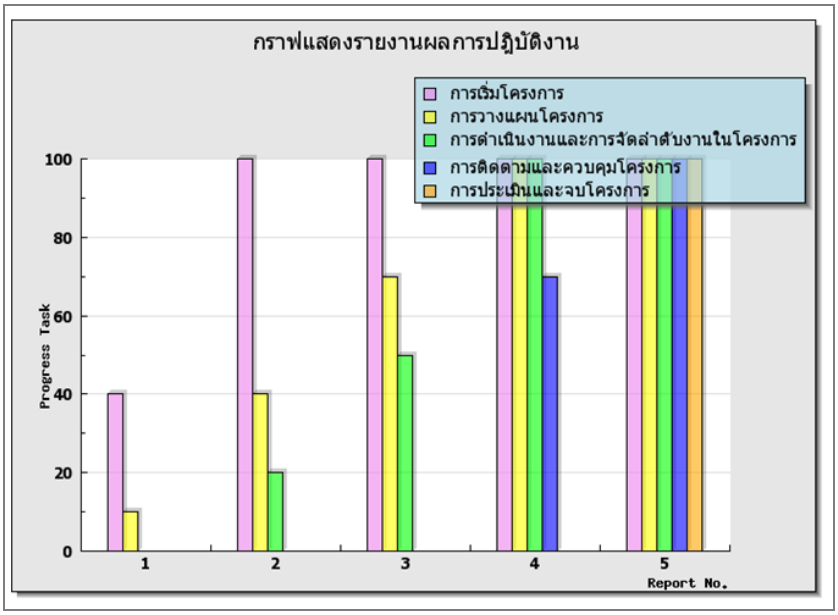


Figure 4.9 The report of progress and status of task Page

4.1.5 Performance evaluation

This feature is designed for administrator/evaluator to evaluate the tasked assigned to any person using online multiple choice formed created in section 4.1.2. Moreover, the system can also warn the administrator/evaluator when the assignment is completed (see figure 4.10)

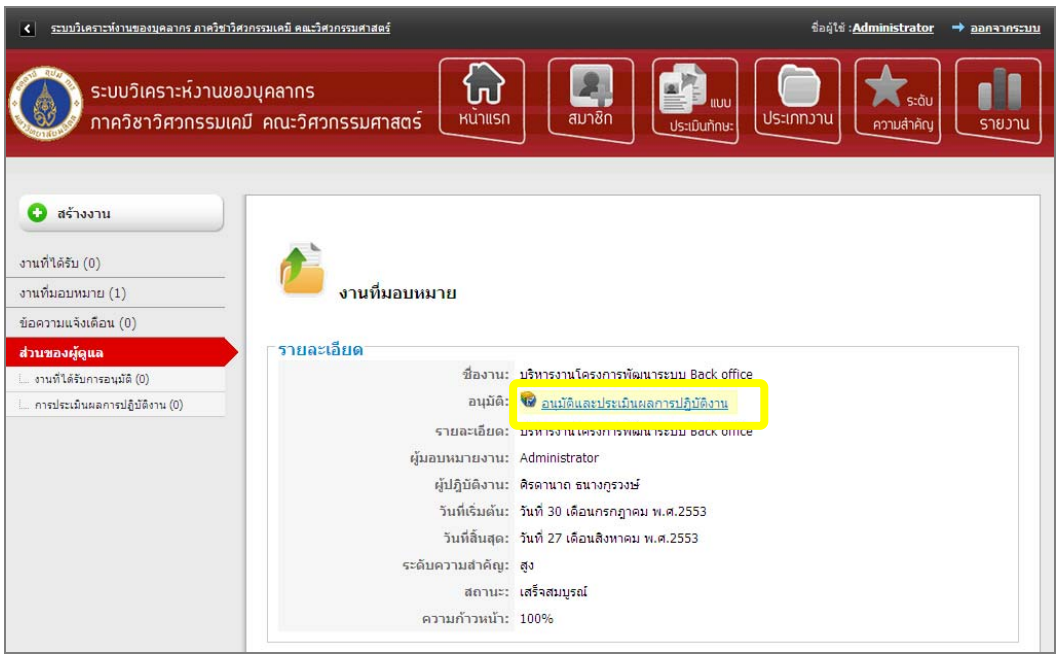
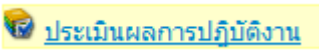


Figure 4.10 The page of performance evaluate

The system displays button “Approval and evaluation of performance” 

when the progress task is 100 percent and the progress task is not 100 percent display the button “Evaluation of performance” 

. The after approval the core skill evaluation form is then displayed as shown in figure 4.11

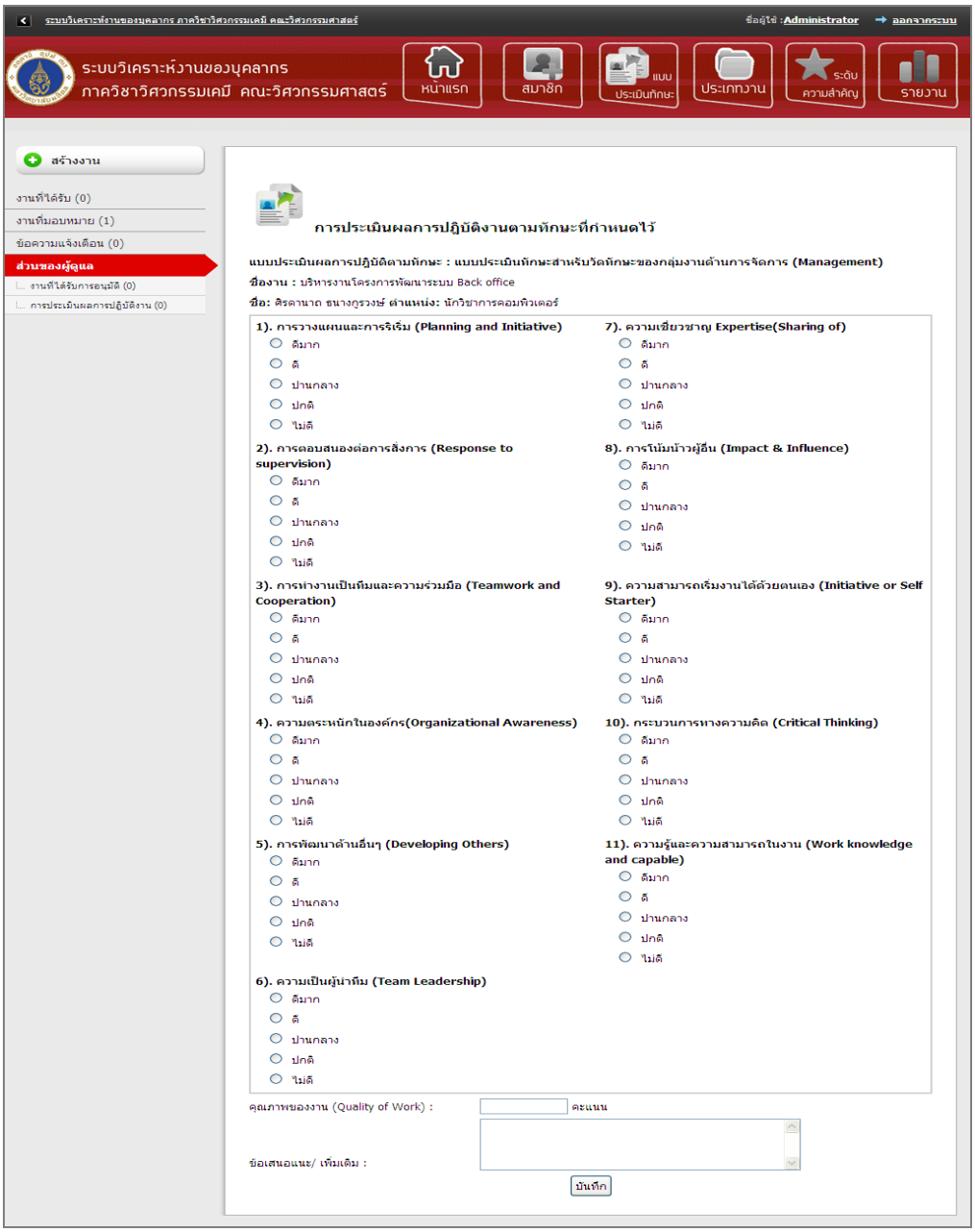


Figure 4.11 The page for evaluate “Core Skill Evaluation Form”

After administrator/evaluator evaluate the assignment via the designed form (Core Skill Evaluation Form) including the quality of work, the report is showed in figure 4.12

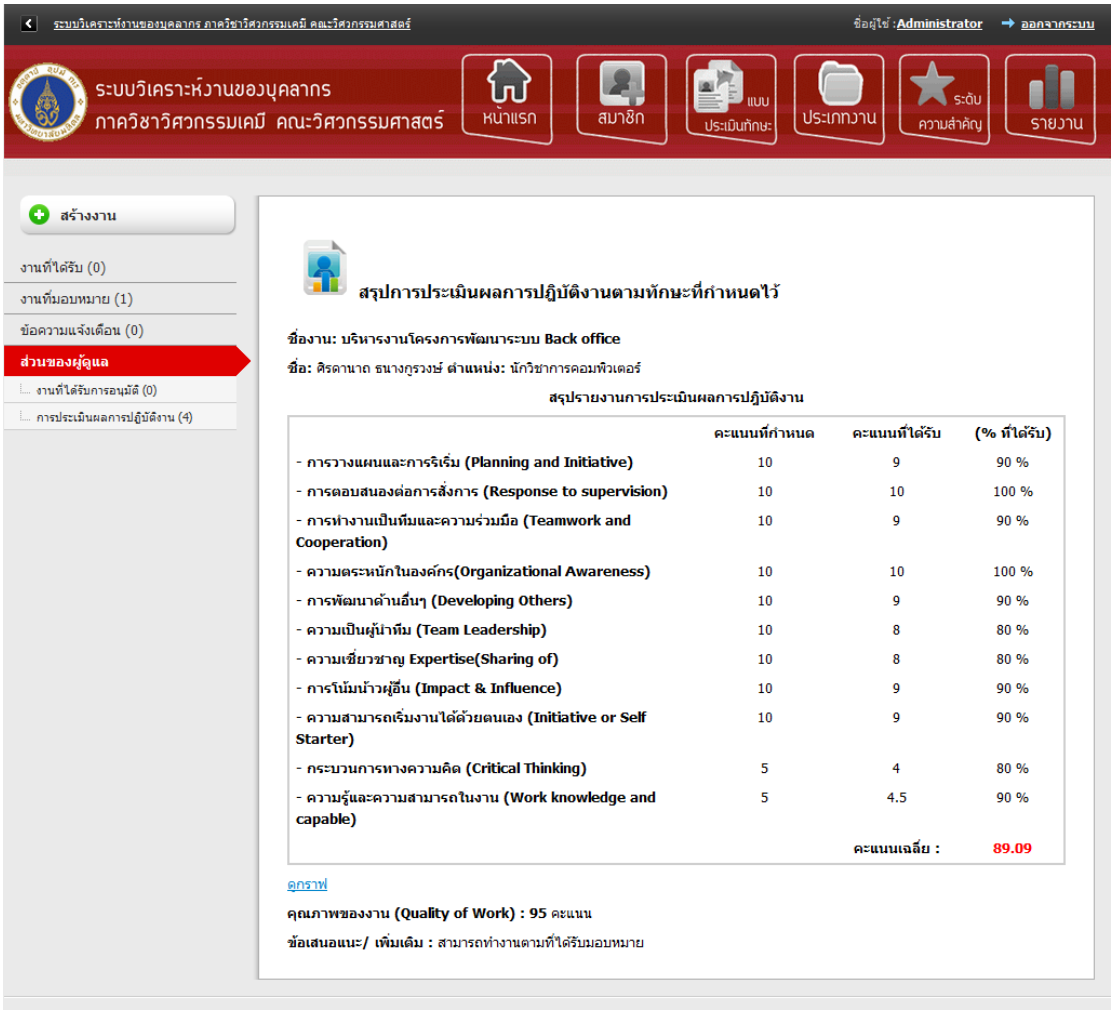


Figure 4.12 The report of performance evaluation page

4.2 User Interface

The user interface shown in figure 4.13 allows all users to view their own assigned tasks as well as reporting the progression of their assignment via this system.

There are 2 menu bars; (A) Home and (B) Personal information and 4 windows;

1. The menu bar area which used to control the system menu.

2. The logon status window displayed the current access or logon user.

3. The task menu area which used to view all tasks and personal message.

4. The system displayed topic and detail of task received.

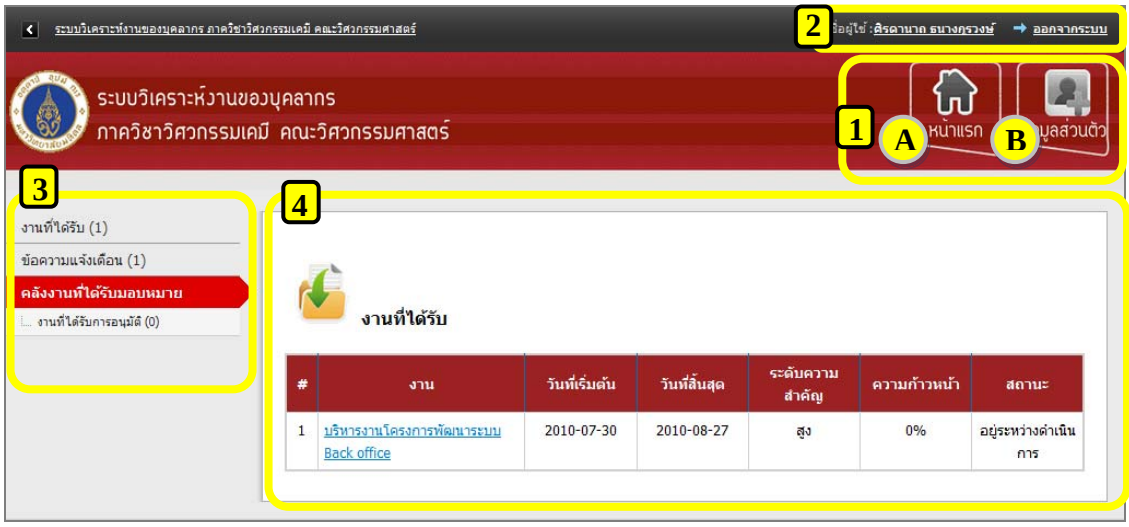


Figure 4.13 The main page of log on as a user

4.2.2 Update progress task

The logged user can see all tasks in the main page, as shown in figure 4.13. However, user can choose to update any task as shown in figure 4.14.

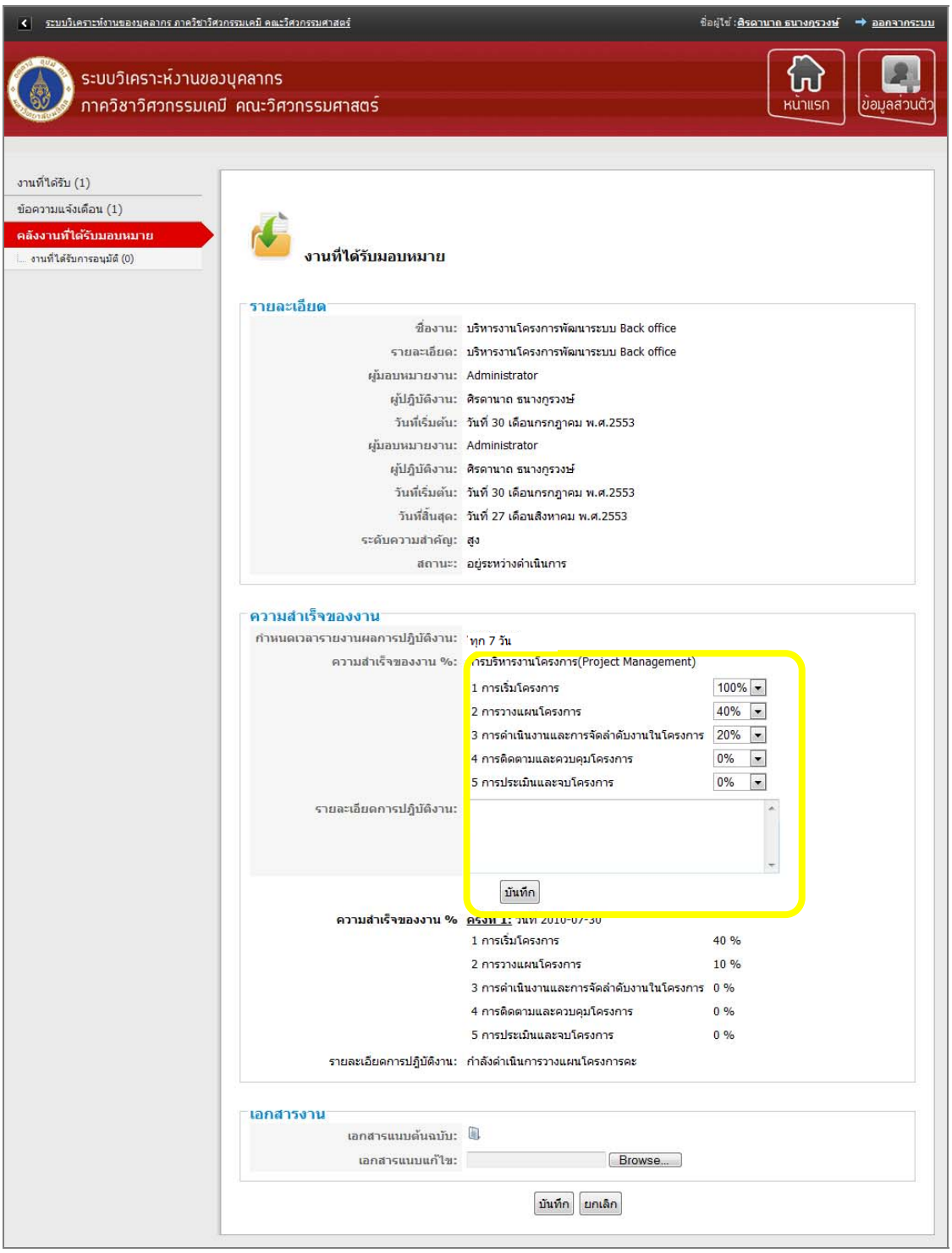


Figure 4.14 The page for update progress task

4.2.3 Personal information

The Personal information menu allows both administrator/evaluator and user to view and edit personal information. However, only administrator/evaluator can

edit every member profile, the users can only edit and view their information as show in figure 4.15

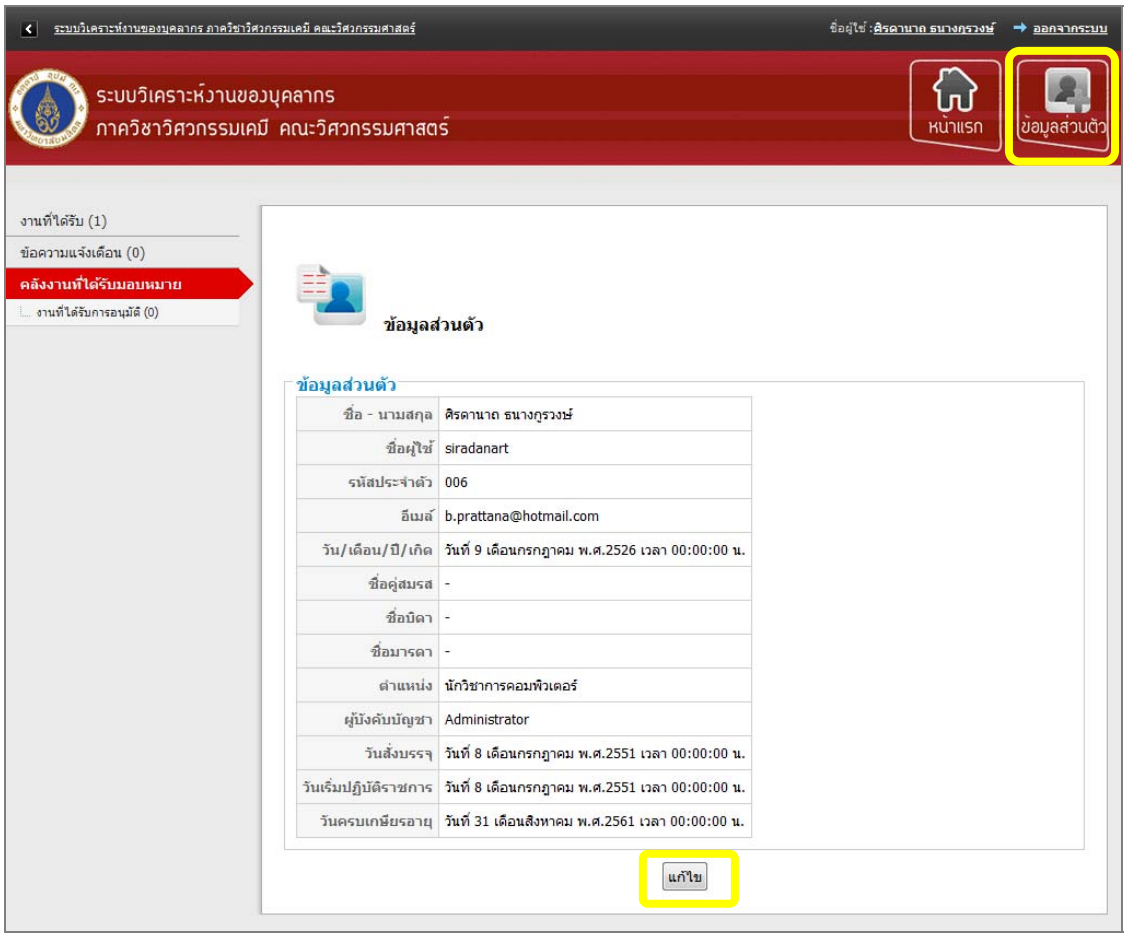


Figure 4.15 The page for user profile editing

4.3 The evaluation period for Performance Evaluation System

The evaluated results from the task analysis system can also used for the performance evaluation (PA) system as a part of the PA evaluation form. However, the administrator/evaluator has to assign the PA evaluation period for each person as shown in the figure 4.16

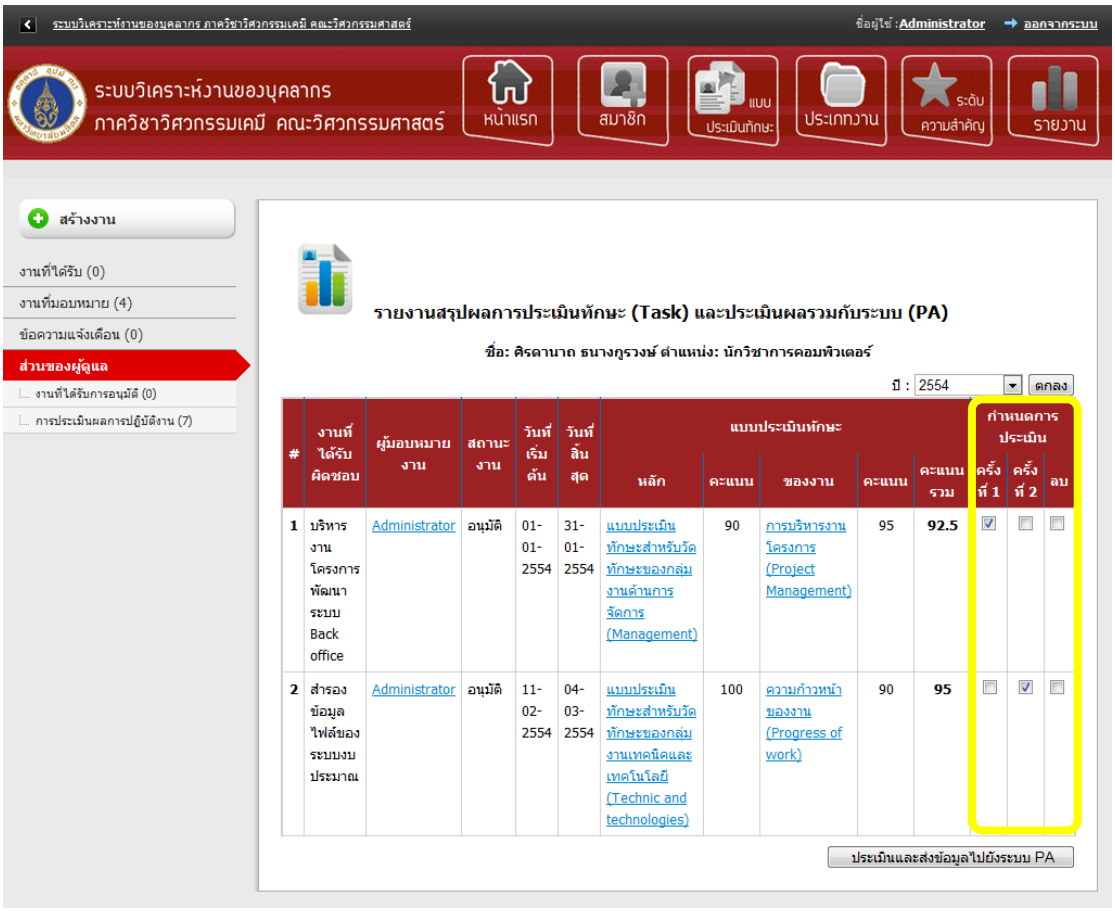


Figure 4.16 The page of the evaluation period for Performance Evaluation System

After evaluating to performance evaluation system, administrator/ evaluator can view report. Take result of performance evaluation based on skills/abilities of employee from all task in the task analysis system combine with CC of performance evaluation system to summarize the operation of employee as show in figure 4.17.

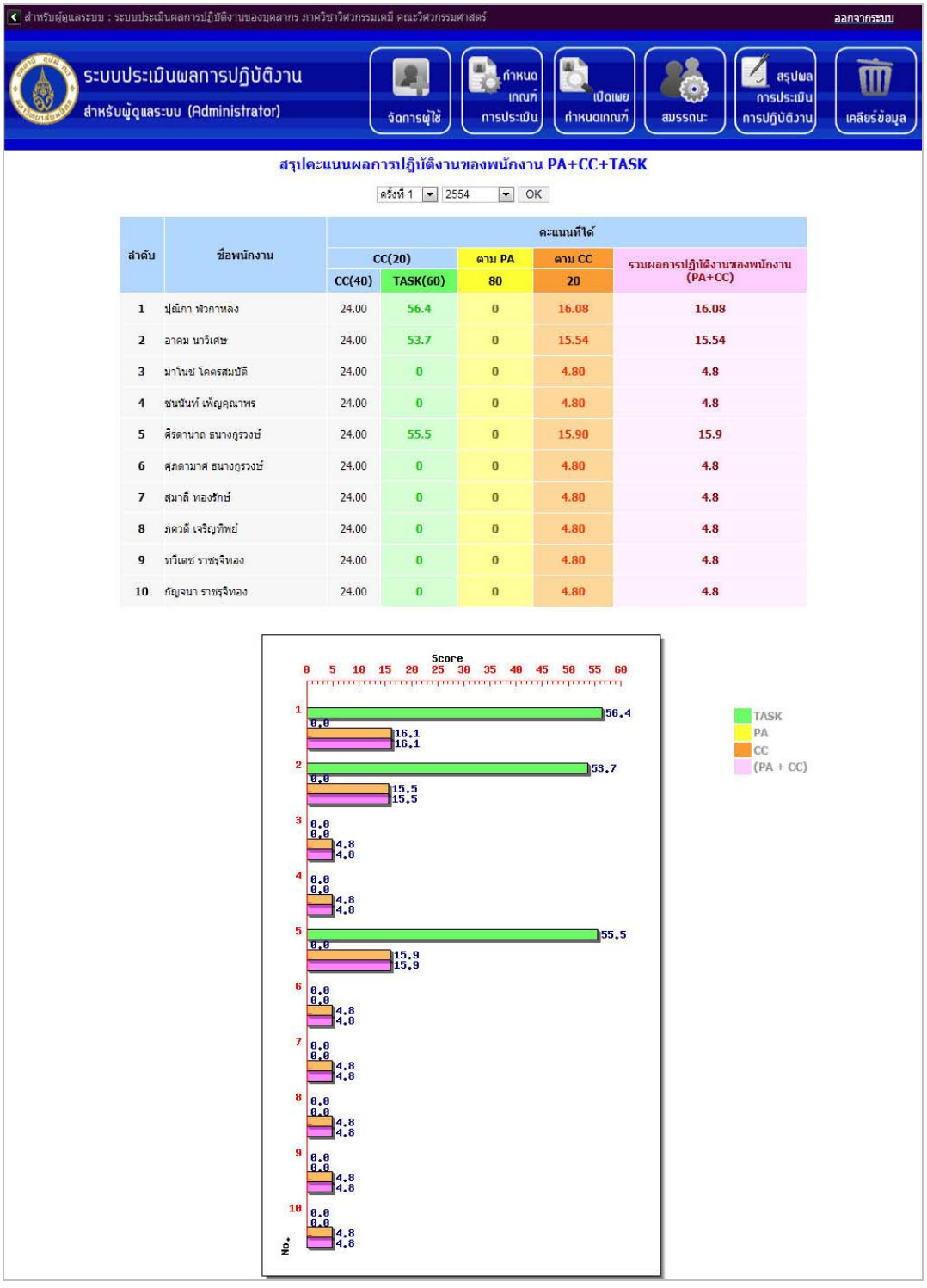


Figure 4.17 The summary in the report evaluation page

CHAPTER V
DISCUSSIONS

According to the results shown in figure 4.1, the task analysis system composed 5 menus which allow administrator/evaluator to manage user profile, skills/abilities evaluation, manage default system parameters such as task category, important level of task, and view reports that appeared in the main menu. It is composed of 4 major windows which allow administrator/evaluator to create task, view all tasks, view topic, and detail of received and assigned tasks.

In the main menu, administrator/evaluator can create and edit user profile for every user. However, due to the security aspect for this program, it is allow administrator/evaluator to add, edit, or delete members from this system only. Therefore, application users cannot create new profile by themselves in order to prevent multi account from one user which may pose some difficulty to verify the user information for analysis.

The administrator/evaluator can define structure, evaluation detail of skills/abilities form, and define choice with the score in skills/abilities evaluation form. However, this feature only allows administrator/evaluator to define the form and evaluation score depending on the different kind of assignment i.e., administrator/evaluator A has assigned a task for one staff using his/her designed evaluation form, another administrator/evaluator B has also assigned a similar task for one staff with his/her designed form. However, these two forms may have some common evaluation criteria but the scoring in these two forms may different. The system is also allowed those two evaluations to be fulfilled independently since each task may have the different criteria. Therefore, the topic, subject, choice and scoring of each evaluation form will depend on each admin.

Although, this system allows the administrator/evaluator to create their own evaluation form independently, some core skill evaluation form may be similar to one another formed that has been created previously. This will create unnecessary form into the database. Therefore, the system should have some feature that can check for the existing formed in the database and give some suggestion before a new form has been created.

According to the core skill evaluation and task skill evaluation used in the Performance evaluation system, the ratio of core skill evaluation and task skill evaluation has been assigned to be 50%-50% by default which may not reflect the personal development in some cases. Therefore, the system should allow users to set the weight of these two parts independently, so that the task analysis and the core skill analysis can project the performance of each person in actual. The system should have a feature allows administrator/evaluator to define percentage of the core skill/abilities and task skill prior to the evaluation form design.

Another feature that may enhance the use of this application as a personal development tools for the staffs is the prediction of the core skill value of each person. For example, this system has been used for a while and there are a large number of data in the database, this system should make use of these data to predict the skill level of each person automatically i.e., staff A has been evaluated in the assigned tasks for 3 years, the average score for the computing skill for staff A in first second and third are 60, 80, and 90. The average score is 77 points, therefore, the system should set the standard level of $\geq$ 77 points in order to pass the skills test. If the score is a measure of skill scores lower than the standard set in the year. The organization should have training skills in the user computer to the employee to develop skills in the following deficiencies.

In summary graph of performance report, administrator/evaluator can review the summary results, the skill/abilities of practical work annually. However, there is another deficiency is the ability to review the skill history (in multiple periods) not only the previous year.

CHAPTER VI
CONCLUSIONS AND RECOMMENDATION

6.1 Conclusion

The task analysis system Web-Based Application for Department of Chemical Engineering Faculty of Engineering, Mahidol is an easy and facilitates way to conduct the procedure performance evaluate of employee every year. It can be done with just few clicks in the computer instead papers and calculating by hand. To assign tasks and monitor tasks to employee in the department and evaluate performance of employee. In this system, the administrator does not need to worry about any calculations since the administrator/evaluator can create topic and the score of Evaluation of skills / abilities form according factors skills or abilities by itself. The calculation will all be done automatically and stored in the database. Any information from the database can be retrieved anytime. This system is easy to use, clear to understand and very effective. It is a web-based system everybody will need to login with their unique login ID and password. Thus it will be very safe and secure information. The administrator/evaluator don't worry about their evaluate score will be available only to himself. All the definitions of the competencies and objectives are stored in the database and can be viewed and updated anytime conveniently. The task analysis system helps the competencies and objectives to be more specific according to the different needs of the task, departments, and the job positions. Unlike in paper evaluate forms where there are only certain sets of general competencies for all employees, in this system, the administrator/evaluator can choose the most appropriate one according to the task descriptions. In addition, administrator/evaluator is able to monitor the progress and status of task and view report of progress and status of task of employee in the department. This system is a time-saving, easy and secure system which performs the evaluation in a fairway. And can help administrator/evaluator conduct a reality check on employee and improve their skill/abilities and performance. The task analysis system process is that of decision

making in which the employees are given sufficient time to learn new technologies, be more efficient, increase their working speed and improve the quality of their skill/abilities work.

6.2 Recommendations

6.2.1 All administrator/evaluator should understand the different kind of evaluation set in the database; therefore, the evaluation of the similar task should used the similar evaluation form.

6.2.2 According to the Core skill and the task Evaluation by the designed system, the system should make used the personal evaluation skill data stored in the database to predict the minimum skill level for each person in each criterion using Decision Support System (DSS). Thus this system is then can be used as a tool for enhancing the performance of each person for the personal development.

6.2.3 This system should also designed and developed using secure https or Hypertext Transfer Protocol Security for exchanging data between the server and client to maintain the confidentiality of information since it contains personal information of each staffs.

6.2.4 The system has been developed for a single organization and cannot support when apply to multiple organizations simultaneously.

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APPENDIX

DATADICTIONARY

The Task Analysis System consists of 16 entities as Follow:

Table : pa_evaluate

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Evaluate_ID
2	name	varchar(255)			Name of Evaluate
3	description	text			Description of Evaluate
4	published	tinyint(1)			Published of Evaluate?

Table: pa_evaluate_subjects

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Evaluate_Subjects_ID
2	eid	int(11)		✓	ID of Evaluate
3	name	text			Name of Evaluate_Subjects
4	ordering	int(10)			Ordering of Evaluate Subjects
5	mark	int(11)			Marking of Evaluate_Subjects
6	choice_type	varchar(100)			Type of Choice

Table: pa_evaluate_choices

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Evaluate_Choices_ID
2	esid	int(11)		✓	ID of Evaluate_Choices
3	name	varchar(255)			Name of Evaluate_Choices
4	mark	int(11)			Marking of Evaluate_Choices

Table : pa_docsskill

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Docsskill_ID
2	name	varchar(255)			Name of Docsskill
3	description	text			Description of Docsskill
4	published	tinyint(1)			Published of Docsskill?

Table : pa_docsskill_subjects

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Docsskill_Subjects_ID
2	dsid	int(11)		✓	ID of Docsskill
3	name	text			Name of Docsskill_Subject

Table: pa_groups

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Groups_ID
2	name	varchar(255)			Name of Groups

Table: pa_personal_message

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Personal_Message_ID
2	taskid	int(11)		✓	ID of Tasks
3	userid	int(11)		✓	ID of Users
4	underid	int(11)		✓	ID of Unders
5	date	datetime			Date of send personal message
6	message	text			Details of send personal message
7	status	tinyint(4)			Status of personal message

Table: pa_task_categories

No	Data Element	Data Type	PK	FK	Definition
1	id	int(10)	✓		Task_Categories_ID
2	name	varchar(255)			Name of Categories
3	description	varchar(255)			Description of Categories
4	published	tinyint(1)			Published of Task Categories?

Table:

pa_task_period

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Task_Period_ID
2	name	varchar(255)			Name of Task Period
3	period	int(11)			Number of Day

Table: pa_task_level

No	Data Element	Data Type	PK	FK	Definition
1	id	int(10)	✓		Task_Level_ID
2	name	varchar(255)			Name of Task Level

Table: pa_task_effect

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Task_Effect_ID
2	taskid	int(11)		✓	ID of Task
3	dsid	int(11)		✓	ID of Docsskill
4	percent	varchar(255)			Percent of Task
5	message	text			Comment of Task
6	createdate	date			Date of Create

Table: pa_tasks

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Task_ID
2	code	varchar(100)			Code of Task
3	category_id	int(10)		✓	ID of Category
4	name	varchar(255)			Name of Task
5	description	text			Description of Task
6	userid	int(10)		✓	ID of Users
7	underid	int(10)		✓	ID of Unders
8	startwork	date			Date started of Task
9	endwork	date			Date Ended of Task
10	docfile	varchar(255)			File Attachment
11	eid	int(10)		✓	ID of Evaluate
12	dsid	int(11)		✓	ID of Docsskill
13	period	int(11)			ID of Period
14	level	varchar(255)			Level of Task
15	statuss	int(11)			Status of Task
16	progress	int(11)			Progress of Task
17	comments	text			Comments of Task
18	editwork	date			Date of editwork
19	docfile_assigned	varchar(255)			File Attachment of assigned

Table: pa_under

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Under_ID
2	userid	int(11)		✓	Under_ID
3	unstatus	int(11)			Under status
4	upstatus	int(11)			Upper status

Table:

pa_underevaluate

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Underevaluate_ID
2	userid	int(11)		✓	ID of Users
3	underid	int(11)		✓	ID of Unders
4	taskid	int(11)		✓	ID of Task
5	task_name	varchar(255)			Name of Task
6	eid	int(11)		✓	ID of Evaluate
7	selectchoices	text			Select Choices
8	score	int(11)			Score of Evaluate
9	quality	int(11)			Score of Task
10	comment	varchar(255)			Comment
11	date	date			Date of Evaluate

Table: pa_users

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Users_ID
2	name	varchar(255)			Name of users
3	username	varchar(150)			User Name
4	email	varchar(100)			E-mail
5	password	varchar(100)			Password
6	usertype	varchar(25)			Type of User
7	block	tinyint(4)			Block
8	sendEmail	tinyint(4)			Send Email
9	gid	tinyint(3)		✓	ID of Groups
10	registerDate	datetime			Date of Register
11	lastvisitDate	datetime			Date of Last visit
12	activation	varchar(100)			Activation
13	code	varchar(20)			Code of users

14	birthday	datetime			Date of Birth
15	lovername	varchar(255)			Lover Name
16	fathername	varchar(255)			Father Name
17	mothername	varchar(255)			Mothe Name
18	typeposition	int(11)			Type position
19	position	varchar(255)			Position
20	parent	int(11)			Parent
21	appointdate	datetime			Appoint Date
22	startworkdate	datetime			Startwork Date
23	endworkdate	datetime			Endwork Date
24	params	text			Params

Table : pa_evaluate_average

No	Data Element	Data Type	PK	FK	Definition
1	id	int(11)	✓		Ealuate_Average_ID
2	userid	int(11)		✓	ID of Users
3	taskid	int(11)		✓	ID of Task
4	year	varchar(100)			Year
5	evaluate_date	datetime			Date of Evaluate
6	average	double(100,2)			Average
7	status1	tinyint(1)			Status1
8	status2	tinyint(1)			Status2
9	status3	tinyint(1)			Dtatus3

BIOGRAPHY

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