What is the composition of skill shortages among
craft and related trades workers in Thailand.

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จุฬาลงกรณ์มหาวิทยาลัย
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งานศึกษาโครงสร้างของทักษะในกลุ่มประเภทงานช่างฝีมือและงานอื่นๆที่เกี่ยวข้องใน
ตลาดแรงงานของไทย

น.ส.จันทิชา ชัยไพรินศิริ

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จันทิชา ชัยไพรินศิริ : งานศึกษาโครงสร้างของทักษะในกลุ่มประเภทงานช่างฝีมือและงานอื่นๆที่เกี่ยวข้องในตลาดแรงงาน
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งานวิจัยนี้มีจุดประสงค์สำหรับ 1. เพื่อตรวจสอบองค์ประกอบของการขาดแคลนทักษะของกลุ่มประเภทงานช่างและฝีมือ
และงานอื่นที่เกี่ยวข้องเกี่ยวข้องในประเทศไทย 2. เพื่อระบุการขาดแคลนทักษะและความสามารถหลักในอาชีพ 3. เพื่อหาแนวทางการ
แก้ไขของนโยบายและประเภทของแรงงานที่ควรได้รับการส่งเสริม

วิทยานิพนธ์ฉบับนี้จึงมุ่งที่จะเติมเต็มช่องว่างนี้โดยการทดสอบความสอดคล้องของผลลัพธ์ด้วยการวัดแรงงานที่ขาดแคลนและ
ความสามารถที่ขาดแคลน และเพื่อหาแนวทางนโยบายในการส่งเสริมให้ตรงจุด โดยมุ่งเน้นให้แรงงานของประเทศมีประสิทธิภาพมาก
ยิ่งขึ้น การลงทุนทางด้านการศึกษาสามารถปรับให้เข้ากับความต้องการและความขาดแคลน รวมไปถึงทักษะและความสามารถที่ขาดแคลน
ของแรงงาน นอกจากนี้การพัฒนาความสามารถของบุคลากร ไปจนถึงการฝึกอบรมงานในองค์กรหรือหน่วยงานจะสามารถพัฒนาแรงงานที่
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ผลการวิจัยพบว่า ทักษะและความสามารถในกลุ่มงานประเภทงานช่างและงานฝีมือและงานอื่น ๆ ที่เกี่ยวข้องในประเทศไทย
นั้น ส่วนมากนั้นเป็นทักษะและความสามารถที่สามารถพัฒนาได้ และทักษะและความสามารถบางส่วนนั้นอาจใช้เวลานานในการเรียนรู้และ
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This research aims to examine the causes of skills shortages among craft and related trades workers in Thailand, to identify the main skills shortages in various occupations, and to identify the policy solutions and the types of workers that need to be encouraged.

This thesis thus aims at filling this information gap and testing the consistency of the results by measuring the labour shortages and skills shortages and investigating the policy recommendations that can be successfully implemented. The policy recommendations are focused on improving the efficiency of the labour force of Thailand, particularly through investment in education, which can help to fulfil demand and alleviate shortages, including skills shortages. Furthermore, the development of personal capabilities, as well as on-the-job training and apprenticeships in organisations and departments, will be able to develop the existing labour workforce along with new workers in the future to become a multi-skilled labour force.

The results of the study showed that with regard to the skills and knowledge among craft and related trades workers in Thailand, most of the skills and knowledge can be developed by taking courses or receiving training. However, several of the skills and fields of knowledge may require a long period of time to understand and obtain. Moreover, both the private and public sector should focus on education by concentrating more on vocational education and programmes that are equivalent to higher education.

จุฬาลงกรณ์มหาวิทยาลัย

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Field of Study:	Labour Economics and Human Resource Management	Student's Signature ....
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CHAPTER 1: INTRODUCTION

1.1 Introduction

Human skills are frequently viewed as being at the centre of our advanced learning-based economies (OECD, 2016), but however high their level may be, they should be applied to practical use in order to contribute to individual achievement in the work environment and the economic growth of society.

The term 'skills mismatch' is defined as the gap between the skills that workers are required to have for various types of work and the skills that they actually possess. The occurrence of skills mismatch usually results in a number of negative impacts on various aspects of the economy. The salaries of workers, their level of satisfaction regarding their job, and the accumulation of human capital can all be adversely affected (Allen & Velden, 2001); (Mavromaras, McGuinness, O'Leary, Sloane, & Wei, 2013);(Glenda Quintini, 2011). In terms of a broader perspective, skills mismatch is seen to result in the allocation of resources that is inefficient, which leads to a lower level of labour productivity (McGowan and Andrews, 2015a). The specific skills and knowledge that are needed to produce and process goods are applied by the craft and related trades workers, who are required to comprehend the complete set of processes as well as the tools and materials that are involved in production, in addition to the final product's characteristics and function.

Skills in the second ISCO level are required for most of the occupations in this group (International Labour Office [ILO], 1990). The occupations that are categorised within this classification may include several responsibilities at the management level, particularly those tasks in which a labourer works independently, either with or without assistance from other workers or associates. Nevertheless, in cases where the description of the principle duties is related to a specific skilled trade, these categories are selected for the classification.

Reducing skills mismatch thus seems to be of the utmost importance for countries that are aiming to reach economic growth by efficiently exploiting the

dynamics of the needs and demands of their labour markets. Recent research has highlighted that the levels of skills mismatch have increased over time and that OECD calculations have concluded that a substantial percentage of workers in Thailand can be defined as skill mismatched. Decreasing ability that results in negative impacts is by all accounts of the most extreme significance for nations that are striving to achieve financial development but are currently misusing the elements of the needs and requirements of their workers. Recent research has revealed that the degree of aptitude incapacity has expanded over time, and OECD figures show that a significant portion of labourers in Thailand can be characterised as having a lack of expertise.

Analyses of skills demand and supply provide a core input to the future development of labour markets. Coordinating abilities and employment is gaining importance due to rising joblessness and expanding challenges for individuals (especially recently graduated students from various education levels) who are entering the labour market to find jobs matching their potential. In addition, structural changes challenge the government, academic institutions and enterprises with regard to providing the skills that their economies need to grow and prosper. Also, the Thai population is ageing rapidly, leading to a massive outflow of experienced workers, while the individuals who are not yet working should adjust to the new aptitudes that numerous occupations require. The dynamics of the Thai labour market today not only create new jobs while other fields shrink or disappear but also give rise to changing skill requirements in many existing jobs.

'Skills mismatch' refers not only to skills gaps and shortages but also to the qualifications, knowledge and skills that exceed job requirements (European Centre for the Development of Vocational Training [CEDEFOP], 2010). Although the principal focal point of this study is on the effects of open approaches as well as individual and firm attributes (for example, age, sexual orientation, vagrant status, and firm size) that have similarly been characterised as elements affecting the likelihood of being aptitude challenged, the primary aim of the investigation will hence be to examine this collection of attributes that impact expertise resources before presenting any arrangement of alternatives.

1.2 Situation in the Thai labour market

Thailand has a relatively low unemployment rate, in which it is estimated that the nationwide rate is 1 to 2%, which is quite a small percentage of the population. However, to meet the demands of the country, the National Statistical Office of Thailand has conducted a survey of the labour demands and shortages in order to examine which industries are affected by labour shortages so as to benefit the government in the planning and development of manpower.

According to the National Statistical Office, the survey, which is known as the Labour Demand of Establishments Survey, was conducted on the demand and shortages of labour in various businesses in Thailand as a collection of information from establishments with more than six employees. The data was collected from 31,856 sample establishments and covered the various sectors such as wholesale, manufacturing and services. There are 189,182 establishments in Thailand. Moreover, the survey found that there are 306,148 workers and that 181,827 people are needed in these establishments in Thailand. The data shows that the shortage of workers is for difficult or hard-earned jobs lasting from 6 months or more based on the statistical information from establishments in the wholesale and retail businesses. The results of the survey showed that the demand and the shortage of the establishments engaged in various businesses is highest in the craft and related trades workers, which are included in category 7 as classified by the International Labour Organization (ILO).

The Bureau of Statistics has classified the occupations according to international standards by using the document from the International Labour Organization (ILO), which lists 10 categories of occupations: 1. Managers, 2. Professionals, 3. Technicians and Associate Professionals, 4. Clerical Support Workers, 5. Services and Sales Staff Workers, 6. Skilled Agricultural, Forestry and Fishery Workers, 7. Craft and Related Trades Workers, 8. Plant and Machine Operators and Assemblers, 9. Elementary Occupations, and 10. The Armed Forces.

1.3 Reasons for choosing category 7 of craft and related trades workers

This study is focused on category 7, which includes craft and related trades workers. In the area of craft and related trades workers, there is a slow decline in the number of labourers in terms of demand and shortages. Craft and related trades workers are workers who have a variety of occupations, mostly machinists and repairers that can be classified as skilled workers. Due to the shortage of skilled labour, which is caused by changes in the demand and supply in the labour market resulting from many factors, such as higher competition in work and changes to the ways of working according to the era, both the employers and employees have to adjust themselves to cope with these factors. Thailand has recently gained insights into these changes along with many other countries in the world. According to the statistics, Thailand's labour shortages involve both unskilled workers and talented workers, but in fact, Thailand mainly lacks the workforce in the crafts group that requires specific individual skills in various trades, which is caused by a lack of learning and work experience.

1.4 Research objectives and structure of the thesis

The main research objectives that will be focused on in this paper are:

1. To examine the composition of skills shortages among craft and related trades workers in Thailand.

2. To identify the main skills shortages in various occupations.

3. To identify the policy solutions and the types of workers that need to be encouraged.

Accordingly, this study proceeds as follows. Section 2 defines the skills shortages and skills mismatch that are highlights in the situation of both the demand side and the supply side of Thailand's labour market, and also provides an occupational analysis based on two organisations: ISCO (The International Standard Classification of Occupations) and SOC (O*NET online). Section 3 and section 4

present the procedures, the data collection and the results in addition to a brief analysis of the results. Section 5 is the conclusion, in which the results, the limitations of the study and the policy recommendations based on the results are discussed.

CHAPTER 2: LITERATURE REVIEW

This chapter provides an intensive literature review on related issues concerning the composition of skill shortages among craft and related trade workers in Thailand, which have been discussed by researchers in the past. The information used in this section is generated from books, academic journals and other reliable sources. Reference is given to the survey of Labour Demand for Establishment Survey in 2008 and 2013 by the National Statistical Office, which reveals that the labour shortage in Thailand is likely to increase. Similar to countries, one of the important issues is skill shortages. This report will define the situation wherein not having enough workers is called a "shortage" and a situation where there are an insufficient number of workers with a specific set of skills is a "Mismatch" (Alicia Sasser Modestino, 2010).

2.1 Skill shortages

Business sectors identify skills shortages throughout the APEC region as one of the most significant problems impinging on economic development. The need to monitor and regulate the nature of skills shortages or surpluses is a critical prerequisite for generating a comprehensive and evidence-based regional response to the problem. The following sections draw on the economy reports prepared for this project and the literature that is available to report on the status of skills shortages across economies. While some economies don't identify current skills shortages, they do identify occupations where growing demand is predicted. Although growing demand does not necessarily equate to a skill shortage, it does suggest an occupational niche where a skill shortage might appear.

Some economies have a well-established and well-resourced labour force monitoring system that has been developed over many decades. For others, this is a comparatively new process. As a consequence, there is considerable variability in the level of data available for analysis. Moreover, the comparability of occupational data across economies is variable because the level of skills and competencies ascribed to

a particular occupation in a specific economy is not the same across the region. Thus, if an economy has a qualifications framework in place, it allows for a more potentially significant comparison across economies.

Given the great diversity across economies in their industrial structure, labour markets and approaches to assessments of labour market imbalance, a five-way classification of these economies has been employed in this section. Many different systems could have been employed, though it is believed this approach will assist the reader to compare and contrast the considerable quantity of empirical detail as well as to draw out major themes.

The first section below introduces, as far as possible, a regional perspective of labour force shortages and potential over-supply. This is followed with more detailed descriptions of each economy, discussed according to the five-way classification.

There are five key abilities recognised as being vital to instructing and learning in senior cycle training. These include data handling, being actually compelling, conveying, basic and innovative reasoning and working with others. Physical instruction gives students a one of a kind opportunity to create key abilities through learning in the psychomotor space. Learning results in senior cycle physical training as clear articulations of what is normal. Students will accomplish in terms of information and getting abilities and dispositions. Every one of the key aptitudes is implanted in the learning results in senior cycle physical instruction. For instance, aptitudes identifying with being compelling, conveying, and working with others are obviously explained in the learning results of the personal and social duty educational programme model. Basic and inventive reasoning aptitudes are vital to the learning results that incorporate compositional errands, such as in moving or aerobatics in sports training, or the plan of new amusements as may be required in the teaching diversions for understanding the curricular model.

The utilisation of a scope of instruction and learning techniques makes it conceivable not exclusively to meet the distinctive adapting needs of understudies yet in addition enables the key aptitudes to be created, including:

1. Skills 2. Knowledge 3. Education 4. Abilities 5. Work Activities

- Relational abilities can be created by including students in a gathering or accomplice-based critical thinking undertakings.

- Developing and keeping up great connections is integral to the key expertise of working with others. Chances to build up this expertise regularly emerge in physical action as well as a rivalry.

- Being presently powerful incorporates the capacity to consider one's own presentation in various physical exercises and to get ready for development. Every one of the models gives specific points of view to students about themselves as members of a physical activity.

- The well-arranged utilisation of learning results will empower educators to aid the improvement of the key aptitudes and evaluate students' advancement in them. As educators watch students participating in various learning encounters, they can utilise these opportunities to provide developmental input to students about their utilisation of key aptitudes.

2.2 Skill Mismatch Overview

Skill mismatch is defined as a mismatch for a certain worker between his/her current skills and the required skills for his/her job. This is the widely used definition of skills mismatch (OECD, McGowan and Andrews, 2015a and 2015b; Desjardins and Rubenson, 2011). Skill mismatch occurs when the skills possessed by workers either exceed or fail to meet the skills required at their workplace. Indeed, some people might be capable of handling more complex tasks with their skills being underused. These people are referred to as being over-skilled. On the opposite side, people might lack the skills normally required for the job. These people are referred to as under-skilled. Over-skilled people and under-skilled people are thus mismatched. When people are neither over-skilled nor under-skilled, they are defined as well-matched.

Skill mismatch is a situation in which a company or employer cannot find a qualified person for a job vacancy. A position left vacant can cause disruptions in the work of the company. Sometimes, they decide to solve this situation using workers who may be either under-skilled or under qualified (Desjardins and Rubenson, 2011). Many studies claim that temporary factors may cause a skills mismatch. For example, economic shock, lack of information about the labour market and improvements in

technology can cause mismatches, but the real reason is the imbalances between the labour supply and demand in different skills.

2.3 Demand Side of the Labour Market

There have been significant changes in the structure of employment in many countries since 2000 due to the coming of new technologies that play an important role in the work system and altered employers' demands for working skills and higher educational qualifications (Stephen Machin, 2002). Moreover, new technologies prompt an adjustment in procedure and hierarchical changes. Another reason that organisations receive new technology is the issue of work, particularly the lack of low-skilled work in light of the fact that new innovations are related with diminished work contribution of manual and psychological undertaking schedules and expanded work contribution of non-routine intellectual assignments. Intellectual undertakings, schedules and expanded work contribute to non-routine subjective assignments. In addition, they cause a gap between skilled and low-skilled workers (Akkaya Senkrua, 2015).

However, the Thai labour market had a high number of low skilled workers in 2011. The table 1, below indicates that more than half (52.85 per cent) of all workers in Thailand were low-skilled workers. Further, the level of education in Thailand is mostly lower secondary level. On the other hand, this same period of time saw the establishment have a high demand for craft and related trade (category 7) workers with medium-skill level.

Education/Year	2001	2005	2010	2011
No Education	3.48	3.58	2.99	2.95
Less than elementary	39.91	34.47	28.39	27.25
Elementary	22.37	22.07	22.87	22.65
Lower Secondary	12.75	14.14	15.69	15.99
Upper Secondary	9.79	11.64	13.83	14.09
Higher Education	11.44	13.6	15.89	16.75
Others	0.04	0.07	0.09	0.09
Unknown	0.22	0.43	0.25	0.23
Total (in percentage)	100	100	100	100
Total (in thousands)	32,104.25	35,257.17	38,037.34	38,464.67

Table 1 Employed persons, by educational attainment

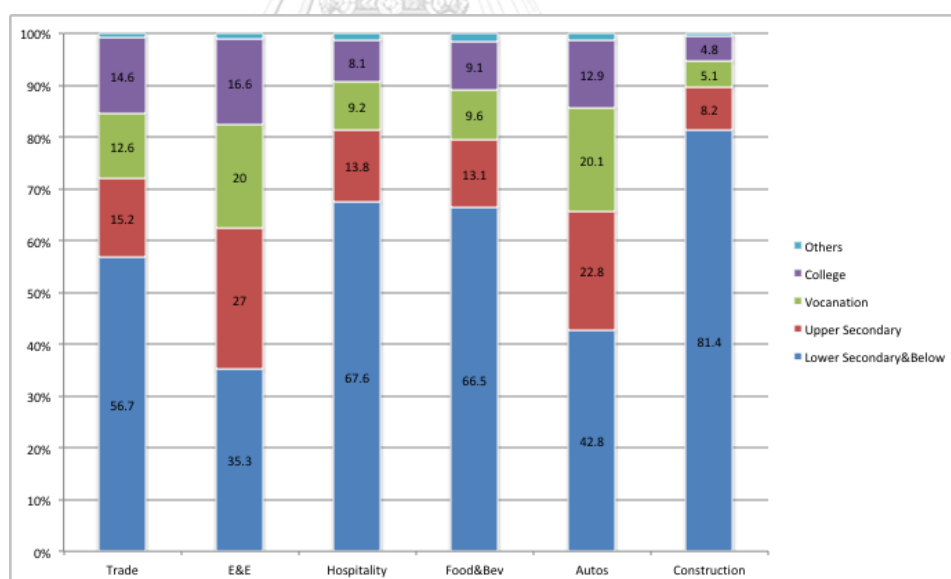Source: TDRI 2012 (Skills for Employability: Southeast Asia)

Figure 2.1 Share of workers by education levels across industries

Source: Labour force survey, 2013

The figure 2.1 also confirms that most of the employment in Thailand comprises low-skilled workers, especially in the construction business, where the demand is for vocational workers.

2.4 Supply Side of the Labour Market

There appears to be an excess supply of workers in the labour market in Thailand, especially college graduates, which can be traced back to several causes. For example, the launch of the 15 years basic education policy in 2009 (Kindergarten to Upper Secondary education) allows students to access education without paying for school fees or books. Many student loan programmes have also been developed in the last two decades, meaning higher demand for higher education prior to economic change. Thai society assigns more value to highly-educated workers. From all the reasons given above, it is a motivation for students to try to study as high as possible.

Year	Number of graduates			Percentage of upper-secondary graduates	Percentage of vocational graduates
	upper-secondary	vocational	total		
1996	197,286	170,202	367,488	54	46
1997	243,526	176,965	420,491	58	42
1998	277,128	193,136	470,264	59	41
1999	295,213	206,145	501,358	59	41
2000	332,028	170,499	502,527	67	33
2001	347,169	145,980	493,149	71	29
2002	352,324	170,104	522,428	68	32
2003	344,860	160,910	505,770	69	31
2004	325,424	142,510	467,934	70	30
2005	319,250	158,943	478,193	67	33
2006	316,277	160,250	476,527	67	33
2007	306,821	163,152	469,973	66	34
2008	308,103	167,994	476,097	65	35

Table 2 The Number and Ration of Upper-Secondary Graduates to Vocational Graduates

Source: Office of the National Economic and Social Development Board, 2015

The statistics in the table 2 reaffirm that students continue to study as general graduates (upper-secondary school) instead of vocational school after finishing lower-secondary school. The ratio from both sides shifted up dramatically from 54:46 in 1996 to 65:35 in 2008 (Akkaya Senkrua, 2015).

According to the increasing supply of university graduates entering the labour market, as mentioned in the table, the number is eventually going to reach the point where the labour market is unable to absorb the increase of highly-educated workers, instead preferring vocational graduates. An imbalance between demand and supply may persist for long periods if either the demand or supply constantly rises much more than the other. To solve this situation, the public sector and private sector may have to consider both sides.

2.5 Occupation

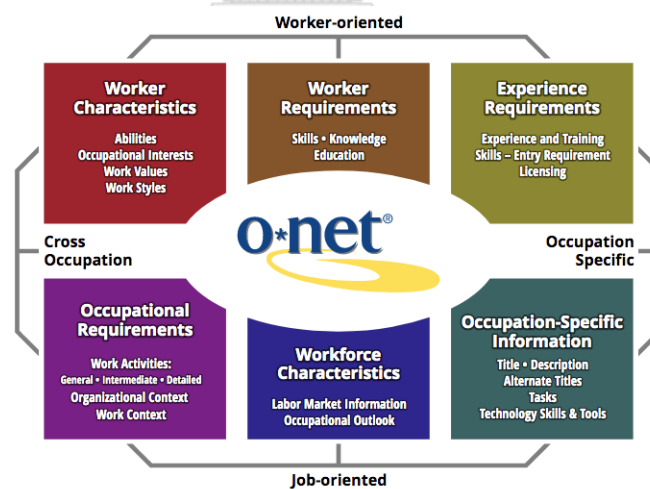### 2.5.1 Occupation analysis by data from O*Net Online

Figure 2.2 The O*NET content model

Source: onetonline.org

The O*NET programme is our nation's primary source of occupation information, providing a database of worker attributes and job characteristics. Data

has been collected from a sample of businesses and sample workers in the real world by a set of standardised questionnaires. Respondents are asked to provide general demographic, skills and abilities information.

All data that has been gathered will be analysed through "The Content Model", which is the conceptual foundation of O*NET and will be used to identify the most important types of information. Then, analysis of job and organisation data that has been collected will be done. Information is provided that users can focus on in terms of areas of key attributes and the characteristics of workers and occupations. This is done by dividing them into six major domains, as shown in the picture.

O*NET information from figure 2.2 has proven to be helpful to people for finding training and jobs they need. It also helps employers by giving them skilled workers, which are important to remain competitive in the marketplace.

Even though O*NET data is actually helpful to researchers, it is necessary to take precautions in choosing data because of the vast database and redundant data; many variables have unclear meanings. The data should always be checked before use (Cifuentes, Boyer, Lombadi, and Punnett, 2010; Burrus and Way, 2017).

2.5.2 Occupation analyse by the International Standard Classification of Occupations

The International Standard Classification of Occupations (ISCO-08) is a worldwide order overseen by the International Labour Organisation (ILO). It is an update of the ISCO-88, which it overrides. ISCO-08 is a device for arranging employment into an obviously characterised set of gatherings, as indicated by the assignments and obligations embraced in the activity. ISCO-08 was created to encourage universal correlations of word-related insights and to fill in as a model for nations creating or overhauling their national word related characterisations. The structure utilised for the plan and development of ISCO-08 depends on two primary ideas: the idea of the occupation and the idea of expertise. A vocation is characterised in ISCO-08 as "a lot of undertakings and obligations performed, or intended to be performed, by one individual, including for a business or in independent work". Occupation alludes to the sort of work performed in an occupation. The idea of

occupation is characterised as a "lot of employments whose primary assignments and obligations are portrayed by a high level of similitude". An individual might be concerned with an occupation through fundamental employment as of now held, a moment work, a future employment or an occupation recently held. Expertise is characterised as the capacity to do the assignments and obligations of a given activity. For the reasons in ISCO-08, two components of aptitude are utilised to organise occupations into two gatherings:

(a) Skill level characterised as a component of the unpredictability and scope of assignments and obligations to be performed in an occupation

(b) Expertise and specialisation considered regarding four ideas: the field of information required, the instruments and apparatus utilised, the materials chipped away at or with and the sorts of products and ventures created

2.6 Potential solution for skill shortages

Skill shortages have been global issues for decades, since the arrival of digital technology that has changed the way we work. Government and private sectors or even workers are required to solve this situation. There have been several studies that convey this topic.

2.7 Policy

On this matter, several possible solutions seem to emerge. Skills mismatch can be addressed through a better adaptation to the available supply of skills in the labour force. Policies aiming at reducing frictions in the allocation of labour could thus solve mismatch issues. Desjardins and Rubenson (2011) stress the importance of taking into consideration both the demand and the supply side of skills when dealing with skills mismatch. Both policies targeting the demand and the supply of skills can result in reduced skills mismatch. The demand side of skills is concerned with policies mostly aimed at firms, while the supply side of skills mainly deals with the available workforce in the labour market. Though some of the following policies can be

categorised both from the demand and supply of skills, this distinction is made to guarantee greater clarity in the analysis.

2.7.1 On-The-Job Training

Becker (1993) states that on-the-job training is a process that raises future productivity and differs from school training in that an investment is made on the job rather than in an institution that specialises in teaching.

The labour market in Thailand is currently facing a skills mismatch problem due to the oversupply in quantity but undersupply of skilled workers. Government and industries must develop programmes to encourage and support the development of existing workers' skills rather than find new ones to close the gaps.

On-the-job training is probably the most economical and suitable way to improve the quality of workers. This is possible through in-house training, where experienced workers share their valuable knowledge with others. Another option is to seek outside training from experts to train employees.

2.7.2 Apprenticeship

The advancement of modern economies has changed the way employment is operated and maintained in most countries, including Thailand.
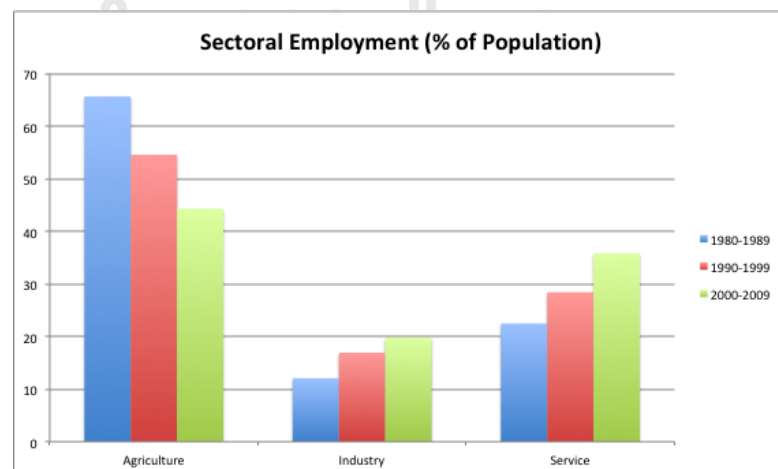

Figure 2.3 Sectoral Employment

Source: NESDB (2011)

Although the majority of the workforce still belongs to the agriculture sector, the trends in the figure 2.3 indicate that a significant number of workers have moved to other industries.

Thailand's economy in this decade focuses on export manufacturing, especially in the automotive industry. Germany is one of the countries that have been very successful in dealing with the changing market. Thailand could use it as a model for its own development (EIC, 2015). Germany has a successful apprenticeship model called "dual-education", which requires students to undertake apprenticeships at companies outside of school or university. This system gives Germany a low level of unemployment. Further, German companies gain high competitiveness from skilled workers (Lerman Robert, 2013). Some German companies have brought apprenticeship programmes into Thailand, such as Mercedes-Benz and BMW. Both companies have two-year programmes that provide a combined classroom course and incorporated training centre. Also, they rotate the students between different firms in the industry that have coordinated apprenticeship programmes (EIC, 2015).

Most apprenticeship programme students get a full scholarship, wage salary, and employee benefits. The most important reward is a job offer at the end of the training. This could offer a seamless transition from school to the industry and is also a powerful solution to skill shortages. Thus, closing Thailand's skill gap means companies should assign importance and cooperation to apprenticeship and training programmes.

2.7.3 Education

Due to some causes like a 15-year free education policy, the student loan fund, and the prestige of university certificates, some issues like over-education and imbalance in labour force have been invoked.
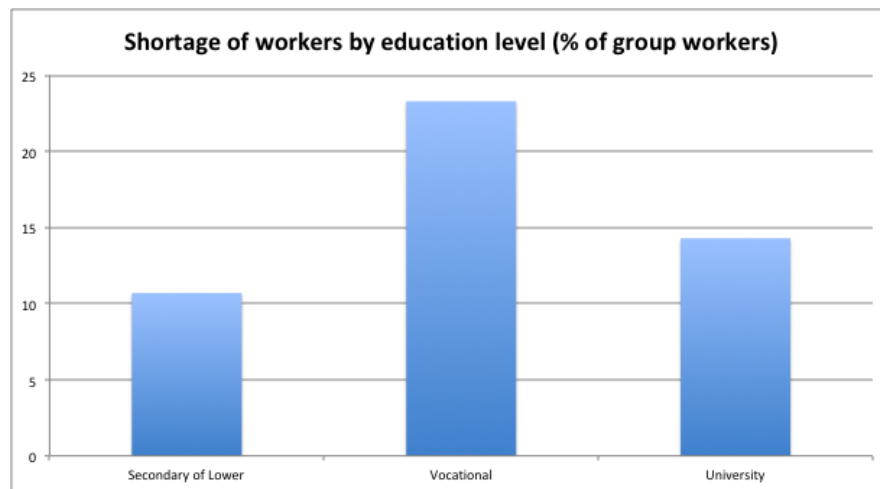
Figure 2.4 Shortage of Workers by educational level
Source: EIC surveys 2014

The figure 2.4 above indicates what groups of workers are needed by employers. The most significant shortages involve workers with vocational degrees. This may occur because candidates with vocational certificates require less training, though they have already learned practical job skills, hands-on experience and workplace adaptability.

As Akkaya (2015) points out, university graduates have been found to comprise the largest worker groups with over-education due to the supply exceeding the need and overrating on general education. Employers also give an edge to vocational degree students. The government should aim to balance the ratio of vocational education to public education from the current share of about 30:70 to at least 50:50. First, restructure the education system to support the vocational school and some private institutions that have been highly regarded by industries. Second, require secondary schools to give better advice and knowledge about the labour market to reduce changes or the possibility of being overeducated. Third, raise the university standards for those entering to reduce the number of graduates while increasing quality and reducing the risk of oversupply.

CHAPTER 3: METHODOLOGY

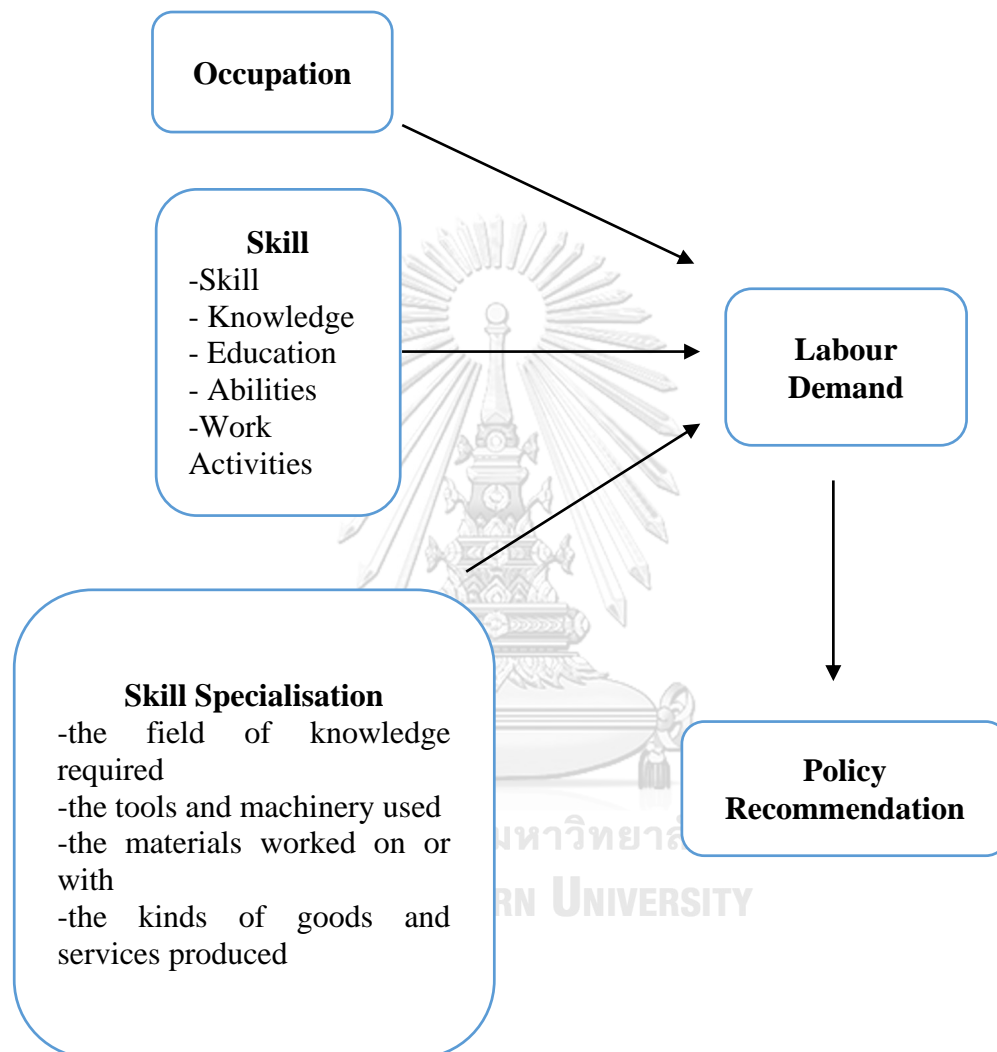## 3.1 Conceptual Framework

Figure 3.1 The Conceptual Framework

3.2 Empirical Framework

This chapter describes the conceptual framework of the research methodology and design used in the study as shown in figure 3.1. It also discusses the rationale for the research methodology employed, which is directed by the objectives of the study. There were 2 types of data collected by this study. First, secondary data from NSO (National Statistical Office of Thailand) was collected under the topic of Labour Demand for Establishment Survey in the years 2008 and 2013, while the second type was the skill data from O*NET.

3.2.1 Labour Demand for Establishment Survey (2008, 2013) and ISCO

The concept of the Labour Demand for Establishment Survey and ISCO are used to describe occupations. The main reason for NSO to survey this topic was to identify the trends of labour demand as well as labour shortages in establishments in Thailand. This survey expected to help in the planning and development of the labour force in Thailand, as well as to provide a guideline for new entries in the workforce, including students and people who want to enter the workforce. The statistics of this survey uses ISCO (International Standard Classification of Occupation), which comprises 4 versions including ISCO-58, ISCO-68, ISCO-88 and ISCO-08. In this study, ISCO-08 is primarily used since it is the latest update. ISCO-08 can be classified into 10 major groups, including 1) Managers, 2) Professional, 3) Technicians and associate professionals, 4) Clerical support workers, 5) Service and sales workers, 6) Skilled agricultural, forestry and fishery workers, 7) Craft and related trades workers, 8) Plant and machine operators, and assemblers, 9) Elementary occupations, and 10) Armed forces occupations. The concept of skill level is applied mainly at the top (major group) level of the classification. This means that eight of the ten major groups in ISCO-08 contain occupations at only one of the four skill levels. For example, ISCO category 7, Craft and related trade workers only includes occupations at the highest ISCO skill level, Skill Level 7. Skill specialisation is considered in terms of 4 ideas:

- the field of information required
- the apparatuses and hardware utilised

- the materials chipped away at or with

- kinds of merchandise and ventures delivered

Inside each significant gathering, occupations are masterminded into unit gatherings, minority gatherings and sub-real gatherings, which are fundamentally based on the aspects of expertise specialisation. On account of ISCO-08 Noteworthy Gathering 1, Administrators, senior authority and officials, and Significant Gathering 0, Military occupations, the idea of ability level is connected fundamentally at the second various levels.

3.2.2 O*NET

Another framework and conceptual model that uses the description of occupations is O*NET ONLINE (The Occupational Information Network), which is also uses to define skills. O*NET occupations are rated on 6 types of interests: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional, which are compatible with Holland's R-I-A-S-E-C Interest Structure (Holland, 1985). The O*NET database has a wide assortment of labourer and occupation oriented information classifications. The O*NET Substance Model provides a system that recognises and arranges all significant data about work. The O*NET-SOC Occupation Scientific categorisation spreads work performed in the U.S. economy and characterises the arrangement of occupations for which information is gathered. The O*NET Program is the country's essential wellspring of word-related data. Substantial information is basic to understanding the quickly changing nature of work and how it impacts the workforce as well as the U.S. economy. From this data, applications are created to encourage the improvement and upkeep of a talented workforce in Thailand. Integral to the task is the O*NET database, containing many institutionalised and occupation-explicit descriptors on very nearly 1,000 occupations covering the entire U.S. economy. The database, which is accessible to everyone at no expense, is persistently refreshed from contributory efforts by a wide scope of specialists in many occupations. O*NET data is utilised by a considerable number of people each year, including those exploiting O*NET On the web, My Best course of action, and other freely and secretly created applications. The information has demonstrated its significance in helping individuals secure the preparation and

positions they need while also encouraging managers and gifted specialists to be aggressive in the commercial sector. The Occupational Information Network (O*NET) is developed with the support of the U.S. Department of Labour/Employment and Training Administration (USDOL/ETA) through an allowance in relation to the North Carolina Branch of Trade.

O*NET uses the Standard Occupational Classification (SOC) code. Inside each significant gathering, occupations are masterminded into unit gatherings, minority gatherings and sub-real gatherings based on aspects of aptitude specialisation. ISCO-08 (International Standard Classification of Occupations) and SOC (Standard Occupational Classification) have different codes of occupation to get the same code. This framework uses a crosswalk between ISCO-08 and SOC-10 to examine the description to match the same occupation. The crosswalks were developed by the Institute for Structural Research (IBS) and the do-file (Hardy, Keister & Lewandowski, 2018)

3.3 Data Process

First, the secondary data is collected from the Labour Demand for Establishment Survey by the National Statistical Office in years 2008 and 2013. There are 10 categories of occupation classified by ISCO (International Standard Classification of Occupations). The data from the Labour Demand for Establishment Survey showed that occupation category 7 had lack of demand. Moreover, defining the occupation in category 7 used the data from ISCO (International Standard Classification of Occupations). On this point, it is important to know what occupation in category 7 is under the ISCO code.

For the second step, defining each occupation will use the data from O*NET. O*NET is the primary source of occupational information from the U.S. Department of Labour/Employment and Training Administration, which has the definitions for all occupations. In this step, the importance scores for skills, knowledge, abilities and work activities will be used from each occupation in category 7 by collecting the

important scores with more than 50 per cent and selecting the top 3 importance scores that have 150 skills. This is done to define which skill is the most important among the occupations in category 7 and identify the skill shortages. The data in this step is from O*NET, so the code of the occupation will be under the SOC code. When data from the first step and O*NET are different codes, then this step uses the crosswalk to get the code ISCO-08 to SOC-10 to examine the same occupation.

The third step is carried out to calculate the data from the first and second steps that already collected data. By using the amount of labour demand from the Labour Demand for Establishment Survey multiplied by the percentage of importance score from O*NET and dividing by 100, it becomes person units. The formula is shown below. The results of this calculation are the number of the people in those skill shortages.

<u>Example of Formula</u>

Labour demand   9   persons
Cognitive Abilities   50%   (importance)

$$\frac{9 \times 50}{100} = 4.5 \text{ person units}$$

There are 4.5 persons who have skill shortages in cognitive abilities.

The last step uses STATA to group the same codes of occupation and find the mean of each skill. This step will collect the results from STATA and interpret them in a graph in the next chapter.

3.4 Research methods

This study aims to examine the composition of skill shortages among craft and related trades workers, to identify the primary skill shortages in occupations, and to

draw policy recommendations from the results based on the theory that has been used and analysed. The results of the research may be purposefully used, creating and applying reductions methods of the skills shortages. The results may be used to solve problems in terms of both skill shortages and labour shortages.

Secondary data from the Labour Demand for Establishment Survey by National Statistical Office for years 2008 and 2013 was used.

1. The data showed Cognitive Abilities compared to labour demand
2. The data showed Psychomotor Abilities compared to labour demand
3. The data showed Physical Abilities compared to labour demand
4. The data showed Sensory Abilities compared to labour demand
5. The data showed Basic Skills compared to labour demand
6. The data showed Complex Problem Solving compared to labour demand
7. The data showed Social Skills compared to labour demand
8. The data showed Technical Skills compared to labour demand
9. The data showed Systems Skills compared to labour demand
10. The data showed Resource Management Skills compared to labour demand
11. The data showed Knowledge compared to labour demand
12. The data showed Information Input compared to labour demand
13. The data showed Mental Processes compared to labour demand
14. The data showed Work Output compared to labour demand
15. The data showed Interacting with Others compared to labour demand

3.5 Data Collection Procedure

Data collection for use of the information in this study was divided into two aspects, namely the collection of primary data and secondary storage, which are summarised below.

1. The data collected from the secondary source comprising the Labour Demand for Establishment Survey (NSO) in years 2008 and 2013 focuses on occupation category7.

2. Using crosswalks to get the same code ISCO and SOC (O*NET)

3. The data was collected from data cognitive abilities, psychomotor abilities, physical abilities, sensory abilities, basic skills, complex problem solving, social skills, technical skills, systems skills, resource management skills, knowledge information input, mental processes, work output, and interacting with others (O*NET). All skills were collected from O*NET to support the clarification of the purpose for doing the research.

4. Collection of secondary data. The study, research and data collection concern the idea of academic theory and various research papers related to the thesis, which adopt a framework concept in education.

CHAPTER 4: RESULTS

In this chapter, the findings of the skill shortages based on the objective of this study are discussed. First, the composition of skill shortages among craft and related trade workers are examined. Second, the main skill shortages in occupations are identified. Finally, the policy solutions based on the results in this chapter and theoretical framework from Chapter 2 are recognised.

4.1 Overview

From the data of the Labour Demand for Establishment Survey in 2008 and 2013, the establishment demand for labour was 395,567 persons and labour shortages were 250,397 people in 2008. In 2013, the establishment demand for labour was 306,148 persons and labour shortage comprised 181,827 people. As the numbers from 2008 to 2013 showed, there was a decline of both labour demand and labour shortages. However, craft and related trade workers saw an increase (category 7). In 2008, the labour demand was 12,920 people. In 2013, the labour demand was 25137 people, as selected by the first 2 digits code of ISCO (71XX).
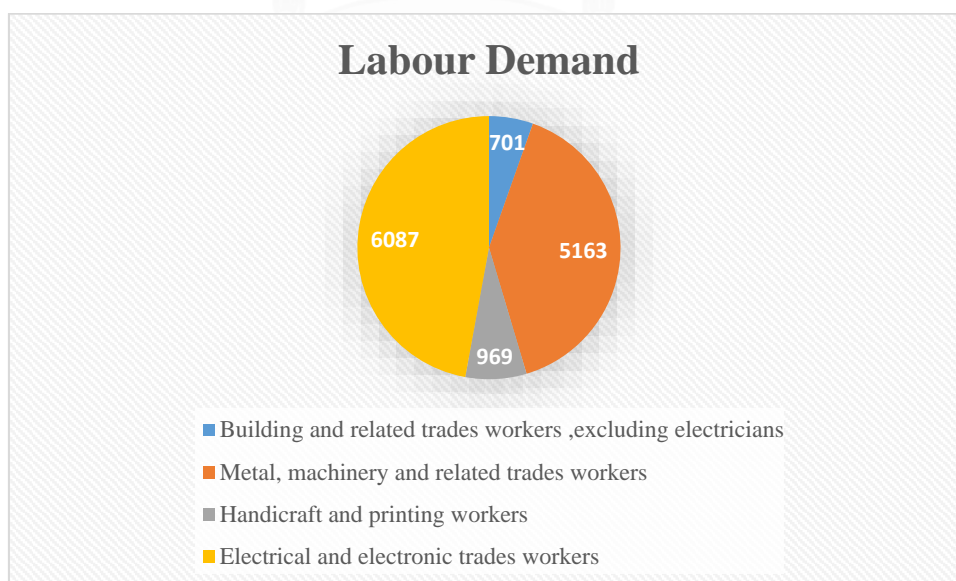
Figure 4.1 The Labour Demand of Establishment in Craft and Related Trades workers in 2008
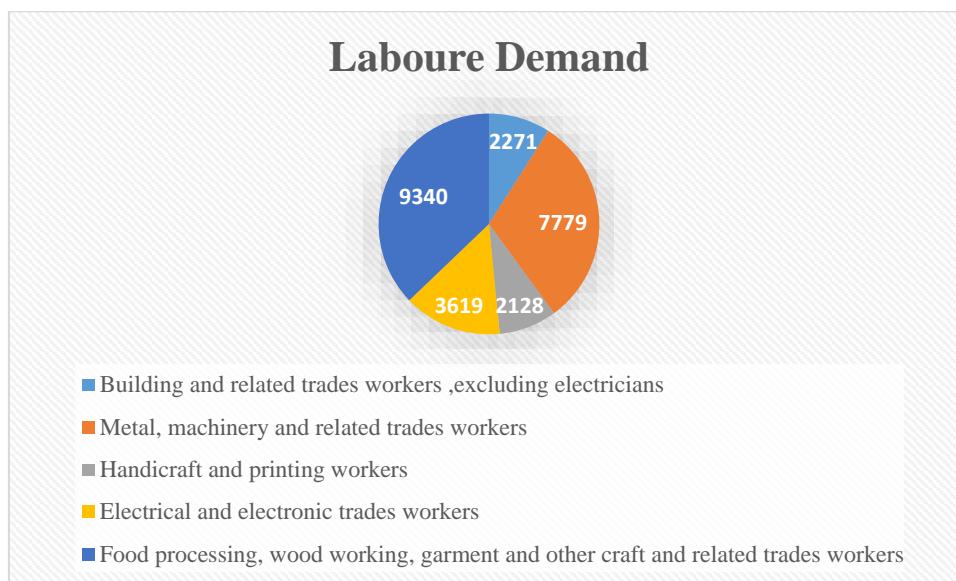
Figure 4.2 The Labour Demand of Establishment in Craft and Related Trades workers in 2013

From Figure 4.1, the establishment demand in 2008 for workers in building and related workers excluding 701 electricians (71XX), 5163 metal and machinery as well as related workers (72XX), 969 handicraft and printing workers (73XX) and 6087 electrical and electronic trade workers (74XX). From Figure 4.2, the establishment demand in 2013 for workers in building and related workers excluding 2271 electricians (71XX), 7779 metal and machinery and related workers (72XX), 2128 handicraft and printing workers (73XX), 3619 electrical and electronic trade workers (74XX) and 9340 food processing, woodworking, garment and other craft and related trade workers (75XX).

In Figures 4.1 and 4.2, there are additional occupation groups including food processing, woodworking, garment and other craft and related trade workers. The reason is that the survey relies on ISCO updated from ISCO-08 to ISCO-88.

4.2 Results

Figure 4.3

  4.2.1 From figure 4.3, the comparison of data for 2 years, research studies found that Problem Sensitivity is a skill shortage. The results of calculations in 2008 showed that the shortage in Problem Sensitivity was 8362.67 person unit. In 2013, it was shown the shortage of Problem Sensitivity was 15013.07 person unit. Problem Sensitivity is the capacity to tell when something isn't right or is probably going to turn out badly. It doesn't include tackling any issue, just perceiving that there is an issue.

  Moreover, a comparison of data over 2 years reveals that research studies have shown Spatial Orientation is the least shortage skill. In 2008, the shortage was 3209.03 person unit. In 2013, the shortage was 4252.64 person unit. Spatial Orientation is the capacity to realise your area concerning nature or to know where different articles concern you.

Figure 4.4

4.2.2 From figure 4.4, the comparison of data for 2 years, research studies found that Arm-Hand Steadiness is a skill shortage. The results of calculations in 2008 showed the shortage of Arm-Hand Steadiness was 8023.89 person unit. In 2013, it was shown that the shortage of Arm-Hand Steadiness was 15788.39 person unit. Arm-Hand Steadiness is the capacity to keep your hands and arms enduring while at the same time holding your arms and deliver in one position.

In a comparison of data for 2 years, research studies have also shown that Speed of Limb Movement is the least shortage skill. In 2008, the shortage was 3930.01 person unit, while in 2013, the shortage was 6002.18 person unit. Speed of Limb Movement is the capacity to rapidly move the arms and legs.

Figure 4.5

4.2.3 From figure 4.5, the comparison of data for 2 years, research studies found that Trunk Strength is a skill shortage. The results of calculations in 2008 showed the shortage of Trunk Strength was 6393.97 person unit. In 2013, it was shown that the shortage of Trunk Strength was 10891.74 person unit. Trunk Strength is the capacity to utilise the stomach and lower back muscles to help some portion of the body more than once or ceaselessly after some time without 'giving out' or exhausting.

A comparison of data by research studies for 2 years also revealed that Dynamic Flexibility is the least shortage skill. In 2008, the shortage was 1005.42 person unit. In 2013, the shortage was 1385.96 person unit. Dynamic Flexibility is the capacity to rapidly twist and over twist, as well as stretch, contort, or connect with the body, arms, or potentially the legs.
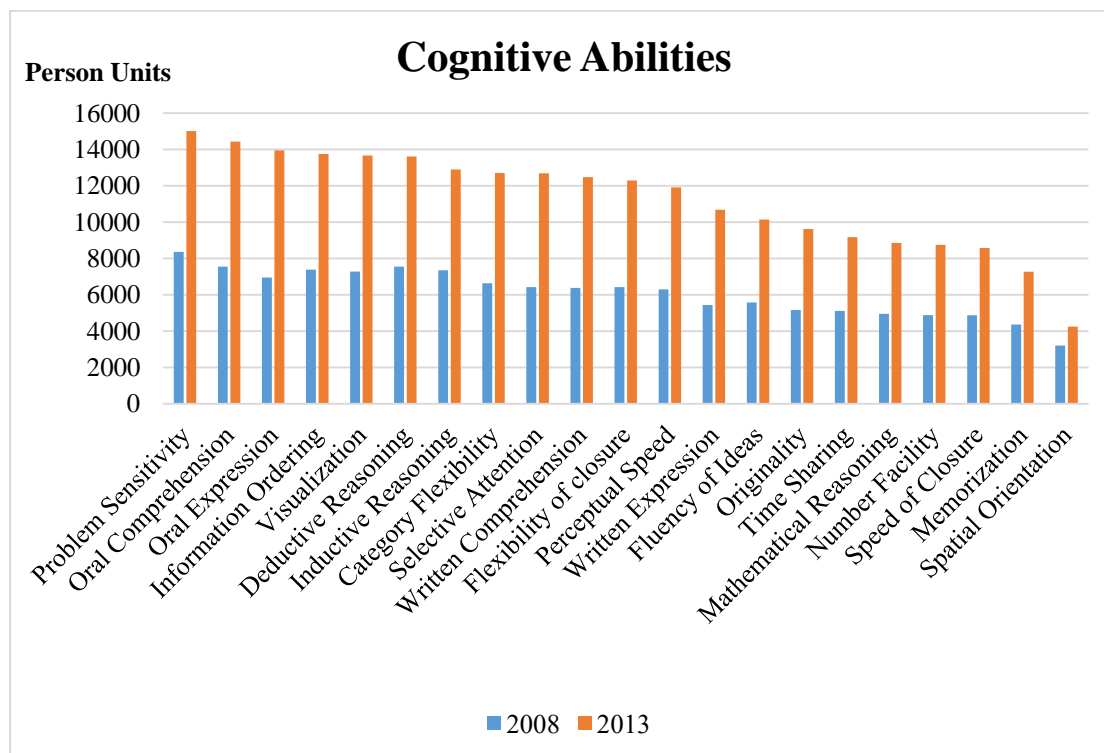
Sensory Abilities

Person Units

Figure 4.6

4.2.4 From figure 4.6, the comparison of data for 2 years, research studies found that Near Vision is a skill shortage. The results of calculations in 2008 showed the shortage of Near Vision was 8508.85 person unit. The shortages of Near Vision was 16465.30 person unit in 2013. Near Vision is the capacity to see subtleties at short proximity (inside a couple of feet of the onlooker).

Moreover, a comparison of data for 2 years by research studies showed that Night Vision is the least shortage skill. In 2008, the shortage was 2465.92 person unit. In 2013, the shortage was 3124.38 person unit. Night Vision is the capacity to see under low light conditions.
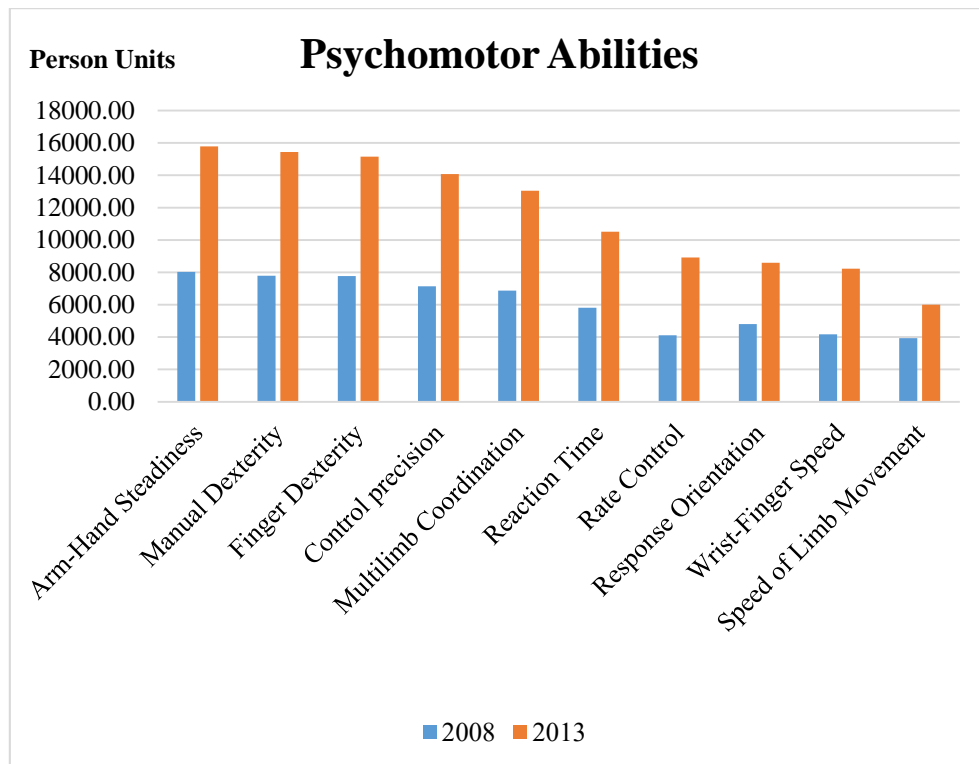
Figure 4.7

4.2.5 From figure 4.7, the comparison of data for 2 years, research studies found that Critical Thinking is a skill shortage. The results of calculations in 2008 showed the shortage of Critical Thinking was 7404.79 person unit. In 2013, it was shown that the shortage of Critical Thinking was 13429.64 person unit. Critical Thinking involves utilising rationale and thinking to distinguish the qualities and shortcomings of elective arrangements, as well as the ends or methods to deal with issues.

Moreover, a comparison of data by research studies over 2 years showed that Science is the least shortage skill. In 2008, the shortage was 2691.81 person unit. In 2013, the shortage was 3783.49 person unit. Science is utilising scientific knowledge, guidelines and strategies to resolve issues.

Figure 4.8

4.2.6 From figure 4.8, the comparison of data for 2 years, research studies found that Complex Problem Solving Skills is a skill shortage. The results of calculations in 2008 showed the shortage of Complex Problem Solving Skills was 6592.02 person unit. In 2013, it was shown the shortage of Complex Problem Solving Skills was 11743.12 person unit. Complex Problem Solving Skills involve recognising complex issues and exploring related data to create and assess choices as well as actualise arrangements.
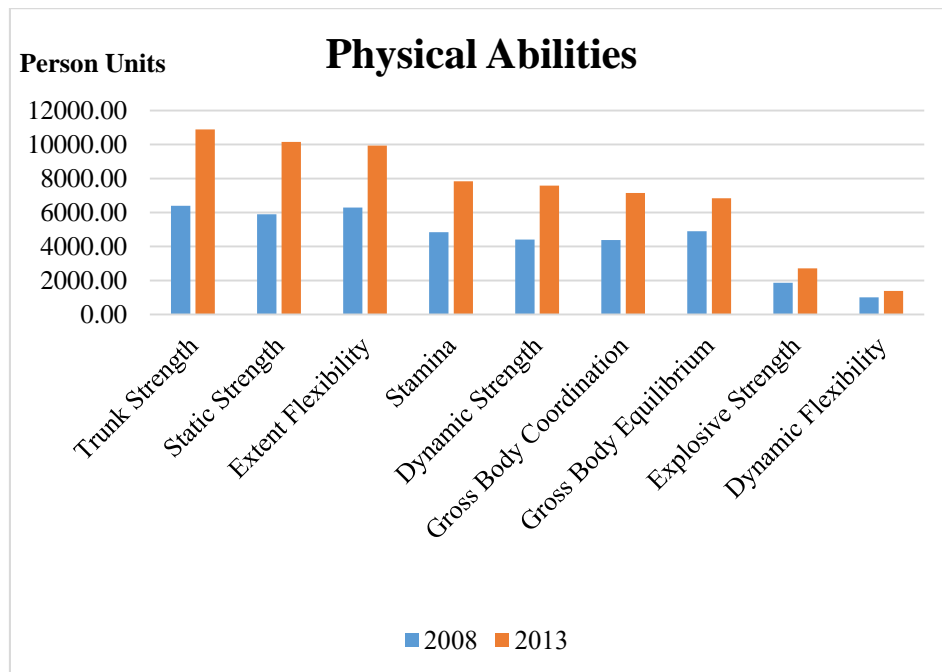
Figure 4.9

4.2.7 From figure 4.9, the comparison of data for 2 years, research studies found that Coordination is a skill shortage. The results of calculations in 2008 showed the shortage of Coordination was 6191.08 person unit. In 2013, it was shown the shortage of Coordination was 11390.58 person unit. Coordination is the modifying of activities with other activities.

Moreover, a comparison of data for 2 years revealed that research studies have shown that Negotiation is the least shortage skill. In 2008, the shortage was 4084.21 person unit. In 2013, the shortage was 7477.41 person unit. Negotiation is uniting others and attempting to accommodate.

Technical Skills
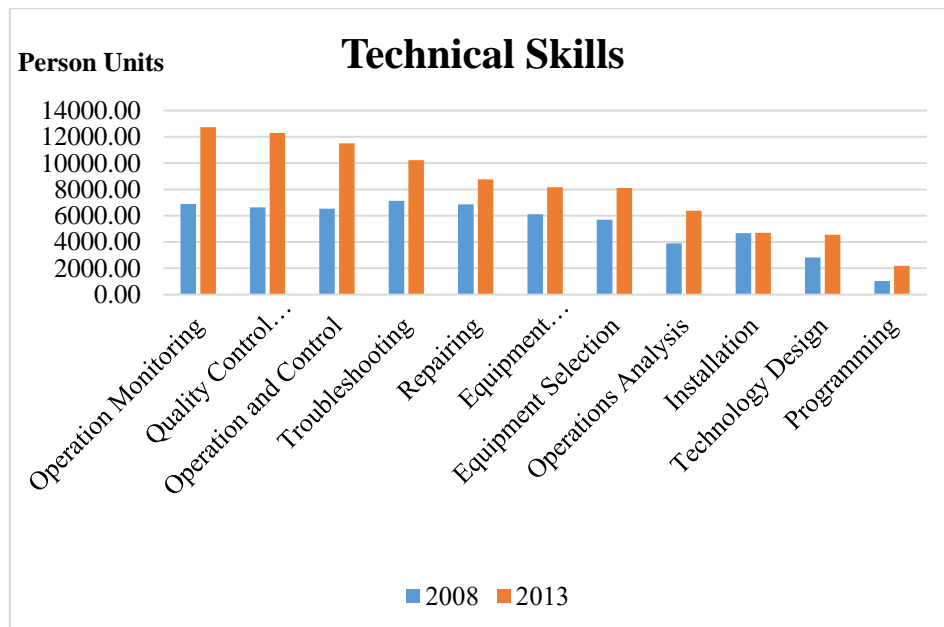
Figure 4.10

4.2.8 From figure 4.10, the comparison of 2 years of data, research studies found that Troubleshooting and Operation Monitoring are skill shortages. The results of calculations in 2008 showed the shortage of Troubleshooting was 7138.12 person unit. In 2013, it was shown the shortage of Operation Monitoring was 12728.56 person unit. Troubleshooting is deciding reasons for working blunders and choosing what to do about it. Operation Monitoring is watching measures, dials, or others pointer to ensure a machine is working correctly.

Moreover, a comparison of data for 2 years by research studies showed that Programming is the least shortage skill. In 2008, the shortage was 1036.24 person unit. In 2013, the shortage was 2193.43 person unit. Programming is composing PC programs for various purposes.
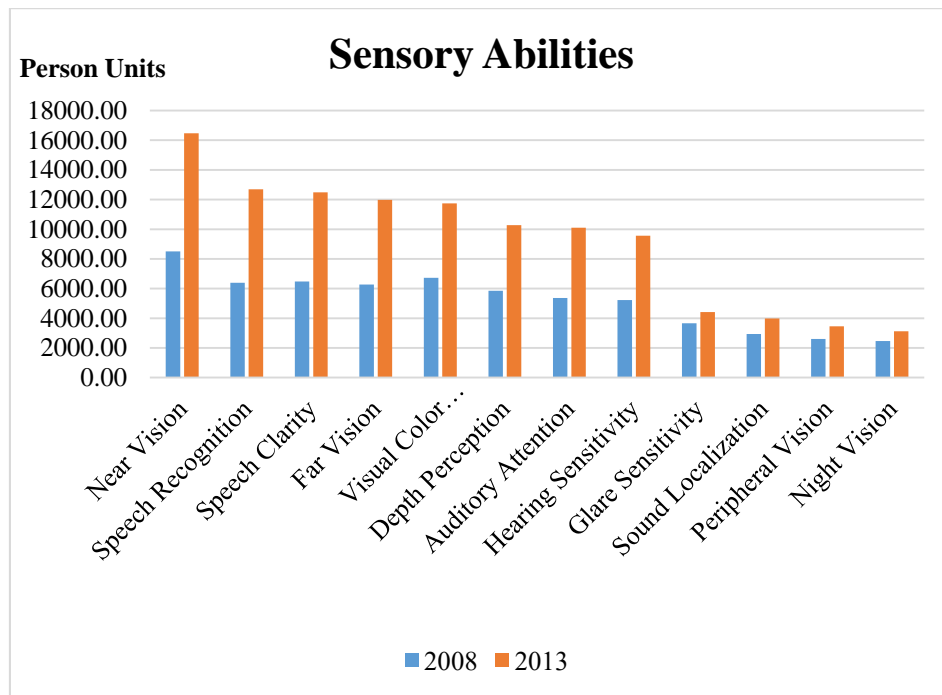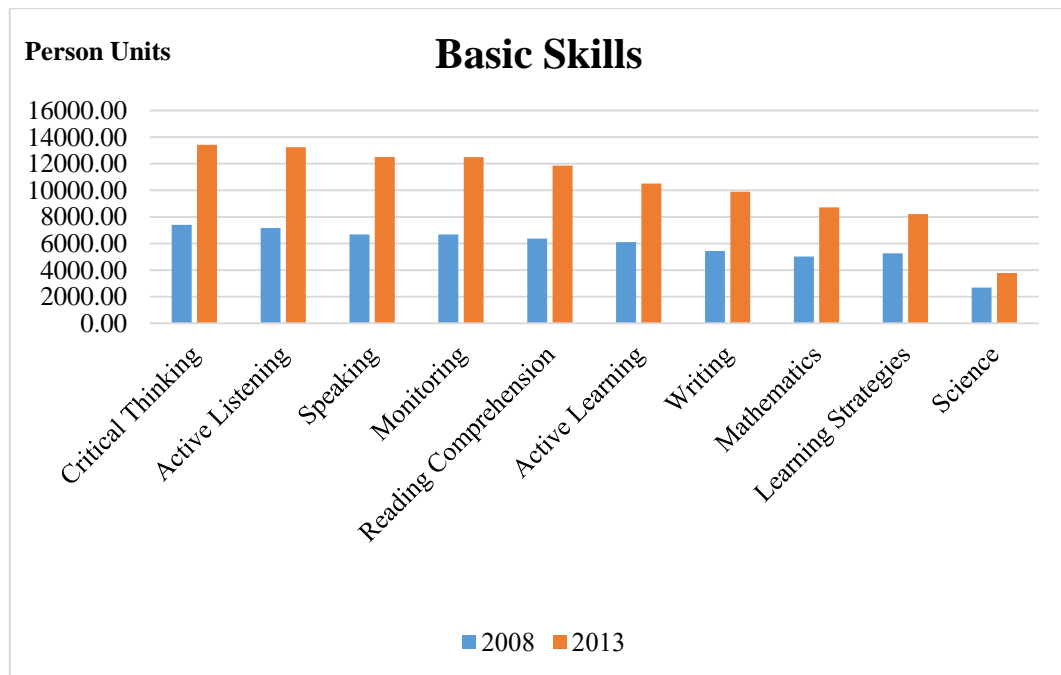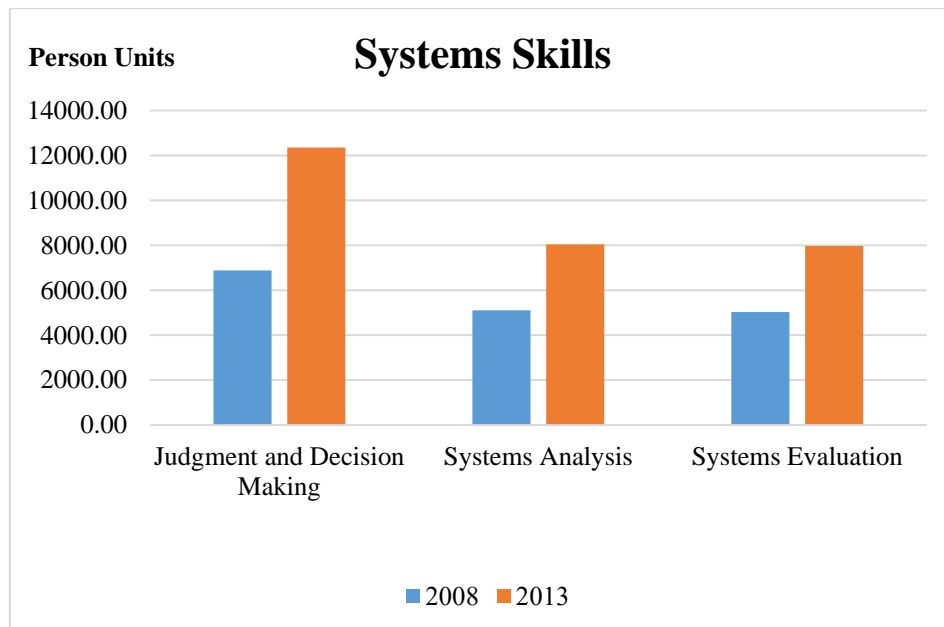
Figure 4.11

4.2.9 From figure 4.11, the comparison of data for 2 years, research studies found that Judgment and Decision Making is a skill shortage. The results of calculations in 2008 showed the shortage of Judgment and Decision Making was 6879.46 person unit. In 2013, it was shown the shortage of Judgment and Decision Making was 12351.89 person unit. Judgment and Decision Making is thinking about the relative expenses and advantages of potential activities to pick the most suitable one.

Moreover, a comparison of data for 2 years by research studies showed that System Evaluation is the least shortage skill. In 2008, the shortage was 5027.53 person unit. In 2013, the shortage was 7971.33 person unit. System Evaluation is recognising the proportions of markers in framework execution and the activities expected to improve or address execution with respect to the objectives of the framework.
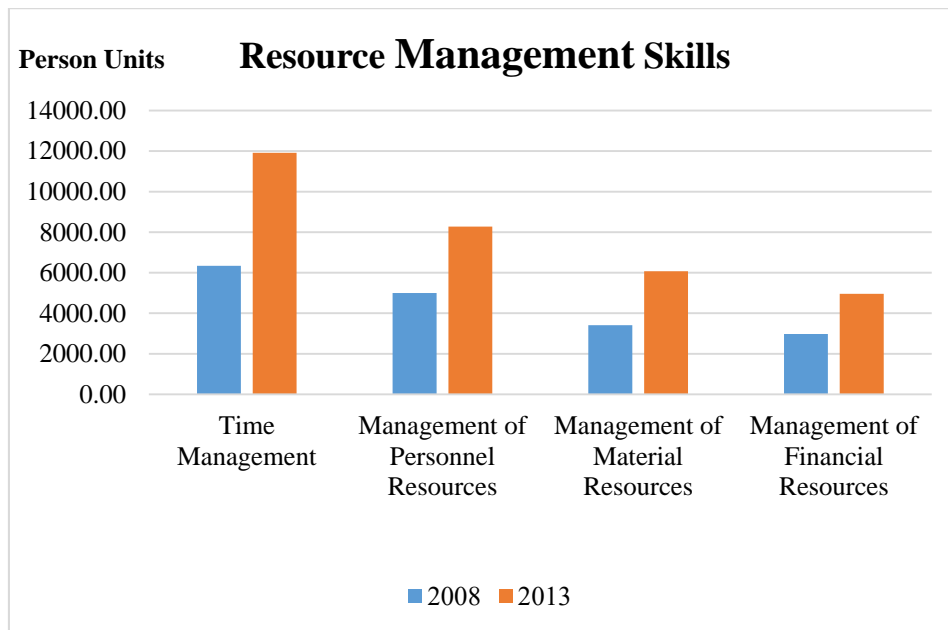
Figure 4.12

4.2.10 From figure 4.12, the comparison of data for 2 years, research studies found that Time Management is a skill shortage. The results of calculations in 2008 showed the shortage of Time Management was 6336.82 person unit. In 2013, it was shown the shortage of Time Management was 11914.03 person unit. Time Management is dealing with one's own time and the seasons of others.

Moreover, a comparison of 2 years of data by research studies showed that Management of Financial Resources is the least shortage skills. In 2008, the shortage was 2978.39 person unit. In 2013, the shortage was 4961.73 person unit. Management of Financial Resources is deciding how cash will be spent to complete work and representing the uses.

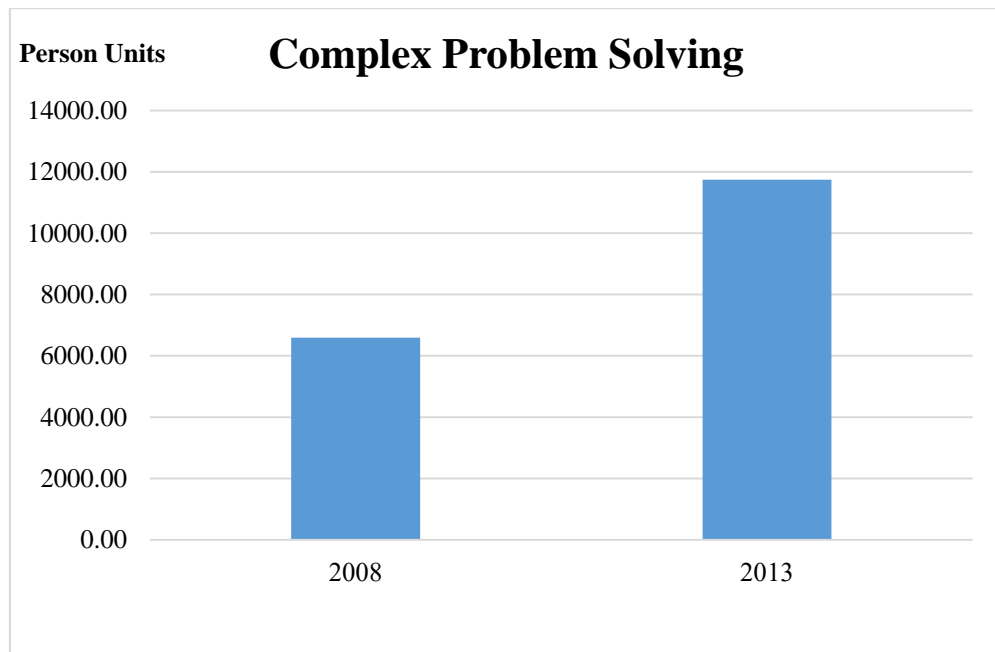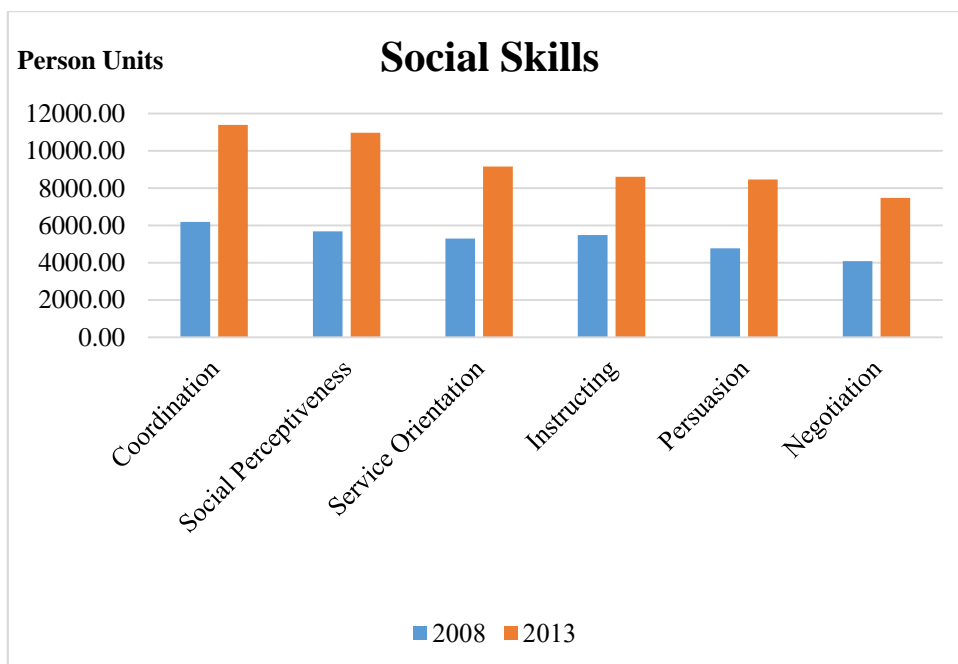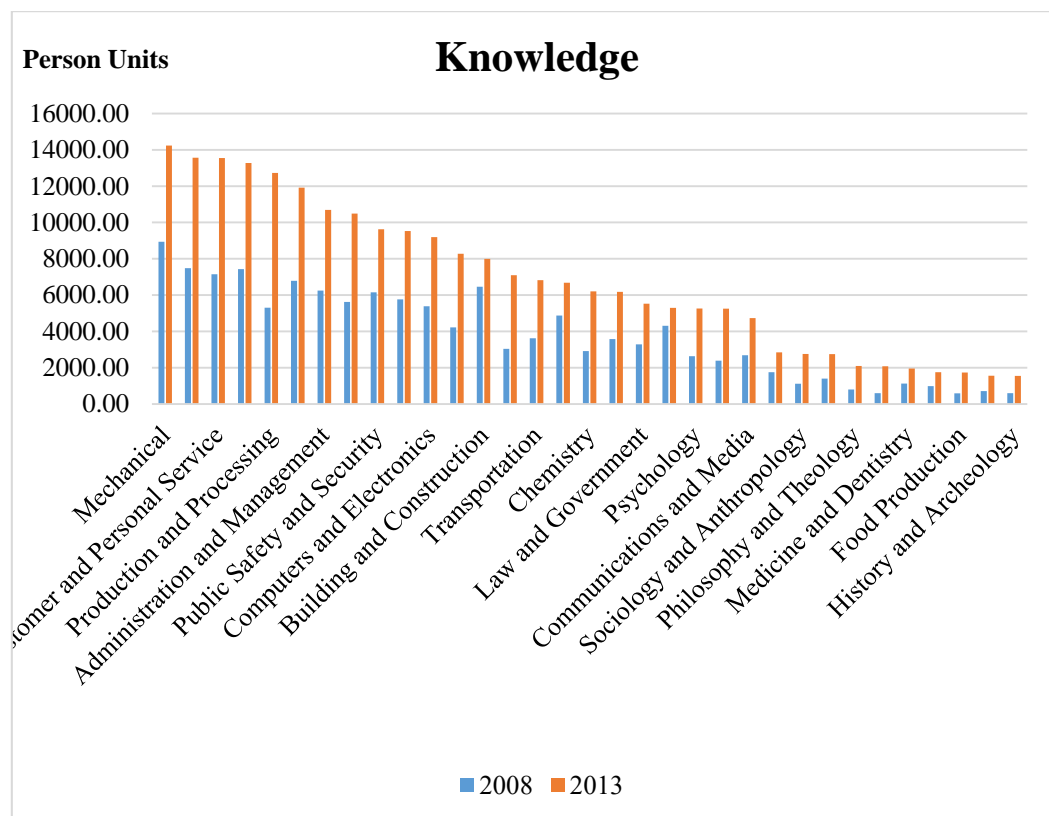**Figure 4.13**

4.2.11 From figure4.13, the comparison of data for 2 years, research studies found that Mechanical is a skill shortage. The results of calculations in 2008 showed the shortage of Mechanical was 8935.46 person unit. In 2013, it was shown the shortage of Mechanical was 14234.35 person unit. Mechanical is the learning of machines and apparatuses, including their plans, uses, fixes, and maintenance.

Moreover, a comparison of data for 2 years by research studies showed that Food Production is the least shortage skill. In 2008, the shortage was 589.59 person unit. In 2013, History and Archaeology shortage was 1544.56 person unit. Food Production is information about the methods and gear for planting, developing, and gathering nourishment items (both plant and creature) for utilisation, including capacity/dealing with procedures. History and Archaeology is information about recorded occasions and their causes, markers, and the consequences for human advancements and societies.
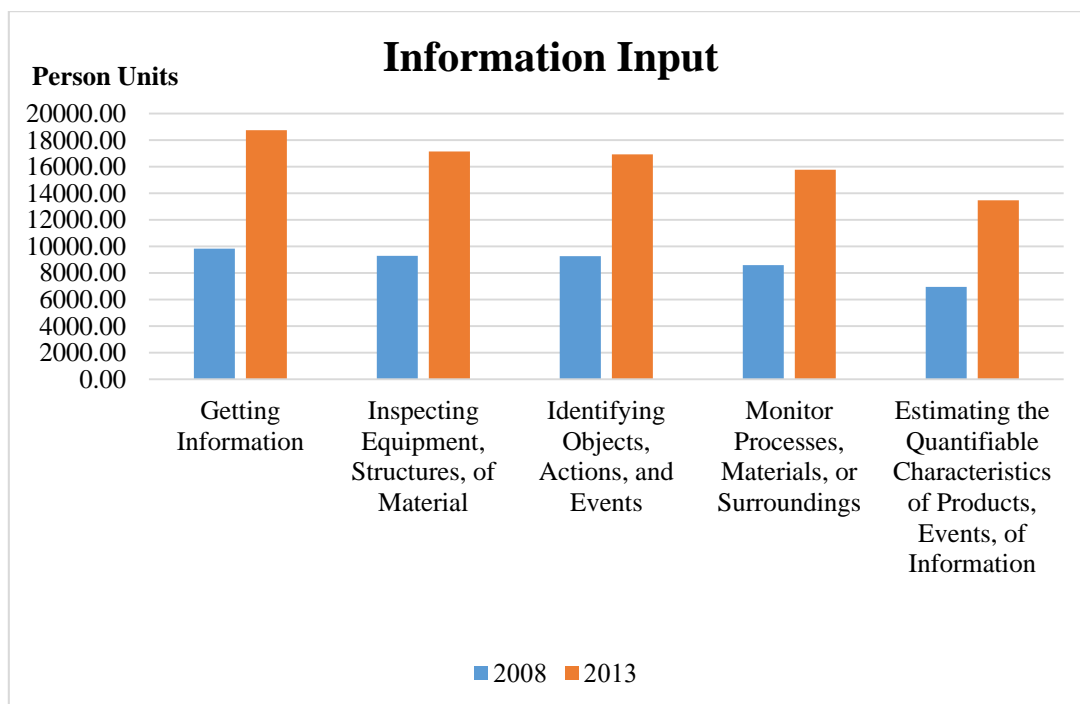
Figure 4.14

4.2.12 From figure 4.14, the comparison of data for 2 years, research studies found that Getting Information is a skill shortage. The results of calculations in 2008 showed the shortage of Getting Information was 9837.30 person unit. In 2013, it was shown that the shortage of Getting Information was 18749.64 person unit. Getting Information is watching, accepting, and generally acquiring data from every important source.

Moreover, a comparison of data for 2 years by research studies showed that Estimating the Quantifiable Characteristics of Products, Events, of Information is the least shortage skill. In 2008, the shortage was 6959.66 person unit. In 2013, the shortage was 13465.37 person unit. Estimating the Quantifiable Characteristics of Products, Events, of Information involves assessing sizes, separations, and amounts or deciding the time, costs, assets or materials expected to play out a work action.
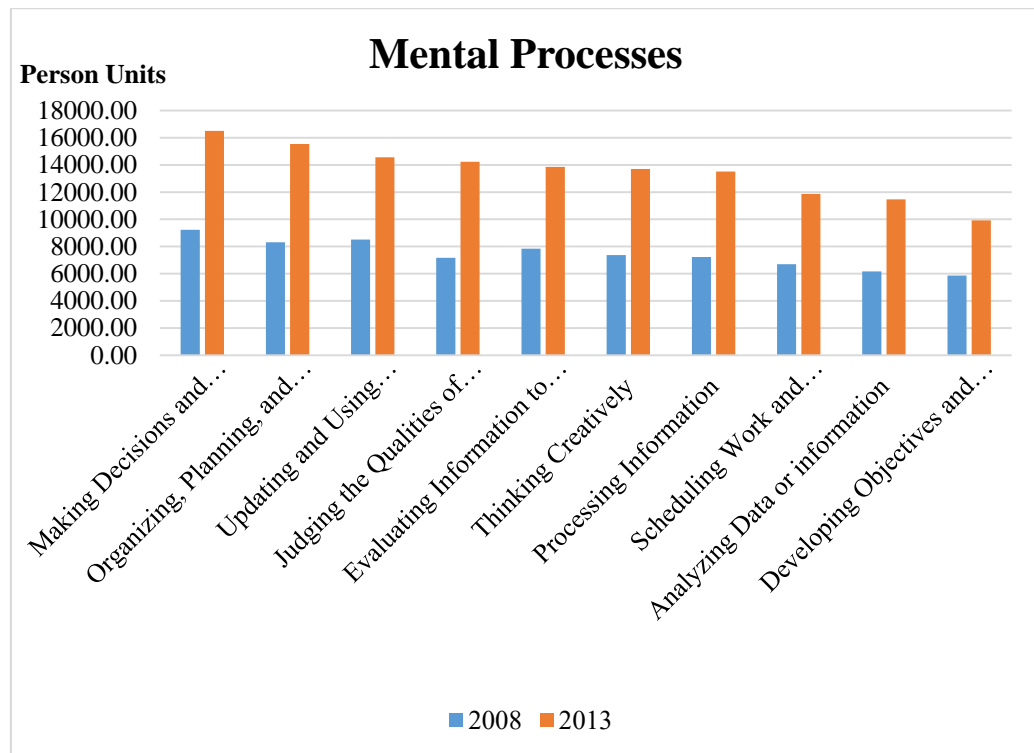
Figure 4.15

4.2.13 From figure 4.15, the comparison of data for 2 years, research studies found that Making Decisions and Solving Problems are skill shortages. The results of calculations in 2008 showed the shortage of Making Decisions and Solving Problems was 9223.81 person unit. In 2013, it was shown the shortage of Making Decisions and Solving Problems was 16507.44 person unit. Making Decisions and Solving Problems is examining data and assessing the results to choose the best arrangement and resolve issues.

Moreover, a comparison of data for 2 years by research studies showed that Developing Objectives and Strategies is the least shortage skill. In 2008, the shortage was 5864.23 person unit. In 2013, the shortage was 9926.48 person unit. Developing Objectives and Strategies involves setting up long-run destinations and determining the systems as well as activities needed to accomplish them.
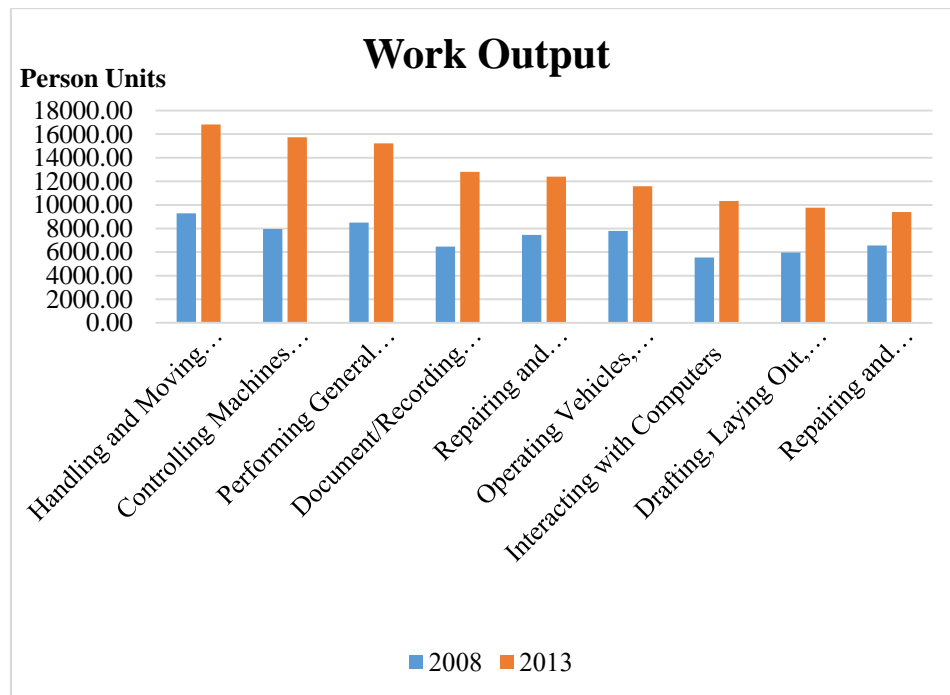
Figure 4.16

4.2.14 From figure 4.16, the comparison of data for 2 years, research studies found that Handling and Moving Objects are skill shortages. The results of calculations in 2008 showed the shortage of Handling and Moving Objects was 9293.76 person unit. In 2013, it was shown that the shortage of Handling and Moving Objects was 16819.76 person unit. Handling and Moving Objects is utilising the hands and arms to take care of, introduce, situate, and move materials as well as control things.

Moreover, a comparison of data for 2 years by research studies showed that Interacting with Computers is the least shortage skill. In 2008, the shortage was 5539.59 person unit. In 2013, Repairing and Maintaining Electronic Equipment shortage was 9394.94 person unit. Interacting with Computers involves utilising PCs and PC frameworks (counting equipment and programming) to program, compose programming, set up capacities, enter data, or process data. Repairing and Maintaining Electronic Equipment is overhauling, fixing, aligning, managing, calibrating, or testing the machines, gadgets, and hardware that work essentially based on electrical or electronic (not mechanical) standards.
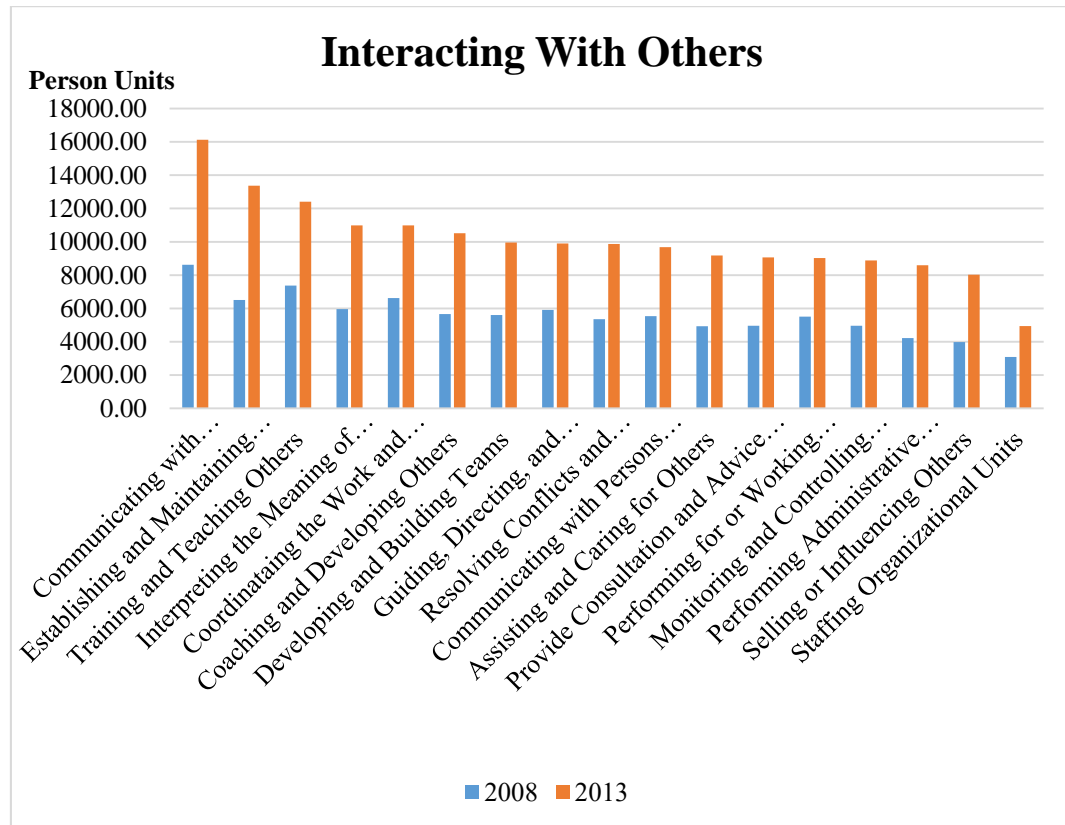
Figure 4.17

4.2.15 From figure 4.17, the comparison of data for 2 years, research studies found that Communicating with Supervisors, Peers, or Subordinates are skill shortages. The results of calculations in 2008 showed the shortage of Communicating with Supervisors, Peers, or Subordinates was 8625.84 person unit. In 2013, it was shown that the shortage of Communicating with Supervisors, Peers, or Subordinates was 16127.29 person unit. Communicating with Supervisors, Peers, or Subordinates is giving information to managers, colleagues, and subordinates by phone, in composed structure, email, or face to face.

Moreover, a comparison of 2 years of data by research studies showed that Staffing Organisational Units is the least shortage skill. In 2008, the shortage was 3090.71 person unit. In 2013, the shortage was 4946.72 person unit. Staffing Organisational Units is enrolling, meeting, choosing, contracting, and advancing representatives in an association.

CHAPTER 5: CONCLUSION

This chapter discusses the composition of skill shortages among craft and related trades workers in Thailand also to identify the skill shortages in occupation. The summarize of the result will show on the table. The last will be the policy recommendation to help resolve labour shortages and skill shortages.

5.1 Overview

According to the results in the previous chapter, the table shows the summarize of each ability, skills, knowledge and work activities which one needs to be concern. The results show that most in the year 2008 and 2013 are in the same direction, that is the result is in the same skills. However, in Technical Skills which in a different direction that is in the year 2008 the skill shortage is Troubleshooting and Operation Monitoring, in the year 2013, the skill shortages are Operation Monitoring. Even though all these skills seem to be skill shortages in Thailand, but these imply in craft and related trades workers (category 7) that what this study focuses. The others categories the skills shortages might not be the same, and it does not mean that those skills are not significant, there are significant at some point depending on what occupation that focus.

		2008	2013
Abilities	Cognitive Abilities	Problem Sensitivity	Problem Sensitivity
	Psychomotor Abilities	Arm-Hand Steadiness	Arm-Hand Steadiness
	Physical Abilities	Trunk Strength	Trunk Strength
	Sensory Abilities	Near Vision	Near Vision
Skills	Basic Skills	Critical Thinking	Critical Thinking
	Complex Problem Solving Skills	Complex Problem Solving Skills	Complex Problem Solving Skills
	Social Skills	Coordination	Coordination

	Technical Skills	Troubleshooting and Operation Monitoring	Operation Monitoring
	Systems Skills	Judgment and Decision Making	Judgment and Decision Making
	Resource Management Skills	Time Management	Time Management
Knowledge	Knowledge	Mechanical	Mechanical
Work Activities	Information Input	Getting Information	Getting Information
	Mental Processes	Making Decisions and Solving Problems	Making Decisions and Solving Problems
	Work Output	Handling and Moving Objects	Handling and Moving Objects
	Interacting With Others	Communicating with Supervisors, Peers, or Subordinates	Communicating with Supervisors, Peers, or Subordinates

Table 3: The results of Abilities, Skills, Knowledge and Work Activities

From the result table 3, most of the skills are possible to be trained while on the job training or apprenticeship. Nevertheless, some skill may take a long period to be trained, and some skill may depend on individual physical factor. The example, Near Vision, is both physical and abilities that can be trained. Eyes are a vital factor of training in Near Vision for the eyes depend on individual physical so in abilities can improve over time. In Knowledge, point out that these skills take a long period to understand the knowledge of Mechanical and practicing clearly.

5.2 Limitation

In this examination has a couple of limitations — first, the refreshed of ISCO that changes occupation information and the code of the occupation. The updated rendition is ISCO-08. Because of this revision, it must be cautious when getting the occupation information from ISCO. Second, due to NSO dependent on ISCO data,

Labor Demand of Establishment surveys the year 2008 utilized ISCO-88. However, Labor Demand of Establishment surveys the year 2013 utilized ISCO-08. Due to this modification, a portion of the occupations can't be discovered; this is the utmost of this examination.

5.3 Policy Recommendation

Based on the results of the research, it can be confirmed that the skills that most Thai people lack can be developed through training and experience rather than specialized knowledge obtained from advanced education. However, they must receive cooperation from various organisations in the private and public sectors that are involved in setting various policies. In this study, it was concluded that there are several policy recommendations that can be offered with the expectation to fulfil the skills shortages and labour shortages.

These policies can be set for the support of vocational students by the government and the agencies that can create incentives in order to emphasise the practice rather than the theory by proving the funding to develop this part to be equivalent to the level of higher education, because in Thai society nowadays, the emphasis is on higher education rather than vocational education, which already has effects on the Thai labour force. The labour shortages are in craft and related trades workers who mostly are not studying in higher education but instead are enrolled in vocational education.

Another policy is concerned with apprenticeships and on-the-job training, in which there can be support to have plan to develop personnel in various organisations at all times in order to sufficiently provide the skills required to fill the gaps of long-term skills shortages for corporate sustainability. Moreover, this is not only for the workers who are already employed in an organization but also for the new works who are preparing to enter the labour market, such as the recent graduates or the students who want to work or participate in internship with those students being under the law and regulations. This policy expects to fulfil the gap of skills shortages and to develop the workers in organisations to have more potential, which will have a significant effect on the organizations with regard to the potential workers.

The last policy that this study would recommend is that the departments with sufficient potential may be able to provide scholarships to students by selecting people who have the basic skills that they need and develop them according to a work plan followed by an additional process, for example a course that the company wants or needs. Moreover, specialized internships is training can help students to graduate and be able to return to work efficiently in that organisation or industry.

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APPENDIX I

Abilities - The abilities taxonomy and definition from O*NET

Table AI.1 *Cognitive Abilities*

Cognitive Abilities		Definition
Category Flexibility	-	The ability to generate or use different sets of rules for combining or grouping things in different ways.
Deductive Reasoning	-	The ability to apply general rules to specific problems to produce answers that make sense.
Flexibility of Closure	-	The ability to identify or detect a known pattern (a figure, object, word, or sound) that is hidden in other distracting material.
Fluency of Ideas	-	The ability to come up with a number of ideas about a topic (the number of ideas is important, not their quality, correctness, or creativity).
Inductive Reasoning	-	The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).
Information Ordering	-	The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules (e.g., patterns of numbers, letters, words, pictures, mathematical operations).
Mathematical Reasoning	-	The ability to choose the right mathematical methods or formulas to solve a problem.
Memorization	-	The ability to remember information such as words, numbers, pictures, and procedures.
Number Facility	-	The ability to add, subtract, multiply, or divide quickly and correctly.
Oral Comprehension	-	The ability to listen to and understand information and ideas presented through spoken words and sentences.
Oral Expression	-	The ability to communicate information and ideas in speaking so others will understand.
Originality	-	The ability to come up with unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem.

Perceptual Speed	-	The ability to quickly and accurately compare similarities and differences among sets of letters, numbers, objects, pictures, or patterns. The things to be compared may be presented at the same time or one after the other. This ability also includes comparing a presented object with a remembered object.
Problem Sensitivity	-	The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.
Selective Attention	-	The ability to concentrate on a task over a period of time without being distracted.
Spatial Orientation	-	The ability to know your location in relation to the environment or to know where other objects are in relation to you.
Speed of Closure	-	The ability to quickly make sense of, combine, and organize information into meaningful patterns.
Time Sharing	-	The ability to shift back and forth between two or more activities or sources of information (such as speech, sounds, touch, or other sources).
Visualization	-	The ability to imagine how something will look after it is moved around or when its parts are moved or rearranged.
Written Comprehension	-	The ability to read and understand information and ideas presented in writing.
Written Expression	-	The ability to communicate information and ideas in writing so others will understand.

Table AI.2 *Physical Abilities*

Physical Abilities		Definition
Dynamic Flexibility	-	The ability to quickly and repeatedly bend, stretch, twist, or reach out with your body, arms, and/or legs.
Dynamic Strength	-	The ability to exert muscle force repeatedly or continuously over time. This involves muscular endurance and resistance to muscle fatigue.
Explosive Strength	-	The ability to use short bursts of muscle force to propel oneself (as in jumping or sprinting), or to throw an object.
Extent Flexibility	-	The ability to bend, stretch, twist, or reach with your

body, arms, and/or legs.

Gross Body Coordination	-	The ability to coordinate the movement of your arms, legs, and torso together when the whole body is in motion.
Gross Body Equilibrium	-	The ability to keep or regain your body balance or stay upright when in an unstable position.
Stamina	-	The ability to exert yourself physically over long periods of time without getting winded or out of breath.
Static Strength	-	The ability to exert maximum muscle force to lift, push, pull, or carry objects.
Trunk Strength	-	The ability to use your abdominal and lower back muscles to support part of the body repeatedly or continuously over time without 'giving out' or fatiguing.

Table AI.3 *Psychomotor Abilities*

Psychomotor Abilities		Definition
Arm-Hand Steadiness	-	The ability to keep your hand and arm steady while moving your arm or while holding your arm and hand in one position.
Control Precision	-	The ability to quickly and repeatedly adjust the controls of a machine or a vehicle to exact positions.
Finger Dexterity	-	The ability to make precisely coordinated movements of the fingers of one or both hands to grasp, manipulate, or assemble very small objects.
Manual Dexterity	-	The ability to quickly move your hand, your hand together with your arm, or your two hands to grasp, manipulate, or assemble objects.
Multilimb Coordination	-	The ability to coordinate two or more limbs (for example, two arms, two legs, or one leg and one arm) while sitting, standing, or lying down. It does not involve performing the activities while the whole body is in motion.
Rate Control	-	The ability to time your movements or the movement of a piece of equipment in anticipation of changes in the speed and/or direction of a moving object or scene.
Reaction Time	-	The ability to quickly respond (with the hand, finger, or

foot) to a signal (sound, light, picture) when it appears.

Response Orientation	-	The ability to choose quickly between two or more movements in response to two or more different signals (lights, sounds, pictures). It includes the speed with which the correct response is started with the hand, foot, or other body part.
Speed of Limb Movement	-	The ability to quickly move the arms and legs.
Wrist-Finger Speed	-	The ability to make fast, simple, repeated movements of the fingers, hands, and wrists.

Table AI.4 *Sensory Abilities*

Sensory Abilities		Definition
Auditory Attention	-	The ability to focus on a single source of sound in the presence of other distracting sounds.
Depth Perception	-	The ability to judge which of several objects is closer or farther away from you, or to judge the distance between you and an object.
Far Vision	-	The ability to see details at a distance.
Glare Sensitivity	-	The ability to see objects in the presence of glare or bright lighting.
Hearing Sensitivity	-	The ability to detect or tell the differences between sounds that vary in pitch and loudness.
Near Vision	-	The ability to see details at close range (within a few feet of the observer).
Night Vision	-	The ability to see under low light conditions.
Peripheral Vision	-	The ability to see objects or movement of objects to one's side when the eyes are looking ahead.
Sound Localization	-	The ability to tell the direction from which a sound originated.
Speech Clarity	-	The ability to speak clearly so others can understand you.
Speech Recognition	-	The ability to identify and understand the speech of another person.
Visual Color Discrimination	-	The ability to match or detect differences between colors, including shades of color and brightness.

Knowledge - Knowledge taxonomy and definitions from O*NET

Table AI.5 *Knowledge*

Knowledge		Definition
Administration and Management	-	Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.
Biology	-	Knowledge of plant and animal organisms, their tissues, cells, functions, interdependencies, and interactions with each other and the environment.
Building and Construction	-	Knowledge of materials, methods, and the tools involved in the construction or repair of houses, buildings, or other structures such as highways and roads.
Chemistry	-	Knowledge of the chemical composition, structure, and properties of substances and of the chemical processes and transformations that they undergo. This includes uses of chemicals and their interactions, danger signs, production techniques, and disposal methods.
Clerical	-	Knowledge of administrative and clerical procedures and systems such as word processing, managing files and records, stenography and transcription, designing forms, and other office procedures and terminology.
Communications and Media	-	Knowledge of media production, communication, and dissemination techniques and methods. This includes alternative ways to inform and entertain via written, oral, and visual media.
Computers and Electronics	-	Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.
Customer and Personal Service	-	Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.
Design	-	Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.
Economics and Accounting	-	Knowledge of economic and accounting principles and practices, the financial markets, banking and the analysis and reporting of financial data.
Education and Training	-	Knowledge of principles and methods for curriculum and training design, teaching and instruction for individuals and

groups, and the measurement of training effects.

Engineering and Technology	-	Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
English Language	-	Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.
Fine Arts	-	Knowledge of the theory and techniques required to compose, produce, and perform works of music, dance, visual arts, drama, and sculpture.
Food Production	-	Knowledge of techniques and equipment for planting, growing, and harvesting food products (both plant and animal) for consumption, including storage/handling techniques.
Foreign Language	-	Knowledge of the structure and content of a foreign (non-English) language including the meaning and spelling of words, rules of composition and grammar, and pronunciation.
Geography	-	Knowledge of principles and methods for describing the features of land, sea, and air masses, including their physical characteristics, locations, interrelationships, and distribution of plant, animal, and human life.
History and Archeology	-	Knowledge of historical events and their causes, indicators, and effects on civilizations and cultures.
Law and Government	-	Knowledge of laws, legal codes, court procedures, precedents, government regulations, executive orders, agency rules, and the democratic political process.
Mathematics	-	Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.
Mechanical	-	Knowledge of machines and tools, including their designs, uses, repair, and maintenance.
Medicine and Dentistry	-	Knowledge of the information and techniques needed to diagnose and treat human injuries, diseases, and deformities. This includes symptoms, treatment alternatives, drug properties and interactions, and preventive health-care measures.
Personnel and Human Resources	-	Knowledge of principles and procedures for personnel recruitment, selection, training, compensation and benefits, labor relations and negotiation, and personnel information

systems.

Philosophy and Theology	-	Knowledge of different philosophical systems and religions. This includes their basic principles, values, ethics, ways of thinking, customs, practices, and their impact on human culture.
Physics	-	Knowledge and prediction of physical principles, laws, their interrelationships, and applications to understanding fluid, material, and atmospheric dynamics, and mechanical, electrical, atomic and sub- atomic structures and processes.
Production and Processing	-	Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.
Psychology	-	Knowledge of human behavior and performance; individual differences in ability, personality, and interests; learning and motivation; psychological research methods; and the assessment and treatment of behavioral and affective disorders.
Public Safety and Security	-	Knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions.
Sales and Marketing	-	Knowledge of principles and methods for showing, promoting, and selling products or services. This includes marketing strategy and tactics, product demonstration, sales techniques, and sales control systems.
Sociology and Anthropology	-	Knowledge of group behavior and dynamics, societal trends and influences, human migrations, ethnicity, cultures and their history and origins.
Telecommunication	-	Knowledge of transmission, broadcasting, switching, control, and operation of telecommunications systems.
Therapy and Counseling	-	Knowledge of principles, methods, and procedures for diagnosis, treatment, and rehabilitation of physical and mental dysfunctions, and for career counseling and guidance.
Transportation	-	Knowledge of principles and methods for moving people or goods by air, rail, sea, or road, including the relative costs and benefits.

Skills - The skills taxonomy and definitions from O*NET

Table AI.6 *Basic Skills*

Basic Skills		Definition
Active Learning	-	Understanding the implications of new information for both current and future problem-solving and decision-making.
Active Listening	-	Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
Critical Thinking	-	Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
Learning Strategies	-	Selecting and using training/instructional methods and procedures appropriate for the situation when learning or teaching new things.
Mathematics	-	Using mathematics to solve problems.
Monitoring	-	Monitoring/Assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.
Reading Comprehension	-	Understanding written sentences and paragraphs in work related documents.
Science	-	Using scientific rules and methods to solve problems.
Speaking	-	Talking to others to convey information effectively.
Writing	-	Communicating effectively in writing as appropriate for the needs of the audience.

Table AI.7 *Complex Problem Solving Skills*

Complex Problem Solving Skills		Definition
Complex Problem Solving	-	Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.

Table AI.8 *Resource Management Skills*

Resource Management Skills		Definition
Management of Financial Resources	-	Determining how money will be spent to get the work done, and accounting for these expenditures.
Management of Material Resources	-	Obtaining and seeing to the appropriate use of equipment, facilities, and materials needed to do certain work.
Management of Personnel Resources	-	Motivating, developing, and directing people as they work, identifying the best people for the job.
Time Management	-	Managing one's own time and the time of others.

Table AI.9 *Social Skills*

Social Skills		Definition
Coordination	-	Adjusting actions in relation to others' actions.
Instructing	-	Teaching others how to do something.
Negotiation	-	Bringing others together and trying to reconcile differences.
Persuasion	-	Persuading others to change their minds or behavior.
Service Orientation	-	Actively looking for ways to help people.
Social Perceptiveness	-	Being aware of others' reactions and understanding why they react as they do.

Table AI.10 *Systems Skills*

System Skills		Definition
Judgment and Decision Making	-	Considering the relative costs and benefits of potential actions to choose the most appropriate one.
Systems Analysis	-	Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.
Systems Evaluation	-	Identifying measures or indicators of system performance and the actions needed to improve or correct performance, relative to the goals of the system.

Table AI.11 *Technical Skills*

Technical Skills		Definition
Equipment Maintenance	-	Performing routine maintenance on equipment and determining when and what kind of maintenance is needed.
Equipment Selection	-	Determining the kind of tools and equipment needed to do a job.
Installation	-	Installing equipment, machines, wiring, or programs to meet specifications.
Operation and Control	-	Controlling operations of equipment or systems.
Operation Monitoring	-	Watching gauges, dials, or other indicators to make sure a machine is working properly.
Operations Analysis	-	Analyzing needs and product requirements to create a design.
Programming	-	Writing computer programs for various purposes.
Quality Control Analysis	-	Conducting tests and inspections of products, services, or processes to evaluate quality or performance.
Repairing	-	Repairing machines or systems using the needed tools.
Technology Design	-	Generating or adapting equipment and technology to serve user needs.
Troubleshooting	-	Determining causes of operating errors and deciding what to do about it.

Work Activities - Work Activities Taxonomy and definition from O*NET

Table AI.12 *Information Input*

Information Input		Definition
Estimating the Quantifiable Characteristics of Products, Events, or Information	-	Estimating sizes, distances, and quantities; or determining time, costs, resources, or materials needed to perform a work activity.
Getting Information	-	Observing, receiving, and otherwise obtaining information from all relevant sources.
Identifying Objects, Actions, and Events	-	Identifying information by categorizing, estimating, recognizing differences or similarities, and detecting changes in circumstances or events.
Inspecting	-	Inspecting equipment, structures, or materials to identify

Equipment, Structures, or Material		the cause of errors or other problems or defects.
Monitor Processes, Materials, or Surroundings	-	Monitoring and reviewing information from materials, events, or the environment, to detect or assess problems.

Table AI.13 *Interacting With Others*

Interacting with Others		Definition
Assisting and Caring for Others	-	Providing personal assistance, medical attention, emotional support, or other personal care to others such as coworkers, customers, or patients.
Coaching and Developing Others	-	Identifying the developmental needs of others and coaching, mentoring, or otherwise helping others to improve their knowledge or skills.
Communicating with Persons Outside Organization	-	Communicating with people outside the organization, representing the organization to customers, the public, government, and other external sources. This information can be exchanged in person, in writing, or by telephone or e-mail.
Communicating with Supervisors, Peers, or Subordinates	-	Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person.
Coordinating the Work and Activities of Others	-	Getting members of a group to work together to accomplish tasks.
Developing and Building Teams	-	Encouraging and building mutual trust, respect, and cooperation among team members.
Establishing and Maintaining Interpersonal Relationships	-	Developing constructive and cooperative working relationships with others, and maintaining them over time.
Guiding, Directing, and Motivating Subordinates	-	Providing guidance and direction to subordinates, including setting performance standards and monitoring performance.
Interpreting the Meaning of Information for Others	-	Translating or explaining what information means and how it can be used.
Monitoring and Controlling	-	Monitoring and controlling resources and overseeing the

Resources		spending of money.
Performing Administrative Activities	-	Performing day-to-day administrative tasks such as maintaining information files and processing paperwork.
Performing for or Working Directly with the Public	-	Performing for people or dealing directly with the public. This includes serving customers in restaurants and stores, and receiving clients or guests.
Provide Consultation and Advice to Others	-	Providing guidance and expert advice to management or other groups on technical, systems-, or process-related topics.
Resolving Conflicts and Negotiating with Others	-	Handling complaints, settling disputes, and resolving grievances and conflicts, or otherwise negotiating with others.
Selling or Influencing Others	-	Convincing others to buy merchandise/goods or to otherwise change their minds or actions.
Staffing Organizational Units	-	Recruiting, interviewing, selecting, hiring, and promoting employees in an organization.
Training and Teaching Others	-	Identifying the educational needs of others, developing formal educational or training programs or classes, and teaching or instructing others.

Work Activities — Work Activities Taxonomy and definitions from O*NET

Table AI.14 *Mental Processes*

Mental Processes		Definition
Analyzing Data or Information	-	Identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts.
Developing Objectives and Strategies	-	Establishing long-range objectives and specifying the strategies and actions to achieve them.
Evaluating Information to Determine Compliance with Standards	-	Using relevant information and individual judgment to determine whether events or processes comply with laws, regulations, or standards.
Judging the Qualities of Things, Services, or People	-	Assessing the value, importance, or quality of things or people.
Making Decisions and Solving	-	Analyzing information and evaluating results to choose the

Problems		best solution and solve problems.
Organizing, Planning, and Prioritizing Work	-	Developing specific goals and plans to prioritize, organize, and accomplish your work.
Processing Information	-	Compiling, coding, categorizing, calculating, tabulating, auditing, or verifying information or data.
Scheduling Work and Activities	-	Scheduling events, programs, and activities, as well as the work of others.
Thinking Creatively	-	Developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.
Updating and Using Relevant Knowledge	-	Keeping up-to-date technically and applying new knowledge to your job.

Table AI.15 *Work Output*

Work Output		Definition
Controlling Machines and Processes	-	Using either control mechanisms or direct physical activity to operate machines or processes (not including computers or vehicles).
Documenting/Recording Information	-	Entering, transcribing, recording, storing, or maintaining information in written or electronic/magnetic form.
Drafting, Laying Out, and Specifying Technical Devices, Parts, and Equipment	-	Providing documentation, detailed instructions, drawings, or specifications to tell others about how devices, parts, equipment, or structures are to be fabricated, constructed, assembled, modified, maintained, or used.
Handling and Moving Objects	-	Using hands and arms in handling, installing, positioning, and moving materials, and manipulating things.
Interacting with Computers	-	Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.
Operating Vehicles, Mechanized Devices, or Equipment	-	Running, maneuvering, navigating, or driving vehicles or mechanized equipment, such as forklifts, passenger vehicles, aircraft, or water craft.
Performing General Physical Activities	-	Performing physical activities that require considerable use of your arms and legs and moving your whole body, such as climbing, lifting, balancing, walking, stooping, and handling of materials.

| Repairing and Maintaining Electronic Equipment | - | Servicing, repairing, calibrating, regulating, fine-tuning, or testing machines, devices, and equipment that operate primarily on the basis of electrical or electronic (not mechanical) principles. |
| Repairing and Maintaining Mechanical Equipment | - | Servicing, repairing, adjusting, and testing machines, devices, moving parts, and equipment that operate primarily on the basis of mechanical (not electronic) principles. |

APPENDIX II

ABILITIES

Table AII.1 *The results of abilities year 2008*

2008	Abilities			
ISCO	Problem Sensitivity	Armhand Steadiness	Trunk Strength	Near Vision
7113	19.53	20.46	21.39	19.53
7122	28.05	29.16	29.65	30.50
7123	87.71	110.38	108.59	116.35
7124	231.12	257.04	250.56	237.60
7132	4.85	6.75	5.50	6.90
7211	211.15	270.60	243.95	237.80
7212	716.38	752.50	602.00	776.58
7213	55.00	56.32	51.04	62.04
7214	107.79	124.08	121.57	119.69
7215	0.66	0.50	0.53	0.56
7221	61.04	61.04	47.96	68.67
7222	59.14	57.79	41.66	66.82
7223	240.34	248.87	200.29	249.05
7224	52.20	65.25	40.89	60.03
7231	773.15	738.99	669.13	813.51
7232	3.75	3.60	2.35	3.60
7233	744.10	794.14	624.69	732.90
7311	21.76	20.97	9.29	24.14
7313	286.72	435.20	30.72	399.36
7321	202.30	159.80	59.50	261.80
7322	49.80	43.99	34.03	59.76
7411	3348.00	2812.32	2499.84	3080.16
7412	280.13	273.77	197.84	274.20
7421	288.29	233.32	152.25	312.02
7422	489.72	447.06	348.74	495.29
sum	8362.67	8023.89	6393.97	8508.85

SKILLS

Table AII.2 *The results of skills year 2008*

2008	Skills					
ISCO	Critical Thinking	Complex Problem Solving	Coordination	Troubleshooting	Judgment and Decision making	Time Management
7113	20.46	16.43	17.36	10.85	16.43	17.36
7122	23.77	21.56	24.13	13.48	22.30	23.03
7123	80.55	67.42	78.76	46.54	75.18	84.13
7124	228.96	196.56	222.48	151.20	190.08	203.04
7132	5.00	4.40	4.70	4.55	4.70	4.70
7211	198.85	174.25	149.65	168.10	186.55	192.70
7212	638.12	547.82	529.76	421.40	547.82	511.70
7213	51.04	42.68	41.36	45.32	44.00	44.00
7214	95.88	80.84	96.51	58.91	82.72	82.72
7215	0.56	0.50	0.47	0.41	0.50	0.53
7221	51.23	44.69	47.96	51.23	47.96	54.50
7222	51.46	48.00	43.97	43.78	49.15	48.00
7223	226.63	202.78	200.22	210.44	206.61	198.94
7224	48.72	40.89	30.45	43.50	40.89	38.28
7231	681.55	630.32	569.77	715.70	607.03	597.71
7232	3.60	3.60	2.50	3.90	2.80	2.50
7233	773.00	683.37	655.37	907.43	687.11	649.77
7311	19.15	17.34	12.81	21.99	17.34	15.30
7313	271.36	256.00	209.92	128.00	286.72	271.36
7321	212.50	180.20	180.20	100.30	192.10	185.30
7322	43.99	41.50	41.50	41.50	41.50	41.50
7411	2678.40	2365.92	2232.00	2946.24	2678.40	2232.00
7412	287.67	251.10	216.31	284.99	231.03	224.34
7421	276.42	262.19	217.50	265.74	219.87	242.42
7422	435.93	413.67	365.44	452.62	400.68	371.00
sum	7404.79	6594.02	6191.08	7138.12	6879.46	6336.82

KNOWLEDGE AND WORK ACTIVITIES

Table AII.3 *The results of knowledge and work activities year 2008*

2008	Knowledge	Work Activities			
ISCO	Mechanical	Getting Information	Making Decisions and Solving Problem	Handling and Moving objects	Communicating with Supervisors, peer
7113	17.98	21.70	20.46	28.21	24.49
7122	27.07	34.91	34.79	37.98	31.12
7123	81.74	122.32	98.45	111.58	105.01
7124	241.92	313.20	278.64	339.12	293.76
7132	4.40	7.85	7.35	6.70	6.50
7211	217.30	303.40	262.40	328.00	282.90
7212	614.04	854.84	764.54	1005.34	842.80
7213	60.34	63.80	66.00	70.40	65.12
7214	114.68	146.64	114.68	148.52	121.57
7215	0.67	0.73	0.68	0.58	0.50
7221	67.58	87.20	74.12	83.93	83.93
7222	68.74	75.84	67.01	59.52	64.32
7223	262.84	315.67	287.98	302.89	297.35
7224	56.55	69.60	56.55	63.51	53.07
7231	1010.68	926.84	847.67	855.43	796.43
7232	4.65	4.55	3.95	3.60	4.00
7233	967.52	995.19	937.31	1015.73	913.03
7311	27.09	23.80	24.82	18.70	15.75
7313	250.88	343.04	322.56	332.80	281.60
7321	88.40	297.50	270.30	139.40	275.40
7322	44.82	65.57	68.06	55.61	60.59
7411	3660.48	3481.92	3348.00	3303.36	2946.24
7412	318.00	354.57	343.87	321.57	312.20
7421	293.03	321.90	363.43	230.94	243.59
7422	434.07	604.73	560.21	430.36	504.56
sum	8935.46	9837.30	9223.81	9293.76	8625.84

ABILITIES

Table AII.4 *The results of abilities year 2013*

2013	Abilities			
ISCO	Problem Sensitivity	Armhand Steadiness	Trunk Strength	Near Vision
7111	95.94	12.30	23.37	77.49
7112	10.20	11.73	12.24	11.22
7113	3.15	3.30	3.45	3.15
7114	208.19	246.39	246.39	246.39
7115	384.93	323.83	366.60	342.16
7119	2.63	2.50	2.23	2.49
7122	10.88	11.31	11.50	11.83
7123	46.55	58.58	57.63	61.75
7124	53.50	59.50	58.00	55.00
7125	17.49	21.78	18.48	21.78
7126	36.88	38.06	31.27	38.06
7127	192.44	160.37	121.69	183.95
7131	78.49	105.21	96.86	101.87
7132	180.91	251.78	205.15	257.37
7211	65.41	83.82	75.57	73.66
7212	920.47	966.88	773.50	997.82
7213	14.38	14.72	13.34	16.22
7214	21.79	25.08	24.57	24.19
7215	0.66	0.50	0.53	0.56
7221	168.00	168.00	132.00	189.00
7222	30.18	29.50	21.27	34.10
7223	758.29	787.93	636.03	792.87
7224	25.80	32.25	20.21	29.67
7231	1011.56	966.88	875.47	1064.38
7232	3.00	2.88	1.88	2.88
7233	1715.34	1826.73	1440.59	1693.06
7234	124.08	129.72	88.36	135.36
7311	5.12	4.93	2.19	5.68
7312	8.19	9.75	4.55	9.36
7313	652.96	991.10	69.96	909.48
7314	65.50	90.39	57.64	82.53
7316	38.80	54.00	34.00	52.80
7321	168.39	133.01	49.53	217.91
7322	226.80	200.34	154.98	272.16
7323	43.47	41.40	36.57	43.47

ABILITIES

Table AII.5 *The results of abilities year 2013 (continue)*

2013	Abilities			
ISCO	Problem Sensitivity	Armhand Steadiness	Trunk Strength	Near Vision
7411	978.00	821.52	730.24	899.76
7412	1045.01	995.67	726.57	991.19
7413	16.50	16.50	10.34	16.50
7421	264.60	221.48	137.20	276.36
7422	267.96	244.62	190.82	271.01
7511	227.63	262.99	227.63	269.62
7512	236.91	223.50	196.68	308.43
7514	10.35	7.05	5.70	9.00
7515	91.50	50.02	37.82	87.84
7516	12.00	13.20	10.60	12.00
7521	69.30	67.10	62.15	65.45
7522	287.44	364.09	275.94	356.42
7523	167.44	158.47	167.44	197.34
7531	693.77	863.94	405.79	824.67
7532	113.36	123.76	94.64	140.40
7533	1083.81	1786.50	571.68	1464.93
7534	11.76	15.75	11.13	15.12
7541	1.50	1.50	1.06	1.32
7542	12.00	11.52	8.00	12.00
7543	1752.60	1372.87	1022.35	1840.23
7544	78.96	68.46	59.22	81.48
7549	200.34	231.46	171.16	262.58
sum	15013.07	15788.39	10891.74	16465.30

SKILLS

Table AII.6 *The results of skills year 2013*

2013	Skills					
ISCO	Critical Thinking	Complex Problem Solving	Coordination	Operation Monitoring	Judgment and Decision making	Time Management
7111	88.56	84.87	84.87	54.12	77.49	84.87
7112	9.52	7.99	9.01	6.97	8.50	9.01
7113	3.30	2.65	2.80	2.35	2.65	2.80
7114	179.54	162.35	196.73	162.35	191.00	179.54
7115	305.50	305.50	305.50	287.17	305.50	305.50
7119	2.35	2.01	2.06	2.25	2.15	2.08
7122	9.22	8.36	9.36	7.74	8.65	8.93
7123	42.75	35.78	41.80	36.73	39.90	44.65
7124	53.00	45.50	51.50	45.50	44.00	47.00
7125	16.50	13.53	16.50	14.52	15.51	15.51
7126	34.22	26.85	29.50	31.27	29.50	27.73
7127	177.35	144.33	156.59	167.91	156.59	153.76
7131	81.00	62.63	81.00	55.11	75.99	81.00
7132	186.50	164.12	175.31	227.53	175.31	175.31
7211	61.60	53.98	46.36	66.04	57.79	59.69
7212	819.91	703.89	680.68	827.65	703.89	657.48
7213	13.34	11.16	10.81	13.00	11.50	11.50
7214	19.38	16.34	19.51	18.75	16.72	16.72
7215	0.56	0.50	0.47	0.50	0.50	0.53
7221	141.00	123.00	132.00	168.00	132.00	150.00
7222	26.26	24.50	22.44	27.15	25.09	24.50
7223	657.02	587.86	580.45	839.80	598.98	576.75
7224	24.08	20.21	15.05	30.96	20.21	18.92
7231	771.63	723.66	655.88	741.53	693.19	686.72
7232	2.88	2.88	2.00	3.12	2.24	2.00
7233	1537.12	1358.91	1303.21	1722.77	1366.33	1292.07
7234	124.08	94.00	88.36	82.72	88.36	82.72
7311	4.51	4.08	3.01	4.11	4.08	3.60
7312	8.19	6.89	6.11	6.89	7.80	7.28
7313	617.98	583.00	478.06	478.06	652.96	617.98
7314	65.50	61.57	49.78	40.61	57.64	53.71
7316	38.80	27.60	30.40	35.20	34.00	34.00
7321	176.88	149.99	149.99	124.52	159.90	154.24
7322	200.34	189.00	189.00	238.14	189.00	189.00

| 7323 | 38.64 | 34.50 | 32.43 | 41.40 | 36.57 | 32.43 |

SKILLS

Table AII.7 *The results of skills year 2013 (continue)*

2013	Skills					
ISCO	Critical Thinking	Complex Problem Solving	Coordination	Operation Monitoring	Judgment and Decision making	Time Management
7411	782.40	691.12	652.00	652.00	782.40	652.00
7412	964.28	841.69	725.08	917.93	774.41	751.99
7413	13.20	12.32	12.32	13.20	12.32	12.32
7421	258.72	241.08	196.00	239.12	207.76	213.64
7422	238.53	226.35	199.96	222.29	219.24	203.00
7511	207.74	170.17	186.75	191.17	190.06	186.75
7512	223.50	138.57	223.50	210.09	223.50	223.50
7514	7.05	6.60	7.50	10.35	7.05	6.15
7515	80.52	64.66	64.66	68.32	68.32	57.34
7516	10.00	9.40	8.80	13.80	9.40	8.80
7521	55.00	43.45	48.40	77.55	41.80	46.75
7522	267.00	240.17	217.18	275.94	247.84	251.67
7523	23.50	13.64	6.16	41.58	23.50	9.68
7531	693.77	615.23	575.96	497.42	615.23	693.77
7532	120.64	104.00	97.76	120.64	104.00	107.12
7533	1083.81	940.89	786.06	905.16	1083.81	1083.81
7534	13.23	10.50	9.24	9.87	10.50	10.50
7541	1.44	1.12	1.12	1.38	1.12	1.20
7542	10.56	9.60	8.48	10.08	10.56	9.60
7543	1548.13	1285.24	1460.50	1460.50	1460.50	1285.24
7544	81.48	68.04	73.50	63.00	66.78	77.70
7549	206.17	165.33	171.16	114.76	200.34	212.01
sum	13429.64	11743.12	11390.58	12728.56	12351.89	11914.03

KNOWLEDGE AND WORK ACTIVITIES

Table AII.8 - *The results of knowledge and work activities year 2013*

2013	Knowledge	Work Activities			
ISCO	Mechanical	Getting Information	Making Decisions and Solving Problem	Handling and Moving objects	Communicating with Supervisors, peer
7111	75.03	98.40	110.70	33.21	110.70
7112	10.54	12.75	13.43	15.30	12.24
7113	2.90	3.50	3.30	4.55	3.95
7114	210.10	276.95	284.59	269.31	255.94
7115	403.26	519.35	384.93	464.36	439.92
7119	2.43	2.99	2.75	2.94	2.98
7122	10.50	13.54	13.49	14.73	12.07
7123	43.38	64.92	52.25	59.22	55.73
7124	56.00	72.50	64.50	78.50	68.00
7125	14.85	26.73	22.11	29.04	23.43
7126	46.91	45.43	42.48	47.50	41.89
7127	233.95	227.34	226.40	194.33	220.74
7131	83.50	100.20	96.03	116.90	106.05
7132	164.12	292.81	274.16	249.91	242.45
7211	67.31	93.98	81.28	101.60	87.63
7212	788.97	1098.37	982.35	1291.74	1082.90
7213	16.79	16.68	17.25	18.40	17.02
7214	23.18	29.64	23.18	30.02	24.57
7215	0.67	0.73	0.68	0.58	0.50
7221	186.00	240.00	204.00	231.00	231.00
7222	35.08	38.71	34.20	30.38	32.83
7223	762.00	915.14	834.86	878.09	862.03
7224	27.95	34.40	27.95	31.39	26.23
7231	1150.78	1048.72	948.94	981.97	920.03
7232	3.72	3.64	3.16	2.88	3.20
7233	2227.71	1978.95	1863.85	2019.79	1815.59
7234	186.12	154.16	139.12	152.28	146.64
7311	6.37	5.60	5.84	4.40	3.71
7312	7.80	10.53	10.40	9.36	7.80
7313	571.34	781.22	734.58	757.90	641.30
7314	65.50	64.19	75.98	96.94	36.68
7316	38.80	54.80	45.20	50.00	44.40
7321	73.58	247.63	224.99	116.03	229.23
7322	204.12	298.62	309.96	253.26	275.94

7323	38.64	55.20	50.37	52.44	45.54

KNOWLEDGE AND WORK ACTIVITIES

Table AII.9 - *The results of knowledge and work activities year 2013 (continue)*

2013	Knowledge	Work Activities			
ISCO	Mechanical	Getting Information	Making Decisions and Solving Problem	Handling and Moving objects	Communicating with Supervisors, peer
7411	1069.28	1017.12	978.00	964.96	860.64
7412	1065.93	1188.53	1152.65	1077.90	1046.50
7413	13.42	19.58	18.92	19.14	19.58
7421	288.12	307.72	319.48	227.36	254.80
7422	237.51	330.89	306.53	235.48	276.08
7511	156.91	317.14	286.20	302.77	292.83
7512	125.16	321.84	245.85	201.15	259.26
7514	4.05	12.45	9.45	11.40	10.95
7515	39.04	101.26	90.28	61.00	104.92
7516	12.80	15.40	14.60	14.20	15.00
7521	71.50	86.90	76.45	91.30	81.95
7522	300.21	416.47	362.81	365.37	298.94
7523	170.43	194.35	167.44	218.27	179.40
7531	589.05	955.57	759.22	562.87	667.59
7532	86.32	165.36	139.36	132.08	165.36
7533	988.53	1655.49	1393.47	1726.95	1107.63
7534	9.45	14.91	13.86	15.75	11.13
7541	1.54	1.56	1.58	1.60	1.58
7542	8.00	13.28	13.76	12.80	11.20
7543	963.93	2307.59	1664.97	1577.34	2073.91
7544	57.12	97.86	96.60	76.44	95.76
7549	136.15	280.08	186.72	233.40	161.44
sum	14234.35	18749.64	16507.44	16819.76	16127.29

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