

**GENDER SHIFT IN MALE-DOMINATED FIELD OF STUDY:
A CHANGED POSITION OF FEMALE STUDENTS IN
EDUCATION AND LABOR MARKET**

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Thesis
entitled

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EDUCATION AND LABOR MARKET**

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GENDER SHIFT IN MALE-DOMINATED FIELD OF STUDY: A CHANGED POSITION OF FEMALE STUDENTS IN EDUCATION AND LABOR MARKET

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ABSTRACT

This research aimed to find empirical evidence of a gender shift in Thailand. This research consisted of two studies: a quantitative study and a qualitative study. The quantitative study was documentary research studying the proportion of male and female students at the undergraduate level in the top 3 male-dominated fields of education (computing, engineering, and architecture) in Bangkok and its periphery for the academic years 2001-2011. The qualitative study was a field study which consisted of in-depth interviews with 30 people who are labor producers, labor consumers, and female workers in the top 3 male-dominated fields about the change, the causes of this phenomenon, and the effects as well as the planning to deal with this change.

The findings mean that female students and female workers are increasing significantly in the Thai labor market and the trend of female workers making demands also is increasing in male-dominated fields, but no one is prepared nor planning to handle this change. In the next decade, the earnings and household heads must suddenly change to be “in-hand” of females. The Government should prepare a plan to deal with this change. This phenomenon needs to be studied more to find further effects on both the negative and positive sides.

KEY WORDS: GENDER SHIFT/ FEMALE WORKERS/ EDUCATION/ LABOR MARKET

128 pages

การเปลี่ยนแปลงบทบาททางเพศในคณะที่เป็นของผู้ชาย: การศึกษาการเปลี่ยนแปลงบทบาทของผู้หญิงในระบบการศึกษาและตลาดแรงงาน

GENDER SHIFT IN MALE-DOMINATED FIELD OF STUDY: A CHANGED POSITION OF FEMALE STUDENTS IN EDUCATION AND LABOR MARKET

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บทคัดย่อ

งานวิจัยนี้ต้องการศึกษาเพื่อหาหลักฐานเชิงประจักษ์ของการเกิดการเปลี่ยนบทบาททางเพศ หรือที่เรียกว่า ปรากฏการณ์การเปลี่ยนบทบาททางเพศ (Gender Shift) ในประเทศไทย โดยประกอบด้วย งานวิจัย 2 ส่วน คือ งานวิจัยเชิงปริมาณและงานวิจัยเชิงคุณภาพ โดยกระบวนการวิจัยเชิงปริมาณ ทำการศึกษาสัดส่วนชายและหญิงในระดับปริญญาตรี ในคณะที่เป็นของผู้ชาย (Male-Dominated) ซึ่งประกอบด้วยคณะวิศวกรรมศาสตร์ คณะสถาปัตยกรรมศาสตร์ และคณะวิทยาศาสตร์คอมพิวเตอร์ ในมหาวิทยาลัยที่ตั้งอยู่ในกรุงเทพและปริมณฑล ระหว่าง พ.ศ. 2544 ถึง 2554 และกระบวนการวิจัยเชิงคุณภาพใช้การสัมภาษณ์เชิงลึกกับผู้ผลิตบัณฑิต ผู้ใช้งานบัณฑิต และแรงงานหญิงที่ทำงานในสาขาอาชีพของผู้ชาย เกี่ยวกับปรากฏการณ์ของการที่เพศหญิงเข้ามามีบทบาทอย่างสำคัญในอาชีพที่เคยเป็นของชาย สาเหตุของสถานการณ์ ผลกระทบและแนวคิดเพื่อการตั้งรับกับการเปลี่ยนแปลงนี้

งานวิจัยนี้พบว่า สัดส่วนของนักศึกษาหญิงและแรงงานหญิงเพิ่มขึ้นในสาขาอาชีพที่เป็นของผู้ชาย และมีแนวโน้มความต้องการแรงงานหญิงเพิ่มสูงขึ้นเรื่อยๆ ด้วยแต่ยังไม่มียุทธศาสตร์ของผู้ให้ข้อมูลหลักคนใดมีแนวคิดการเตรียมตัวตั้งรับกับการเปลี่ยนแปลงนี้ ซึ่งการเพิ่มขึ้นของแรงงานหญิง จะส่งผลอย่างมากต่อทุกหน่วยของสังคมโดยเฉพาะเด็กเพราะบุคคลที่ต้องทำหน้าที่แม่ กลับกลายมาเป็นผู้หาเลี้ยงหลักของครอบครัวข้อเสนอแนะจากงานวิจัยชิ้นนี้คือควรมีการศึกษาเพิ่มเติมในเรื่องผลกระทบจากการเปลี่ยนบทบาททางเพศ (Gender Shift) ทั้งในด้านที่เป็นบวกและลบในระยะยาวเพื่อจะนำไปสู่การออกแบบนโยบายที่เหมาะสมทันทั่วทั้งที่เพื่อตอบรับกับปรากฏการณ์ที่กำลังเกิดขึ้นอยู่ ณ.ขณะนี้

คำสำคัญ: การเปลี่ยนบทบาททางเพศ/ แรงงานหญิง/ ตลาดแรงงาน

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CHAPTER I

INTRODUCTION

1.1 Background and problem statement

The world is rapidly changed. In economics, capital flows and economic restructuring have led to significant changes in work. Jobs have shifted from advanced market economics to developing countries and from the formal to informal sectors and also the shifted of labor from male to female (Floro & Meurs, 2009). The alternation of labor market from male to female is from the change of social such as change those in role of gender when many female want to and be single instead of married, so female has to work to take care themselves; Social value change to open more and more to give the opportunities for female in occupation world; Some are economics issue that wife has to work to help husband. Some of the difference between male and female makes female get some advantages and get higher paid than male in the same job; etc. All of above reason let the phenomenon of rapidly increasing in number of female in labor market. This rapid change was concern by global level (Cotter, Hermsen, & England, 2008; Cotter, Hermsen, & Vanneman, 2009, 2011; Coy, 2012; England, 2010; Floro & Meurs, 2009; Gardner & Stowe, 2006; National Center for Education Statistics, 2009).

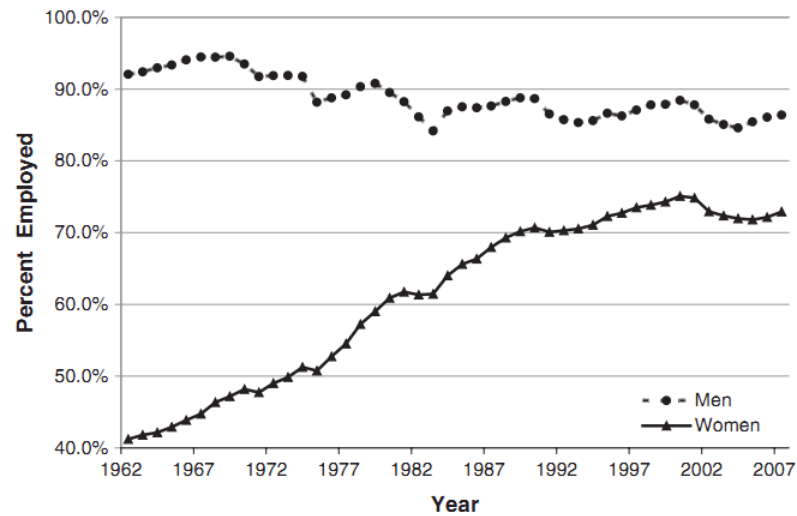


Figure 1.1 Percentage of U.S. men and women employed, 1962-2007 Source: Cotter, Hermsen, and Vanneman (2009)

From Figure 1.1, this graph shows the number of U.S. men and women employed from 1962 to 2007. Percent of male employee decreased from more than 90% to 80%. While on the other hand the number of women employee increased from 40% in 1962 to more than 70% in 2007. The number has risen more than 30% in 45 years. It is a very high development in labor market (Cotter et al., 2009).

Not only in labor world but also in education's where women also enter more and more in higher education.

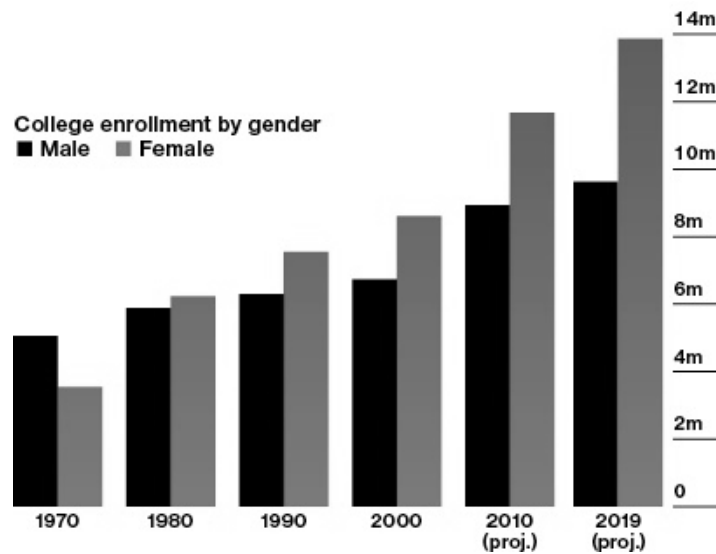


Figure 1.2 Number of college enrollment by gender, 1970-2019 Source: U.S. National Center for Education Statistics (2009) Graphic: Bloomberg Businessweek

From Figure 1.2, the statistics from U.S. National Center for Education Statistics (National Center for Education Statistics, 2009) shows the number of college enrollment by gender from 1970 to 2000 and projects the number of college enrollment in 2010 and 2019. From the graph, it shows that the number of female college enrollment is less than male college enrollment about one million in 1970. In 1980, the number of female college enrollment is higher than male college enrollment. After 1980 the number of female enrollment is still continuously grown up. In 2000 the number of female college enrollment is finally higher than male about two million people. Bloomberg Business work said, “By 2019, the center projects, there will be nearly three women in college classrooms for every two men.” (Coy, 2012)

Increasing number of female in education world means that the number of female production come to occupation world is also increasing because of education produce labor to the market. When female comes to be labor in market more and more, it effects to that jobs, gender roles and also family health (Wyn, Ojeda, Ranji, & Salganicoff, 2003). Previous era, female plays an important role for family care and male goes to work for income of family. According to the gathered data, it shows that nowadays lots of female come to work with many reasons. So, the question is “Who is going to take care their family?”. In many case, female can earn money more than male and get a higher position in the same work. So, many families discuss together

and shift the role, female go to work and male stay at home. Female labor is now increasing both action position and managing position CEO, and making money more than man in the same field (Jintana Boonbongkarn, 2012). Many females are an important key in business world and political world, for examples, Zhang Yin, a Chinese entrepreneur and the richest individual billionaire (US\$4.6 billion) in greater China. (Hutton, 2006) and Angela Dorothea Merkel is the first female Chancellor of Germany. Merkel topped Forbes magazine's list of "The World's 100 Most Powerful Women" in 2006, 2007, 2008, 2009, and 2011 (Forbes, 2006-2009, 2011)

The above situations shows that we are encounter with the world gender issue: number of women in labor market is increasing .In the contrary, in male-dominated occupations, men become to change to stay at home and to take care family instead of women, so call this phenomenon is “Gender Shift”.

In Thailand, there are some empirical data about the increasing number of female in our labor market but not in the big picture. The Nation’s statistic shows proportion of women is also increasing from 30.9 million in 2000 to 33.3 million in 2010 while men is 30 million in 2000 increasing to 32.1 in 2010. Number of women is more than those of men 1.2 million(National Statistical Office, 2012). Also Statistics Table 1 from National Statistical Office shows the proportion of women and men in employment status. In 1996, women government employee increased from 37.3% to 39.4% in 1998 while percent of male has decreased from 62.7% to 60.6%. In private employee, women have also increase from 41.6% to 44.7% within 3 years while men decreased from 58.4% to 55.3%. The interesting point is “Unpaid family worker” employment status that normally is female who work with family business without unpaid salary has been changed to male. Women come back to work with family increasing from 1996 to 1998 31% to 34% (National Statistical Office, 1999). Working with the family business can be applying that someone who not only work with the family business but also have to take care other members. So, the increasing number of female who work outside and those of male who work at home can be implied that our society are facing with the gender shift.

Table 1.1 Employment status divide by gender, 1996-1998

Employment status	1996		1997		1998	
	Women	Men	Women	Men	Women	Men
Total	44.9	55.1	45.4	54.6	45	55
Employer	19.8	80.2	17.7	82.3	20.6	79.4
Government employee	37.3	62.7	38	62	39.4	60.6
Private employee	41.6	58.4	43.4	56.6	44.7	55.3
Own-account worker	29.5	70.5	28.8	71.2	28.8	71.2
Unpaid family worker	69	31	67.4	32.6	66	34

Source: NSO; Labor Force Survey, August 1996-1998.

This existing data and statistics show that a lot of women labor is increasing but no empirical data show that there are statistical significance shift in role between male and female (Gender Shift) in Thailand. So, this research does not concern much about this issue because it takes little effect with the policies.

Table 1.2 Proportion of female students in 2002 of each faculty

Field of Education	Proportion of Female
Engineering	0.1481
Architecture	0.3715
Computer Science	0.4414
Arts	0.5038
Math	0.5356
Law	0.5711
Agriculture	0.5810
Natural Science	0.5816
Education	0.5853
Other	0.6020
Health and Welfare	0.7233
Social Sciences, Business	0.7421
Humanities and Arts	0.8084
Domestic science	0.8613

Source: MUA; Number of Student in 2002 categorize by field of education and sex

From Table 1.2 shows the proportion of female student from the statistics from Ministry of University Affair. In 2002, proportion of female is higher than 50 percent in every field of education except engineering, architecture and computer science. Those fields of education are labelled as “male-dominated field” because the number of male student is higher than female student. (Ministry of University Affairs, 2002)

This study is pointed at Gender shift. So, researchers focus on studying in male-dominated field which are engineering, architecture and computer science. This study is called “Top 3 male-dominated fields” to see the changing of gender proportion. these 3 fields not only represent the gender role ,but also drive their nation’s innovation and competitiveness by generating new ideas, new companies and new industries (Beede et al., 2011)

In America and other developed countries, they have empirical data that shows the gender shift in their society. They aware the gender gap in occupation, especially in top 3 male-dominated fields which are engineering, architecture and computer science. Journal from U.S. Department of commerce, Economics and Statistics Administration said the report found that women are underrepresented both in male-dominated jobs and male-dominated undergraduate degrees and have been consistently over the last decade. This reports aim to provide data and insight that will enable more informed policy making” (Beede et al., 2011).

So, this research comes to solve two questions 1) Is gender shift happen in Thailand? To study and analysis data by looking on supply side in labor market, those universities produce more women labor in last decade or not especially in top 3 male-dominated fields which are engineering, architecture and computer science of study in undergraduate level. It shows empirical data that proportion of female labor is increasing with statistical significance. 2) Why gender shift phenomenon occurs in Thailand? What is the reason? What are the effects? The process is by interviewing labor producers (University), labor users (Company), and female workers who involve with this phenomenon for finding plan to manage this situation and what should labor force policy be? This question is aimed to find how Labor market can take action to respond this coming phenomenon. Then, in long term, national policy should be performed in order to be a guideline for national labor force development in the future.

This research will be empirical data, insight more informed policymaking and help everyone who will affect by the gender shift phenomenon to raise awareness and find plan to handle.

1.2 Research questions

1) Has the proportion of male and female students that enter to undergraduate level in top 3 male-dominated fields of education (Computing, Engineering, Architecture) in Thailand between the academic year 2001-2011 of universities in Bangkok and periphery changed? (If any) how it change?

2) What people, who labor producers, labor users, and female workers in top 3 male-dominated fields of education (Computing, Engineering, Architecture), thought about the change, the cause of this phenomenon and the effect also the plan to deal with the change?

1.3 Research objectives

1) To find empirical evidence of gender shift in Thailand by study the proportion of male and female students that enter to undergraduate level in top 3 male-dominated fields of education (Computing, Engineering, Architecture) between the academic year 2001-2011 of universities in Bangkok and periphery

2) To find the change, cause, effect, and plan of this phenomenon by interview labor producers, labor users, and female workers in top 3 male-dominated fields of education (Computing, Engineering, Architecture) to get more information about gender shift in Thailand

1.4 Research hypothesis

From literature review, the hypothesis for the first research questions is

1) The proportion of male and female students that enter to undergraduate level in top 3 male-dominated fields of education (Computing, Engineering, Architecture) in Thailand between the academic year 2001-2011 of universities in Bangkok and periphery has increased.

1.5 Study contributions

From the result of this research:

This research will be empirical evidence that shows the proportion of producing female labor in Thailand. It is statistical significance increasing and cause gender shift phenomenon effect in Thailand. These findings will raise awareness to people who involve with this phenomenon and provide suitable method to handle this situation, for examples, policy makers who provide reasonable one that support female labor with a goal of gender parity. This research can create great opportunity to expand the support for female in Thailand competitiveness, innovation and jobs in the future.

1.6 Definition of terms

Gender Shift means the change of role between genders, for example, phenomenon which the number of women in labor market is increasing unlike in male-dominated occupations that men choose to stay at home and taking care of family instead. This study will focus on education part that produces labor to the market. The detail of the research is to see the change of male-dominated field of education which normally produces a lot of male labor to produce more female labor to the market. It shows beginning of the phenomenon of gender shift.

Top 3 male-dominated fields of education means the faculty whose mostly student are male and have few female or none. This study will focus on top 3 of male dominant field of education which are Computing, Architecture and building, Engineering and engineering trades in undergraduate level of the universities in Bangkok and periphery, referred by Statistical in 2002 (10 years ago)

ISCED means The International Standard Classification of Education (ISCED). It was designed by UNESCO to serve ‘as an instrument suitable for assembling, compiling and presenting statistics of education both within individual and internationally countries which grouped the field of education into 9 groups of education or 25 fields of education (see more detail about ISCED in Appendix A.

Bangkok and Periphery means Bangkok and Province near Bangkok which are Nakornprathom, Nontaburi, Prathumtani, Samutprakarn, Samutsakorn.

University means the universities under control of government (by Office of the Higher Education Commission)

Undergraduate Level means bachelor degree of study after finish high school

CHAPTER II

LITERATURE REVIEWS

This study aims to study gender shift in male-dominated subjects: A case study of undergraduate students in universities in Bangkok and periphery. The research has studied the concept, theory and related researches to guide the study.

This chapter divides into sub-sections as follows:

- Gender Differences
 - Gender Differences in Physical
 - Gender Differences in Psychology
 - Gender Differences in Social
- Gender Shift
 - The Definition of Gender Shift
 - The Cause of Gender Shift
 - The Effect of Gender Shift
- Related Research

2.1 Gender differences

Everyone knows that there are many humanity similarities in both men and women. However, some difference is in such as differences in the way of thought and reaction. Let's talk about the gender difference in three topics: 1) Gender Differences in Physical, 2) Gender Difference in psychological and 3) Gender Difference in social. The different issues will review to choose only the issue that effect to workplace and education in undergraduate level.

2.1.1 Gender differences in physical

Gender is different in many perspectives. One of the most obvious things is called sexual differences. The first thing that divides us into male and female is “Human genome”. The human genome consists of 23 chromosomes pairs which half of them come from father and another half from mother. From 23 chromosomes pairs, 22 pairs are autosomes and last one pairs is sex chromosomes. The sex chromosome defines you to female by XX and defines you as male by sex chromosome XY.

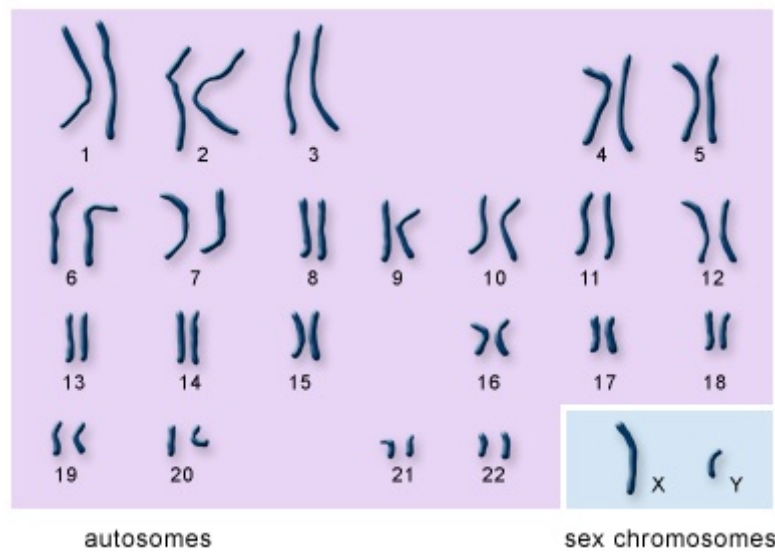


Figure 2.1 Human chromosome Source: U.S. National Library of Medicine

The sex chromosome determines your body to develop in a different way of female and male. So, both are different in structure and function as below. Most difference between male and female will conform to bell-curve (i.e. normal) or you can say it's the mean difference from men such as the height; men are generally taller than women, in some case, a woman can be taller than a man.

Body shape

Normally, male's weight is higher than female and male is higher than female. In Thailand, National Electronics and Computer Technology Center (NECTEC) with National Science and Technology Development Agency (NSTDA) uses 3D body scanning to keep weight and height of Thai people variety are about

13,442 volunteers to find “Size of Thailand” and get the average of weight and height of Thai people from 2006 to 2009. The average height of Thai male is 169.46 cm. while female’s average is 157 cm. Male is taller than female by average 12.54 cm. or about 8%. The average weight of Thai female is 57.40 kg, while male’s weight is 68.83 kg which is more than female about 11.43 kg. So, male is heavier than female about 20%. As shown in the following table (NECTEC & NSTDA, 2009).

Table 2.1 Average size of Thai people: weight and height

Sex	Weight (Kg.)	Height (cm.)
Man	68.83	169.46
Woman	57.4	157

Source: Thailand's Size Survey of NECTEC & NSTDA

For body shape difference between male and female, you can see from the following table. Male average chest is about 39.10 inch and female average chest is 36 inch. Male average waist is about 33.5 inch and female average waist is 31.50 inch. Male average hip is 37.40 and Female’s hip is 38.50 inch. It can see that the upper body or male’s chest is larger than female. In conversely female has lower body or hip that is larger than male on average, an adaptation for giving birth to infants with larger skulls (NECTEC & NSTDA, 2009).

Table 2.2 Average size of Thai people: chest, waist, and hip

Sex	Chest		Waist		Hip	
	Inch	Cm.	Inch	Centimeter	Inch	Centimeter
Man	39.10	99.20	33.50	84.79	37.40	95.00
Woman	36.00	91.09	31.50	79.83	38.50	97.80

Source: Thailand's Size Survey of NECTEC & NSTDA

Strength

What we have known for a decade is that men are stronger than women. By physically, there are many reasons that make man stronger than women.

Maughan, Watson, and Weir have done a research about a group of healthy young subjects 25 men and 25 women to find the gender differences about strength. They found that men are taller, heavier, leaner, and stronger than women. In men, there are correlation between strength and body mass, they suggested that the result of difference are from the difference in fiber types in muscle (Maughan, Watson, & Weir, 1983).

Frontera, Hughes, Lutz, & Evans have also done a research about the strength of the lower body of 200 healthy 45 to 78 years old man and women. They found that women have strength around 40% to 65% of man. But when calculate strength per kilograms of muscle mass, the difference of strength between genders are smaller or not different. The fact from this research is Muscle mass in the main-dominant of strength of human (Frontera, Hughes, Lutz, & Evans, 1991).

Miller, MacDougall, Tarnopolsky & Sale have studied on eight men and eight women about Strength and muscle characteristics. They found that the strength of upper body of women is only approximately 52% of men and for the lower body of women is only 66% as strong as men. As the muscle fiber area, women have smaller fiber area in every part of body. It can be assumed that man has larger muscle fiber than women. Thus man strength are higher than women (Miller, MacDougall, Tarnopolsky, & Sale, 1993).

All above researches can conclude that not only the height and the weight that make men stronger than women, but also the bigger body men contain more muscle mass than women while women have more body fat than men (Gustafsson & Lindenfors, 2004). The more muscle mass you have, the more strength you got. So, men are stronger than women because of men have more muscle mass is the main reason (Frontera et al., 1991; Maughan et al., 1983; Miller et al., 1993). Not only the total muscle mass makes men stronger than women, but also the denser and stronger bones, tendons and ligaments of male. Men have higher blood pressure and hearts beat slower than women (Bren, 2005).

Recovery and pain tolerance

Skin of male and female are difference. Not only the thicker, oiler, redder skin, and cooler skin of male than female, but also the pain receptors per cm of skin of male that lower than female. So, female is more sensitive to pain than male. Moreover, male has larger hearts, 10% higher red blood cell (male: 5.2 million red blood cells, female: 4.6 million red blood cells) and hemoglobin, higher circulation clotting factors. These differences lead to faster healing of wounds and higher peripheral pain tolerance. In other hand, female has higher white blood cell, produce antibodies at faster rate than male. So, they develop the fever diseases and succumb for shorter period (Glucksmann, 1981).

Pregnancy and family care

When talking about sexual difference, the first thing that most of us think about is the sexual organs and reproductive system. Male has penis and scrotum which are positioning outside of body; they can produce billions of sperm in a month. Conversely, female has ovaries and uterus inside the body. Female produces only one egg in a month.

What is the effect from this difference? When you marry or you just have date with sex. Morning After male go back to work while female may be got pregnant. This is one of the reasons that previous decade that the number of female in workplace is decreasing because they don't have a birth control. So, female has to stop work at least 45 day for giving birth or call "maternity leave". This reason makes the employer not want to employ the female labor who pregnant and try to fire them before or after maternity leave. This gender inequality issue calls "Pregnancy Discrimination". It increases every year. In United States, the number of pregnancy discrimination claims that the U.S. Equal Employment Opportunity Commission (EEOC, 2012) received rose annually from 3,977 in fiscal year 1997 to 6,285 in fiscal 2008. It increases 58% from 1997 to 2008. Candace Kovacic-Fleischer, a professor at American University's Washington College of Law, attributed the increase to the many employers who presume that pregnant employees cannot do their jobs efficiently and must be reassigned — or fired (Lash, 2010). Mary Jo O'Neill, a regional lawyer with the EEOC said "We've seen an explosion, a huge increase in cases. The kinds of cases we're

seeing are very blatant, cases where managers say, 'We don't want pregnant women working here.'". Pregnant women claim they've been unfairly fired, denied promotions and in some cases urged to terminate pregnancies in order to keep their jobs."(Armour, 2005). Even though the birth control has been concerned, the problem has not stopped. The next problem we have found is female's and male's fertility are difference. For men, sperm remain potent even in old age while female, after her late thirties , it may take longer to conceive, due in part to decreasing sexual activity and the cumulative effects of medical and gynecological problems (Kotz, 2012; The American Society For Reproductive Medicine., 2008). From graph below, you will see two lines which upper line is likelihood of getting pregnant and lower one is likelihood of infertility. Upper line or likelihood to getting pregnant is start at 86% when female age 20-24 years. It's the highest variation to pregnant. After that it's decline to 0% when female age 50 years or older. In the contrast, percent of infertility start at 3 when female age 20-24 and increase to 100% when age 50 years or older. This two line cross around age 40-44 years, female has a chance to pregnant only 36% and if you pregnant it's fertility up to 32%. It's a very large number of risks to have an infertility baby (Carcio, 1998; Rosenthal, 2002).

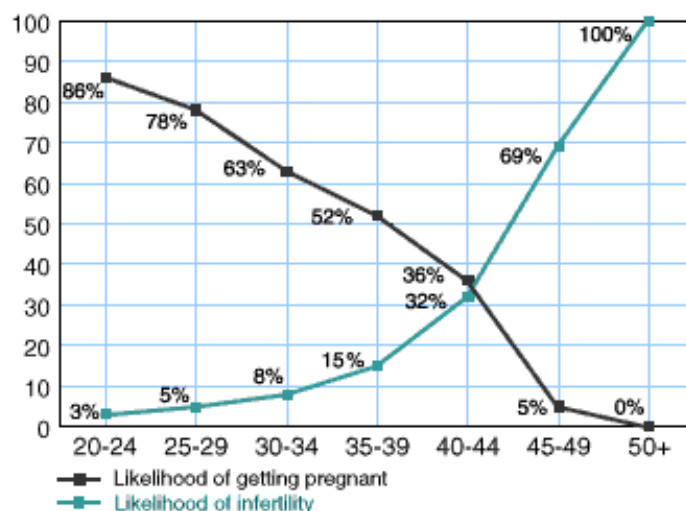


Figure 2.2 Both of the line graphs are for women with normal reproductive function, after having unprotected intercourse for one year. Source: Management of the Infertile Woman by Helen A. Carcio and The Fertility Sourcebook by M. Sara Rosenthal.

Cause of infertility, to pregnancy after age 40 or later may increase chance of Down's syndrome in the children (The American Society For Reproductive Medicine., 2003). From this issue, female who want to have a good family, a cute kids, she has to look for a man and has baby before year of 30. After having a baby, female will take a role of mother to take care of children and family instead of working. In Thailand, mean age at first marriage of Thai woman marry is about 22.1 year olds in 1960 and increase to 24.6 year olds in 2010 (Pramote Prasartkul & Patama Vapattanawong, 2012) and when they got married, most of them have to leave job to be “mother” instead of “worker”.

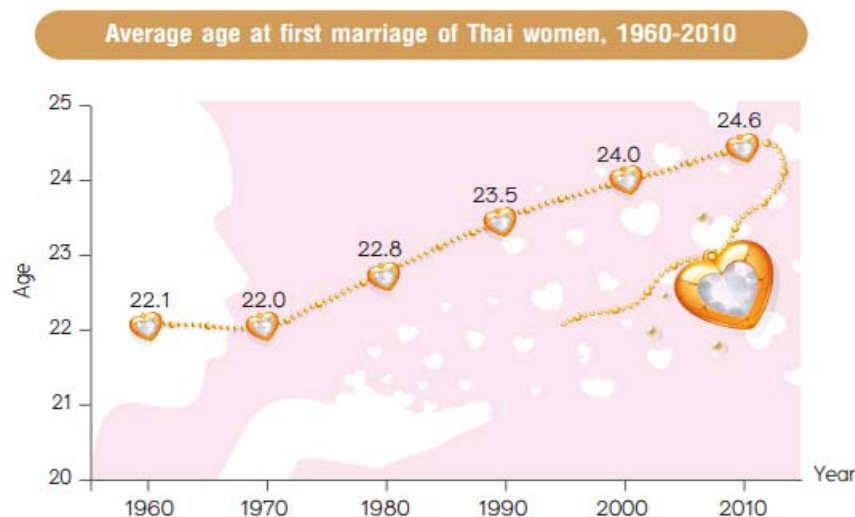


Figure 2.3 Average age at first marriage of Thai women, 1960-2010 Source: Population and Housing Census 1960, 1970, 1980, 1990, 2000, and 2010 (advance report)

Brain

All Animal including human is having slightly difference in brain between male and female (Goy, McEwen, & Neurosciences Research Program., 1980). For men and women, start with the brain size, men have larger brain size than women about 100 gram (Ankney, 1992; Ho, Roessmann, Straumfjord, & Monroe, 1980; Rushton & Ankney, 1996) but women have greater density of neuron in posterior temporal cortex which is responsible for language (Witelson, Glezer, & Kigar, 1995). Many researches support that women are greater than men in language processing

because women have larger left hemisphere auditory, wernicke's and broca's areas which are working for language processing while men have larger inferior parietal lobes which responsible for spatial sense, navigation and direction (Brun et al., 2009; M. Frederikse et al., 2000; M. E. Frederikse, Lu, Aylward, Barta, & Pearlson, 1999; Harasty, Double, Halliday, Kril, & McRitchie, 1997). Moreover, women have larger hippocampus than men, but men have larger amygdala than women. Hippocampus is working for memory storage and spatial mapping of the physical environment. So, women seem to have better memory in detail of thing and keen on landmarks navigation while men are more likely to evaluate the distance better. Also how has a bigger of amygdala which is responsible for emotionally arousing information and environment, and react to stress (Cahill, 2005).

2.1.2 Gender differences in psychology

For gender difference in psychology, people believes that the gender start when they born and kept forming, developing time to time until they grow up. This will lead to another gender difference. There are many theories about the human sexuality: Start with the inborn sexual instinct theory of Havelock Ellis, they believes that boy are boy and girl are girl at born. This theory believes that nature gives us both the instinct of sexual and the sexual reproductive system that distinguish men with women for the reproductive role of human. Lisa and team research on baby's gender instinct by experiment 77 babies. They let the babies choose the photo of doll or vehicle and found that "significant preferences for gender stereotyped toys appearing by 18 months of age". But after this theory and research, there are still many of them proving that not only by the nature instinct, but also by the nurture around baby that performs their gender image (Serbin, Poulin-Dubois, Colburne, Sen, & Eichstedt, 2001).

The most famous theory in psychology is Psychoanalytic theory of Sigmund Freud, which postulated that human being is dominated by two basic instincts: Eros (the sexual drive or creative life force) and Thanatos (the death force or destructiveness). Freud wrote Personality Structure of human divide into three levels: Id, Ego, and Superego. Freud said, "We are born with our Id. The id is an important part of our personality. As newborns, it allows us to get our basic needs met. Freud

believes that Id is based on our pleasure principle. In other words, Id comes whenever we feels good, with no consideration for the reality of the situation.” and Eros or sexual drive is in our Id.

Not only theory of Freud, but also Carl Rogers Personality Development Theory which is the self-concept which defined as "the organized, consistent set of perceptions and beliefs about oneself" (1959).

The self is the humanistic term for who we really are as a person. The self is our inner personality, and can be likened to the soul, or Freud's psyche. The self is influenced by the experiences a person has in their life, and out interpretations of those experiences. Two primary sources that influence our self-concept are childhood experiences and evaluation by others.

According to Rogers (1959), we want to feel experience and behave in ways which are consistent with our self-image and which reflect what we would like to be like, our ideal-self. The closer our self-image and ideal-self are to each other, the more consistent or congruent we are and the higher our sense of self-worth. A person is said to be in a state of incongruence if some of the totality of their experience is unacceptable to them and is denied or distorted in the self-image.

The humanistic approach states that the self is composed of concepts unique to ourselves. The self-concept includes three components: Self worth (or self-esteem), Self-image, Ideal self (Rogers & Koch, 1959).

When talking about the psychological difference between male and female, we mostly think about the cognitive question. Here is some sample one. Who clever than other? Are really that male special in mathematics and science than female? Female can remember more detail and longer than male? Who are happier than other? What about the personality difference between male and female? Is truth that female more empathy and emotion while men are aggression? Let's see what the difference between genders.

First of all, the main question is If male can clever than female especially in math and science.

Many researchers said that women are born with skill of support or care giver. They cannot think rational or abstract thinking, Unlike men who are born to be something like politics, science, or business (Fine, 2011; Worell, 2001). In early

twentieth century, some research show that gender plays no role with general intelligence (Burt & Moore, 1912; Colom, Garcia, Juan-Espinosa, & Abad, 2002; Terman, 1916; Woolley, 1914). Terman and Lewis found that boys were decidedly better in arithmetical reasoning while girls are better at answering comprehension question on a minority test (Terman, 1916). However, some of them say that the difference of intelligence between men and women come from socialization and gender role is the important factor (D.F. Halpern, 2011). The book of Cordia Fine, which studies hundred of research, concludes that “there is currently no scientific evidence for innate biological differences between men’s and women’s minds, and that cultural and societal beliefs contribute to commonly perceived sex differences”. Fine argues that all current paper is limit or has some bias with the sample.

Many of research say there are some difference between gender and male make a bit higher in math and science (Ackerman, 2006; Benbow, Lubinski, Shea, & Eftekhari-Sanjani, 2000; Benbow & Stanley, 1983; Diane F. Halpern et al., 2007; Hyde & Mertz, 2009; Penner, 2008; Spelke, 2005). While some research say that female are not different in math and science (Lewin, 2008). Simon Baron-Cohen, British psychologist, develops “E-S Theory”. The empathizing(E)–systemizing (S) theory said if you are interested in empathizing and response with emotion, or you are systemizing who thinks in system and response with analyze. Simon and Co-author found more male are systemizing while more that female are empathizing (Baron-Cohen, Knickmeyer, & Belmonte, 2005). This theory can also predict who goes into top 3 male-dominated fields rather than gender (Billington, Baron-Cohen, & Wheelwright, 2007).

Female is also skilled in the verbal domain including word fluency, spelling, language ability and grammatical usage (Kimura, 2000)as well as verbal memory – for simple lists of unrelated words, digits, or paragraph content (Heaton, Ryan, Grant, & Matthews, 1996; Kimura, 2000; Rosser, Ensing, Gilder, & Lane, 1984). Additional female advantages have been found on object location memory (McBurney, Gaulin, Devineni, & Adams, 1997; Silverman, Choi, & Peters, 2007), and speeded in fine motor skills (Hall & Kimura, 1995; Nicholson & Kimura, 1996). Additional female advantages may include: ability on computational tests (Chapman, 1988), visual memory for objects (Galea & Kimura, 1993; Harshman, Hampson, &

Berenbaum, 1983), depth and perceptual speed (Kimura, 2000; Majeres, 1983), spelling (Kimura, 2000), way finding with landmarks (Williams, Barnett, & Meck, 1990), and incidental memory (McGuinness, Olson, & Chapman, 1990). McCarthy and Maccoby in difference works suggest that female superiority in verbal tasks is established around the age of 10–11, and is maintained throughout the college years (Maccoby & D'Andrade, 1966; McCarthy, 1946) (Maccoby & Jacklin, 1974).

Studies of male advantages in visual spatial ability suggested that it begins around 6 to 8 years of age (Maccoby & D'Andrade, 1966). Visuospatial skill involves the skill to draw from a model or from memory, to make patterns with objects like blocks, to reason about spatial relations among objects, and to read and follow maps. Some suggests that although this male advantage remains until adulthood, differences may disappear in old age (Schwartz & Karp, 1967). The most consistent and reliable male advantage is found on tests of mental rotation of spatial stimuli (Peters et al., 1995; Voyer, Voyer, & Bryden, 1995). Further, male advantages have been found in problem-solving aptitude tests, targeting (Watson & Kimura, 1991), and a slight advantage on verbal intelligence (D.F. Halpern, 2011)

For personality test, Costa & McCrae develop The Big Five framework of personality traits (Costa & McCrea, 1992), Big Five Factor are

- 1) Neuroticism: identifies individuals who are prone to psychological distress
 - a. Anxiety: level of free floating anxiety
 - b. Angry Hostility: tendency to experience anger and related states such as frustration and bitterness
 - c. Depression: tendency to experience feelings of guilt, sadness, despondency and loneliness
 - d. Self Consciousness: shyness or social anxiety
 - e. Impulsiveness: tendency to act on cravings and urges rather than reining them in and delaying gratification
 - f. Vulnerability: general susceptibility to stress
- 2) Extraversion: quantity and intensity of energy directed outwards into the social world
 - a. Warmth: interest in and friendliness towards others

- b. Gregariousness: preference for the company of others
 - c. Assertiveness: social ascendancy and forcefulness of expression
 - d. Activity: pace of living
 - e. Excitement seeking: need for environmental stimulation
 - f. Positive Emotion: tendency to experience positive emotions
- 3) Openness to Experience: the active seeking and appreciation of experiences for their own sake
- a. Fantasy: receptivity to the inner world of imagination
 - b. Aesthetics: appreciation of art and beauty
 - c. Feelings: openness to inner feelings and emotions
 - d. Actions: openness to new experiences on a practical level
 - e. Ideas: intellectual curiosity
 - f. Values: readiness to re-examine own values and those of authority figures
- 4) Agreeableness: the kinds of interactions an individual prefers from compassion to tough mindedness
- a. Trust: belief in the sincerity and good intentions of others
 - b. Straightforwardness: frankness in expression
 - c. Altruism: active concern for the welfare of others
 - d. Compliance: response to interpersonal conflict
 - e. Modesty: tendency to play down own achievements and be humble.
 - f. Tender mindedness: attitude of sympathy for others.
- 5) Conscientiousness: degree of organization, persistence, control and motivation in goal directed behavior
- a. Competence: belief in own self efficacy
 - b. Order: personal organization
 - c. Dutifulness: emphasis placed on importance of fulfilling moral obligations
 - d. Achievement striving: need for personal achievement and sense of direction

e. Self Discipline: capacity to begin tasks and follow through to completion despite boredom or distractions.

f. Deliberation: tendency to think things through before acting or speaking.

Acronyms commonly used to refer to the five traits collectively are OCEAN, NEOAC, or CANOE.

For the big five personality, norm in U.S. found (N=1301). Female got clearly the highest point of all fields except Conscientiousness This high score means female is anxious and easily stress, imaginative and metaphysical, discipline, empathetic, while male are unflappable, practical and concrete, spontaneous, unempathetic (Lord, 2007)

2.1.3 Gender differences in social

Aristotle said, “Man is by nature a social animal” To live together in social, they have to relate to each other by status that comes with role. “Role” is the thing that other expects us to do. Example the status of mother you have a set of role that everyone expects you are love, nurturing, self-sacrifice, home-making, and availability. Gender is one of the statuses with gender role (Lindsey, 2010).

Gender learn

Gender learn is constructed. We learn gender role via gender socialization, start by the name they give to us, the color that wear when on delivery date, up to the end of life (Ryle, 2012). Children learn to categorize themselves by gender at a very young age. They also learn how to display and perform gendered identities as masculine or feminine. Cahill said, “Boys learn to manipulate their physical and social environment through physical strength or other skills, while girls learn to present themselves as objects to be viewed” (West & Zimmerman, 1987). Children monitor their own and others’ gendered behavior. Gender-segregated children's activities create the appearance that gender differences in behavior reflect an essential nature of male and female behavior (Fenstermaker & West, 2002).

Gender role

To be male (masculine) or female (feminine) in gender role, they were expected attitude and behavior by society in a difference way (Lindsey, 2010). Gender Role difference from the physical and psychological difference between man and women. Men's unique physical advantages in terms of body size and upper body strength provided them an edge over women in those social activities that demanded such physical attributes such as hunting, herding and warfare. In the other hand, women's biological capacity for reproduction and child-bearing is proposed to explain their limited involvement in other social activities. These socially constructed gender roles are considered to be hierarchical and characterized as a male-advantaged gender hierarchy (Wood & Eagly, 2002). The activities men were involved in were often those that provided them with more access to or control of resources and decision making power, rendering men not only superior dispositional attributes via correspondence bias (Gilbert, 1998), but also higher status and authority as society progressed. Linda said, "Early sociological perspectives related to gender roles come from sociology of family (Lindsey, 2010). These explanations centered on why men and women hold different roles in the family that in turn impact the role they perform outside the family". And women's role is unpaid and has to dependence men for food and protection. That makes men's activities are high valued than women. As time pass by women got higher education and increase entering to labor market (Cotter et al., 2009; National Center for Education Statistics, 2009). When social changes, feminism theory comes to empower women in the society, but there are still the gender inequality in society. Some research shows that the Yet, gender role ambiguity regarding instrumental and expressive role is a major factor in divorce (Hacker, 2003), but said the "superwomen" who success both working and family care will be valued (Diekman & Goodfriend, 2006). This research's keyword is gender shift which directly related to the gender role because they shifting in the role.

Feminist theory

Brabeck and Brown said, Feminist theory is the extension of feminism into theoretical or philosophical discourse. It aims to understand the nature of gender

inequality and use it to its advantage to create an equality that is more equal for women. It examines women's social roles, experience, and feminist politics in a variety of fields, such as anthropology and sociology, communication, psychoanalysis, economics, literary, education, and philosophy (Brabeck & Brown, 1997).

2.2 Gender shift

2.2.1 The definition of gender shift

For the word “Gender Shift”, many people use in many ways but no one definition can be the exactly meaning of this word. It’s not like Gender Role, Gender Identity or Gender Equality that you can find exactly meaning from dictionary. When you type the word “Gender Shift” to Longman/Oxford Dictionary or any dictionaries, the result will show something like “No exact result found for *Gender Shift* in dictionaries”. So, find the definition of “Gender” and “Shift” before definition the word “Gender Shift” in this study ways

Start from the word “Gender”:

There are two words that mostly use to define the same things when talk about these issues: “Sex” and “Gender”. In fact, both of these words have the different meaning. The word “Sex” is used when talk about biological of humans, but the word “Gender” is used when talk about psychosocial of humans. In Thai word, mostly use this two word in the same word “เพศ” but the truly word should use is เพศ for Sex and เพศสภาพ เพศสภาวะ เพศสถานะ หรือ เพศภาวะ for Gender (Chalidaporn Songsampam, 2008). This study is interest in “Gender”, and will focus on the definition of the “Gender”.

The exactly definition of gender when you open the oxford dictionary, is “the state of being male or female” (typically used with reference to social and cultural differences rather than biological ones). While World Health Organization (WHO, 2009) use the word “gender” referred to the socially constructed roles, behaviors, activities, and attributes that a given society considers appropriate for men and women. Gender is related to how we are perceived and expected to think and act as

women and men because the way of society is organized, not because of our biological differences while "Sex" refers to the biological and physiological characteristics that define men and women.

End with the word "Shift":

From Oxford Dictionary and Longman Dictionary, there are many meaning of the word "Shift" in both noun and verb. This study focuses on the "Shift" that meaning to move or cause to move from one place/position to another.

For this study, researcher use definition of the word "Gender Shift" as "a phenomenon of human in shift the gender role between male and female". In traditional culture, male is the stronger sex and female is the weaker sex. Male is the breadwinner or the family income provider. He goes out to work or hunt to get food or income to family while female is the one who take care other members in the family, do house work, cook, and etc. Nowadays it already "shifted". Female still the weaker sex but have some special skill that is more suitable with some job than male. A lot of female go out to work and provide income for family. Some of them are single family income provider while male stay at home and take care family (Habeck, Povoroznyuk, & Vaté, 2010; Jintana Boonbongkarn, 2012).

2.2.2 The cause of gender shift

After review many research, we found many causes of this phenomenon in global level. The first one is because of "World War II". It started when United States where many companies sign contract to the government in war equipment production in 1940. But after United States entered to war and men left to war to service the nation. Then, all factories faced the crisis of labor shortage. U.S. National Park Service wrote "At first companies did not think that there would be a labor shortage so they did not take the idea of hiring women seriously. Eventually, women were needed because companies were signing large, lucrative contracts with the government". Because United State wants to win the war, they want many weapons. So, the government decided to launch a propaganda campaign to hire women labor. In campaign they promoted the fictional character of "Rosie the Riveter" to be the ideal woman worker: loyal, efficient, patriotic, and pretty (Sorensen, 2004).



Figure 2.4 the fictional character of “Rosie the Riveter” as the ideal woman worker Source: U.S. National Park Service (<http://www.nps.gov/pwro/collection/website/home.htm>)



Figure 2.5 Women work between World War II Source: U.S. National Park Service (<http://www.nps.gov/pwro/collection/website/pics.htm>)

Not only in United States, but also other country in World War II like Soviet Union, Poland, Italy, Germany, Finland, Canada, Britain were employed a lot of women labor to be navy and all kind of work. Only in United State, more than 12 million women are employed and by the end of the war it increase to 18 million women labor force (Sorensen, 2004). This event changes someone’s attitude about

women that can work in labor market. Claudia said, "World War II had several significant indirect impacts on women's employment, but its direct influence appears considerably more modest" (Goldin & Research, 1989).

Rising of the feminist movement is another one of the most important things to change the female's attitude by trying to empower women to get gender equality and "to change women's inferior social position and the social, political, and economic discrimination that perpetuates it"(Lindsey, 2010). After this movement, another big wave of change in passage of the government's policy equal right acts which trying to make gender equality in concrete form and say discrimination against racial, ethnic, national and religious minorities and women is illegal (U.S.Government, 1964).

Third, legal of birth control for female makes women control the birth and pregnancy by themselves. One of the problems of women labor is pregnancy. Many of them don't want to get pregnant and abort the baby better than take maternity leave and lose her job (Armour, 2005). (Please see more detail of this topic in "Pregnancy and Family Care" in this paper)

Forth, According to the economic competition is higher, so wives have to come out and help husband to work outside home. Especially, some country ,such as Japan, has the policy to change from 'male-breadwinner female-caregiver' to 'double income family model'(Takeda Hiroko, 2011). This policy push a lot of married women go to work outside home. Many of research said that the women labor forces are lower paid. However, some of statistics show that "In 2009, working wives contributed 37 percent of their families' incomes which is up by 10 percentage points from 1970, when wives' earnings accounted for 27 percent of their families' total income. The proportion of wives earning more than their husbands has also grown. In 1987, 18 percent of working wives whose husbands also worked earned more than their spouses; in 2009, the proportion was 29 percent" (U.S. Bureau of Labor Statistics, 2011).

Fifth, rising up in the service sector and decreasing of the manufacturing sector makes female's labor grow up. In 1840 the agriculture aging (including forestry and fishing), 70% of labor force and about 50% of output, is the main product of U.S economics. In 1900 to 1960, 40% of labor and output come from the industry or

manufacturing. In agriculture, especially industry, the employer needs a lot of strength worker and man has more advantage than female. But from 1960, the industry or manufacturing sector was in decline while the service sector was increasing. In 2010, nearly 80 % of labor is in service sector and more than 70% are output from this sector too (Johnston, 2012). Because the service sector uses brain and nice communication more than strength, it gave more opportunity to women to work in labor force market. The Economist who wrote about Female Power said "The rich world has seen a growing demand for women's labor. When brute strength mattered more than brains, men had an inherent advantage. Now that brainpower has triumphed the two sexes are more evenly matched. The feminization of the workforce has been driven by the relentless rise of the service sector (where women can compete as well as men)" (The Economist, 2009).

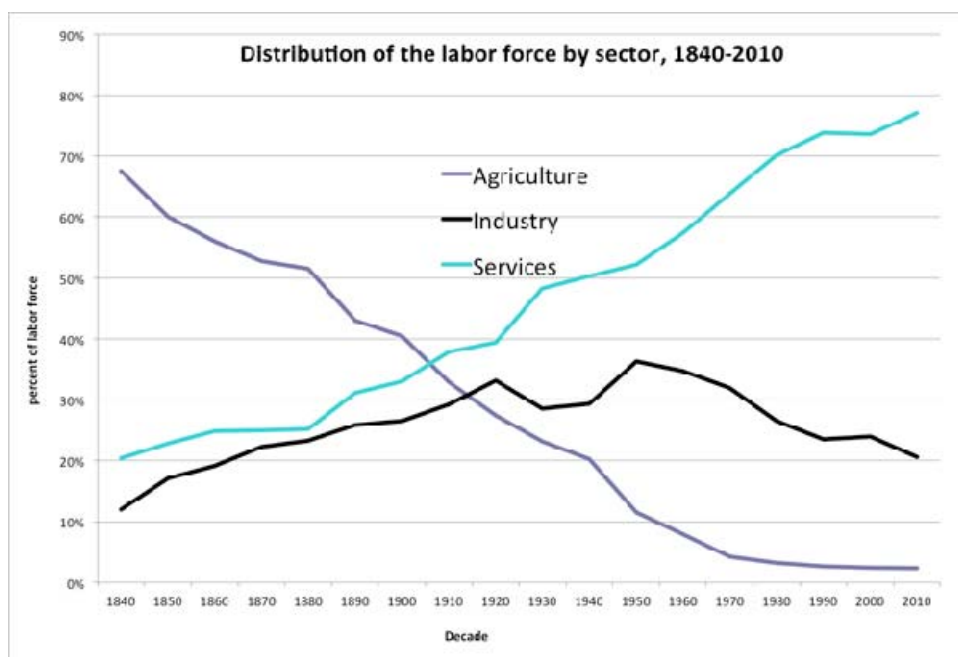


Figure 2.6 Distribution of labor force in U.S. economic between 1840 to 2010
 Source: <http://www.minnpost.com/macro-micro-minnesota/2012/02/history-lessons-understanding-decline-manufacturing>

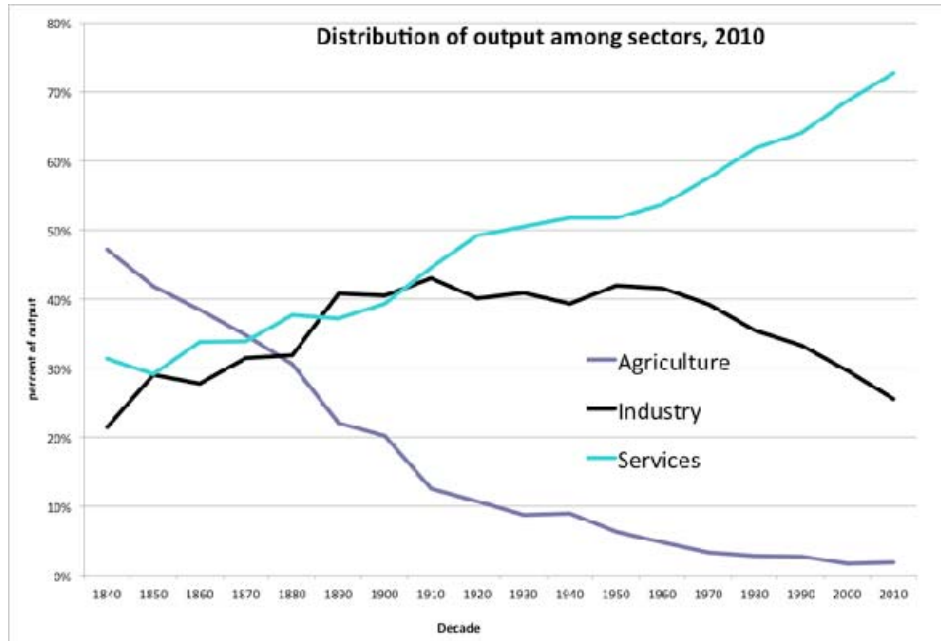


Figure 2.7 Distribution of output in U.S. economic between 1840 to 2010
 Source: <http://www.minnpost.com/macro-micro-minnesota/2012/02/history-lessons-understanding-decline-manufacturing>

In Thailand, Statistics from Office Of The National Economic And Social Development Board 2012 Quarter 2 shows growth rate of Gross Domestic Product of agriculture decreasing from 7.6% from Q1 2011 to 1.3% in Q2 2012 while growth rate of Gross Domestic Product of goods and services increase from 2.8% in 2011 Q1 to 4.5% in 2012 Q2 (Office of the National Economic and Social Development Board, 2012). Not only in service sector but also in industry section should prepare for increasing of female labor (SCB, 2011). Sudarat said. “The complexion of business operation has undergone a significant change during the concluding decades of twentieth century and beginning of the third millennium. In the current era the service sector has acquired more prominence in comparison to the manufacturing sector” (Sudarat Kunakitkumjorn, 2003).

Sixth, the higher level of female’s education also is the important reason that make female can work with job that requires “brain” not only the “strength” or “action”. John Cookson said “With greater educational opportunities yielding better jobs for women than ever before, female spending power have become a central

engine of the economy—and is changing the world for the better” (Cookson, 2010). The statistics from National Center for education statistics (2009) showed number of college enrollment by gender from 1970 to 2000 and project the number of college enrollment in 2010 and 2019. In 1970, the number of female college enrollment is less than male college enrollment about one million. In next decade, 1980, the number of female college enrollment is higher than male college enrollment. After 1980 the number of female enrollment still has grown up higher and higher. In 2000, the number of female college enrollment is higher than male about two million people. Not only the higher rate in education, in some job like pharmacy, the women have been graduating from colleges and schools of pharmacy at a higher rate than men for over 20 years and men are retiring at a faster rate than women (Gardner & Stowe, 2006). It makes number of female pharmacy increase every year.

Last, In Thailand number of female migration more than male, research about “Gender Differentials in Migration to Bangkok” of Kanchana Tangchonlatip (2005) said number of migration of female more than male. One of the reason is female migrant have strong tie to their family more than male migrant. Female migrant when come to work in Bangkok, they always send money back to family more than male. So, when family have to decision to send someone to Bangkok , they choose female to migration (Kanchana Tangchonlatip, 2005). In other country, there is also a lot of female migration to the city. In North Russia, Elena said, “The migration of indigenous women from the tundra/taiga to settlements and towns”(Habeck et al., 2010).

2.2.3 The impact of gender shift

Changing role between male and female is now not completely perfect because female change their role to male role while male does not change anymore. Let’s see the result from this phenomenon

In macro level, this phenomenon increase number of women business owner and women employer. Statistics from U.S. confirms that women-owned business contribute significantly to the U.S Economy. In 2007, women owned 7.8 millions firms having 1.2 trillion dollar sales amount and had employ 7.6 million workers. Report also said, “between 1997 and 2007, the number of women-owned

business grew up by 44%, twice as fast as men-owned firms especially in health care and education services”(U.S. Department of Commerce Economics and Statistics Administration, 2010). Fact sheet from Department for Professional Employees also shows the number of working women increase from 5.1 million in 1900 to 18.4 million in 1950 and to 66.2 million in 2009 (Department for Professional Employees, 2010). From United Nations Statistics Division, Thailand has 43.4 % of female are employees near male 45.6% are employees. 1.5 % of female are employer while 3.9% of male are employers (United Nations Statistics Division, 2010).

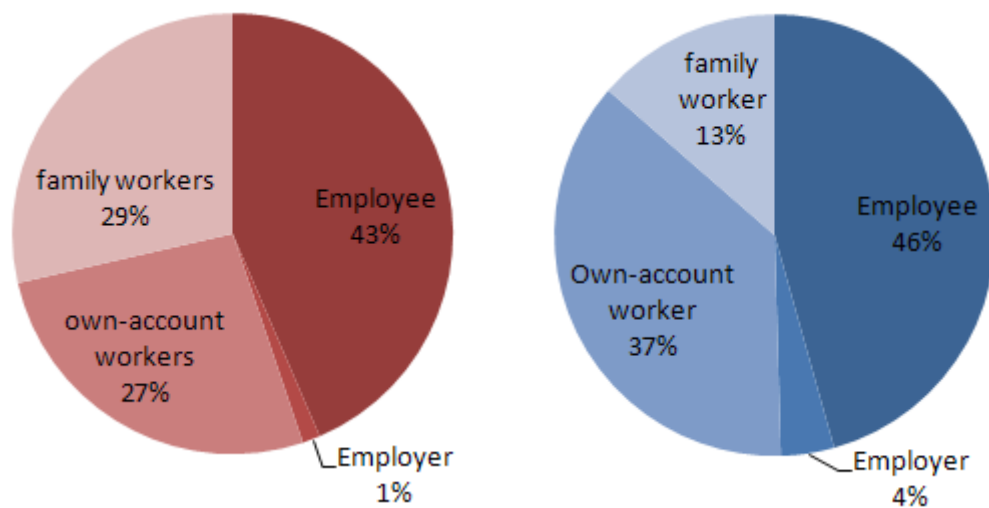


Figure 2.8 Labor divide by labor type 2009 female (left)-male (right)

Source: United Nations Statistics Division (2011)

In micro level, the impact with women’s themselves and families of women who take male role to work outside home are as below:

First, power of women is increasing: when women go to work and get paid, women have more power of buying and also making a decision. Women share 58% of online retail dollar spend and 80% of U.S Health care decision made (TIME, 2012). The Boston Consulting Group surveys 12,000 women in 22 countries and found women share nearly \$12 trillion of the overall \$18.4 trillion in consumer spending globally. By 2014, women will control \$15 trillion (HarperBusiness, 2009). Not only the power of buying, but also the power of decision is increasing especially

where more female than male (Habeck et al., 2010; the United Nations Entity for Gender Equality and the Empowerment of Women, 1995).

Second, changing in income earners is shown up. From *Women in the Labor Force: A Databook of U.S. Bureau of Labor Statistics* (U.S. Bureau of Labor Statistics, 2011) shows that statistics from 1967 to 2007 shown as below :

- The number of more than one earner increases from 55.1% (23,859,000 families) in 1967 to 62.1% (36,312,000 families) in 2007 or about 11% increasing.

- The number of only one earner are decreasing 38.1% in 1967 to 24.4% in 2007 but the interesting point is number of family which husband is the only earner are decline from 35.6% in 1967 to 17.8% in 2007 or “50%” of those family decrease while the number of family which has wife is only earner increase 1.7% in 1967 to 5.6% in 2007 or grow up more than “200%” for wife only earner for family.

Above number shows two things: 1) Most of family model are change from ‘male-breadwinner female-caregiver’ to ‘double income family model’, and keep increasing more and more day after day. 2) Wife who is the only earner of family is increasing rapidly a day while husband work only is declined.

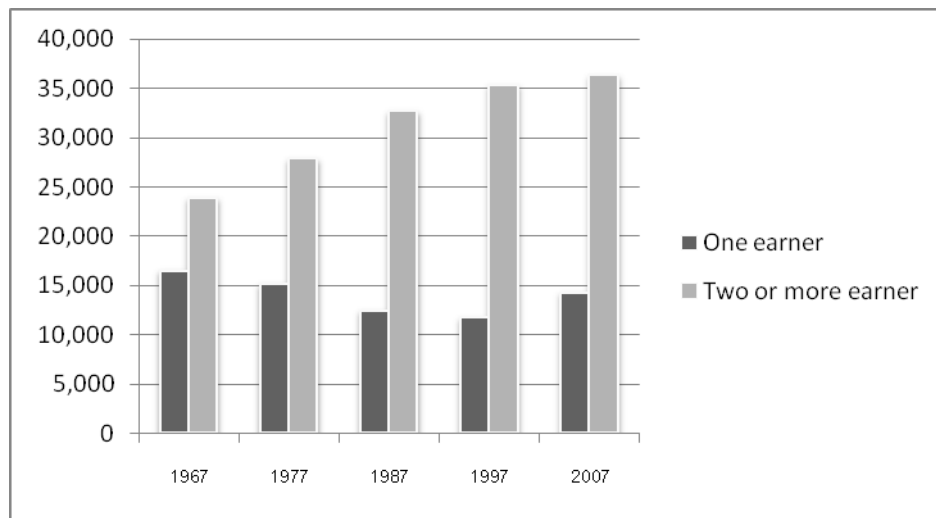


Figure 2.9 The number of one earner family compare to two or more earner family (1967-2007)

Source: A Databook of U.S. Bureau of Labor Statistics (2009) | Design by arinchaya.t

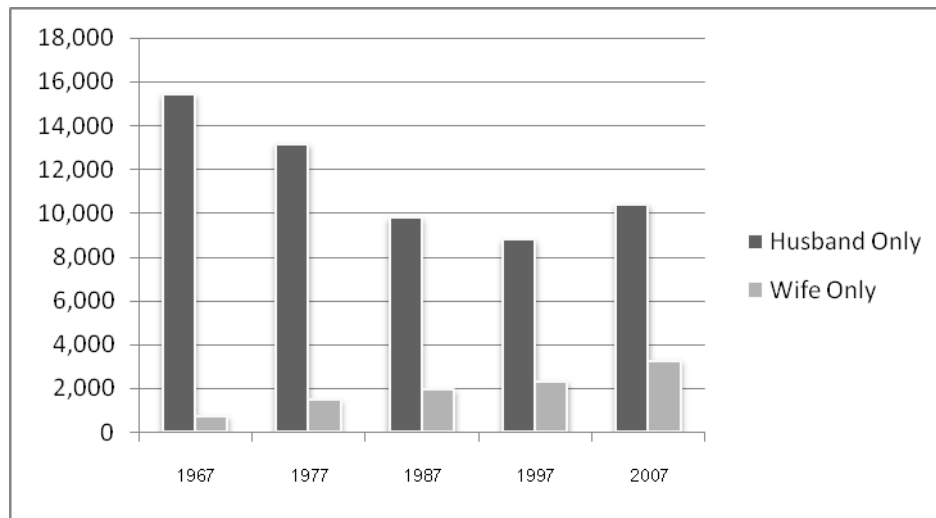


Figure 2.10 The number of one earner family compare between husband only earner and wife only earner (1997-2007)

Source: A Databook of U.S. Bureau of Labor Statistics (2009) | Design by arinchaya.t

Third, for married women, when they go to work as second income family finder, they have to go home and work “second shift”, to prepare food, house working, take care children, and take care older parent(s). To balance work life and family life are not easy because the workplace want them to work hard for the company, so as their family, home want a good mother to take care of all the members. In 1988 survey of young mothers, who have children aged 2 to 4 in the US, found 39% of children were raised by relatives, 25% were raised by a non-related person, and 28% were in a child care center (Veum & Gleason, 1991). But sending baby to child care center is very expensive for poor mothers. It could cost 26% of their income but only 8% for non-poor mother(Cattan, 1991). Some schools have to change the schedule to take children stay longer at school and wait until their father and mother finish the job. It can say “longer school day and shorter summer”(The Economist, 2009). In Japan, married women was called “bad mother” because they come to work and no time to take care their family. (Takeda Hiroko, 2011). Iwamura also research about family’s meal of married women with children born after 1960 and live in Tokyo by taking photo and write dairy. She found that most family members buy food from convenience store and eat individually. From interviewing “wives”, we can give the reason of skip in food preparation is convenience, time-saving and “exhaustion” from

work (Iwamura Nobuko, 2010). Many researchers found that working mother has conflict role of child care giver and the provider of family and effect to welfare of children like nutrition and exercise (Glick & Sahn, 1998; Lamontagne, Engle, & Zeitlin, 1998; Leslie, 1988). With male counterparts, working will take more time and energy which used to be for the family. This can lead to problem in family with conflict and dissatisfaction (Amato & Previti, 2003; Glezer & Wolcott, 1998). About 63% of women divorce during stay in the workforce (U.S. Bureau of Labor Statistics, 2011). Wolcott and Jody said, "Again, disagreements over appropriate gender roles and the allocation of work and family tasks, and autonomy and independence in the relationship, while not specifically mentioned as a reason for the marriage ending, may have been incorporated into responses of incompatibility or aspects of a spouse's personality" (Wolcott, Hughes, & Studies, 1999).

Forth, single women, who get higher education and work with good salary, have trend in delayed marriage or permanent celibacy increasing every year (National Statistical Office, 2010). Phusit Tangsirithamma from Marketing of Management Institute of Mahidol University in seminar "Her Purchasing Power Secret" said "number of single women is increasing because of self-confidence and feeling of independence because higher education and earn money by their own". Not only because they want to be single but sometime most of "high-class" single women are not easy to find the partner who equally or higher enough suitable to be couple (Habeck et al., 2010). Statistics from U.S. Bureau of Labor Statistics shows "unmarried mothers (never married, divorced, separated, or widowed) tend to have higher participation rates than married mothers. In March 2010, 74.9 percent of unmarried mothers were in the labor force, compared with 69.7 percent of married mothers" (U.S. Bureau of Labor Statistics, 2011).

Fifth, male falls into difficult situation, many of male employment rate are decline while the member of hired female is higher. Virginie said "Unemployment male either preferred or forced damages male's public image and often results in alcoholism and multiple physical and psychological stresses experiences by contemporary male. All these factors lead to higher mortality and suicide rates and lower life-expectancy level for male population" (Habeck et al., 2010) while Adrienne French and coauthor research longitudinal between 1978 and 1995 with 2,540 women

who become mothers and found that mothers who came back to work after giving birth are happier than the one who stay home, he said "Work is good for your health, both mentally and physically, It gives women a sense of purpose, self-efficacy, control and autonomy. They have a place where they are an expert on something, and they're paid a wage." (Frech & Damaske, 2012)

2.3 Related research

There are many researches talking about Gender Shift around the world and around profession:

Kelsey and group research with male and female dentists who graduated from Creighton University between 1985 and 2005 about satisfaction with academic preparation and post graduation practice experiences. The result is that no statistically significant differences were found between male and female dentists with respect to satisfaction with academic preparation and post graduation practice experiences. So, It's show that gender is not associated with graduates' level of satisfaction with their academic preparation while in dental school and their practice experiences (Kelsey et al., 2009).

Steele, Jennifer, and James research about level of discrimination and stereo type treat with the first-year and final-year female undergraduates in a male-dominated academic area (i.e., math, science, or engineering) comparing with first-year and final year female in undergraduates in a female-dominated area (i.e., arts, education, humanities, or social science) . They report higher level in discrimination and stereo type for female undergraduate in male-dominated (Steele, James, & Barnett, 2002).

Olga, Joachim, Virginie research about Gender Shift in Russia North. They have demonstrated that both male and female residents of Northern communities share the common post-socialist realities affecting family and gender relations along with other vitally important spheres of their life. Considering this, the concept of gender shift cannot be understood if taken out of the context of people's everyday life

practices impacted by recent socio-economic and political changes, and growing industrialization and globalization of the Russian North (Habeck et al., 2010).

Elena studied gender shift in the Yamal region by looking from the migration of indigenous women from the tundra/taiga to settlements and towns, as well as at the specific gender division of space that has resulted from this process in the Russian North. She found that in Yamal also has the gender shift similar to Russia North (Liarskaya, 2010).

Stephanie and Cindy found that there are gender shift in pharmacy career. It started when women have been graduating from colleges and schools of pharmacy at a higher rate than men for over 20 years, and men's retirement is at a faster rate than women. These two trends have resulted in a practicing profession comprised of a greater percentage of women and the impact of the gender shift. They also offer threats and opportunities for a healthcare profession at the forefront of patient access. Threats resulting from this gender shift have been proposed resulting in decreased pharmacy ownership, diminished political advocacy, and decreased academic leadership (Gardner & Stowe, 2006).

Helen Power said about gender shift from the nurse perspective with increasing of female vets. "With the increase of female vets there has been a definite change in client interactions. We now have a more visible display of caring and empathy." (Power, 2000). Takeda, who writes "Who's afraid of 'Bad Mothers'?" the changing women's socio-economic positions and the discursive politics surrounding in Japan, said that the change of economic will make politic change and from the politic change from 'male-breadwinner female-caregiver' to 'double income family model' in the 2000s. Thus, the good wife and wise mother trend can change women who have to work and take care of family to "Bad mother". Takeda refers to the Iwamura's research about the "Bad mother" who is self-center behaviors for examples, spending money having lunch with friend more expensive than husband's lunch, not preparing meal for family, drinking alcohol outside home at night while their husband does not. Takeda recommends the policy solution by showing example of the Democratic Party of Japan (DPJ) success in realizing the regime shift and more popular among the women in Japan (Takeda Hiroko, 2011).

CHAPTER III

METHODOLOGY

This chapter will talk about the process and method of analyzing the data of female. From two research questions as below:

1) Has the proportion of male and female students that enter to undergraduate level in top 3 male-dominated fields of education in Thailand between the academic year 2001-2011 of universities in Bangkok and periphery changed? (If any) how it change?

2) What people, who labor producers, labor users, and female workers in top 3 male-dominated fields of education, thought about the change, the cause of this phenomenon and the effect also the plan to deal with the change?

Above two research questions have two difference ways to get the result in the next chapter. From the research question there are two things to study

a) To study the proportion of male and female students in undergraduate level in top 3 male-dominated fields of education in Bangkok and periphery. This study is a quantitative study.

b) To study on the change, the cause, the effect and the plan to deal with this phenomenon from the labor producers, labor users, and female workers in top 3 male-dominated fields of education. This study is a qualitative study.

So, this research consists of two studies: quantitative study and qualitative study. Then, this chapter is divided into sub-sections as follows:

- Quantitative Study
 - Data source
 - Study sample
 - Data collected method
 - Analytical process and method
- Qualitative Study
 - Data source

- Study sample
- Data collected method and tools
- Analytical process and method

3.1 Quantitative study

3.1.1 Data source

This part studies on documentary research about the number of freshman or graduated student in male-dominated field of education (Engineering, Architecture, Computing) categorize by gender (male and female) and by ISCED (International Standard Classification of Education) in bachelor degree of every universities in Bangkok and periphery in Thailand between 2001 to 2011, which the secondary data is mainly collected by Office of the Higher Education Commission (Ministry of University Affairs) and each universities mainly. The concerned data will be collected from all types of Thai Universities (all kind of university: close, open, Public, private) in Bangkok and periphery.

3.1.2 Study Sample

This is the study of the number of freshman or graduated student in male-dominated field of education (engineering, architecture, computing) in bachelor degree of every university in Bangkok and periphery in Thailand from 2001 to 2011.

Researcher select study data from below criteria:

- The university is located in Bangkok and periphery.
- The university has male-dominated faculties as Science-Math, Technology, and Engineering and providing that field more than 10 years (before 2001)
- The university had collect the data 2001 to 2011 categorized by gender (male and female)

Collected data will allocation into 3 fields of education

- Computing

- Engineering
- Architecture

After selected universities list from above inclusion criteria, there are 28 universities that located in Bangkok and periphery and provided top 3 male-dominated field of education more than 3 years.

3.1.3 Data collected method

After receiving the 28 universities list, researcher sent the inform letter and requested data to those universities. Researcher gave those universities 2 weeks to send back the data. But after requesting the data, researcher got a question from 10 universities said “They have no historical data of previous ten years categorize by gender and field of education” or “There is no complete ten years data”. Finally, there are 4 universities from 28 universities which had completely data categorize by gender and field of education in previous ten years.

Only 4 universities data was probably not enough, so researcher decided to ask data from Ministry of University Affair, who collect number of freshman student from all universities in five years categorize by group of educations, to composite the picture of changing proportion of male and female.

So, there are two sets of data: data set I (from MUA) and data set II (from universities in Bangkok and periphery).

3.1.4 Analytical process and methods

As a result of the existing data, this research will use the descriptive statistical method to describe the proportion of female to all student change from 2001 to 2011 in the top 3 male-dominated fields of education, and illustrated by graph to show the change through time.

3.2 Qualitative study

3.2.1 Data source

To study on the change, the cause, the effect and the plan to deal with this phenomenon from the labor producers, labor users, and female workers in top 3 male-dominated field of education is the field study from the primary data source who is the labor producers, labor users, and female workers in top 3 male-dominated field of education.

3.2.2 Study sample

Researcher select study sample to interview by one of below criteria:

- Those who are the labor producers of the top 3 male-dominated fields of education such as President or Director of male-dominated occupation association, Dean in Universities of male-dominated field of education
- Those who are labor users of the top 3 male-dominated fields of education such as Business owner, Councils, Human resource manager of male-dominated company
- Those who are female workers of the top 3 male-dominated fields of education

And

- Those who works in that area more than 5 years to make sure they can give the clear pictures of situation

There are study sample of qualitative study 30 persons that allocation into 3 groups

- Labor producers 10 persons
- Labor users 10 persons
- Female workers 10 persons

3.2.3 Data collected method and tool

After receiving the list of people who have completely these conditions, researcher sent letters to ask for study sample for in-depth interview 30 minutes with 9

questions about gender shift phenomenon in their workplace, also inform them with the ethical consideration that research is volunteer. The interviews can stop in any point they want. Researcher will record their voice in tape and delete it after analysis data is ended. Their profile will be protected as a privacy and no one knows who the interviewees are. All 30 persons of study sample agreed to join the study. (see interview question in APPENDIX B.)

3.2.4 Data analytical process and method

This part of study is qualitative research from labor producers, labor users, and female workers about the change and trend, the cause and the effect, and the plan to deal with this change. Data analysis for the second part will be done through content analysis.

CHAPTER IV

RESULTS

This chapter shows the result of quantitative and qualitative data depending on the research questions. This chapter is divided into sub-sections as follows:

3.1 Quantitative Study

3.1.1 General Characteristics of Data

3.1.2 Result of Quantitative Study

3.1.2.1 Data Set I (from Ministry of University Affair)

3.1.2.2 Data Set II (from Individual University)

3.2 Qualitative Study

3.2.1 General Characteristics of Key Information

3.2.2 Result of Qualitative Study

For more information before going through the result of this chapter, this part is classified by type of study: quantitative study and qualitative study. Quantitative study answers the research question number 1 and qualitative study answers research question number 2.

First, from research question “1) Has the proportion of male and female students that enter to undergraduate level in top 3 male-dominated fields of education (Computing, Engineering, Architecture) in Thailand between the academic year 2001-2011 of universities in Bangkok and periphery changed? (If any) how it changes?” researcher studied the proportion of male and female students in undergraduate level in top 3 male-dominated fields of education in Bangkok and periphery. This **quantitative study** uses the data from two data sets, data set I from Ministry of University Affairs and data set II from the data from each university, analyzed by descriptive method. The results are described by bar and graph chart.

Second, from research question “2) What people, who labor producers, labor users, and female workers in top 3 male-dominated fields of education (Computing, Engineering, Architecture), thought about the change, the cause and the effect of this phenomenon also the plan to deal with the change?” researcher studies on the change, the cause, the effect and the plan to deal with this phenomenon from the labor producers, labor users, and female workers in top 3 male-dominated fields of education. This **qualitative study** uses content analytical data from in-depth interview with 30 concerned key informants.

The table below shows the conclusion of research question, method of study, data source, and method of analysis of the result:

Table 4.1 Conclusion of research question, method of study, data source, and method of analysis of the result

Research Question	Method of Study	Data Source	Method of Analysis
1. Has the proportion of male and female students that enter to undergraduate level in top 3 male-dominated fields of education in Thailand between the academic year 2001-2011 of universities in Bangkok and periphery changed? (If any) how it change?	Quantitative study the proportion of male and female students in undergraduate level in top 3 male-dominated fields of education in Bangkok and periphery	Number of freshman/graduated student collected by - SET I: Ministry of University Affairs - SET II: Individually University	- descriptive statistical - illustrated by bar graph and chart

Table 4.1 Conclusion of research question, method of study, data source, and method of analysis of the result (cont.)

Research Question	Method of Study	Data Source	Method of Analysis
2. What people, who labor producers, labor users, and female workers in top 3 male-dominated fields of education, thought about the change, the cause and the effect of this phenomenon also the plan to deal with the change?	Qualitative study on the change, the cause, the effect and the plan to deal with this phenomenon from the labor producers, labor users, and female workers in top 3 male-dominated fields of education	In-depth interview - Labor's producers (10 persons) - Labor's users (10 persons) - Working Women/Mothers (10 persons)	- content analysis

4.1 Quantitative study

From research questions which is “1) Has the proportion of male and female students that enter to undergraduate level in top 3 male-dominated fields of education in Thailand between the academic year 2001-2011 of universities in Bangkok and periphery changed? (If any) how it changes?”, researcher analytics the quantitative data by descriptive statistical method. The results are shown below.

4.1.1 Characteristics of quantitative data

This research aims to find empirical evidences of gender shift in Thailand through studying a proportion of male and female students entering to undergraduate level in top 3 male-dominated fields of education (Computing, Engineering,

Architecture) between the academic year 2001-2011 among universities in Bangkok and periphery. This quantitative study uses the data from two data sets; data set I from Ministry of University Affairs and data set II from each university. Both of data sets were categorized by ISCED, International Standard Classification of Education developed by UNESCO. Descriptive analysis was proceeded and the results were illustrated through charts and graphs.

Below table shows the conclusions of characteristics of quantitative data:

Table 4.2 Conclusions of characteristics of quantitative data

Data Set	Source of Data/Method	Year and University	Classified by	Objective
Set I	Download from Website Ministry of University Affairs	5 years (2006-2011) with 30 universities	Classified by groups of education 1 Education 2 Humanities and arts 3 Social sciences, business and law 4 Science 5 Engineering, manufacturing and construction 6 Agriculture 7 Health and welfare 8 Services	shallow but wide: Investigate trend of all group of education in 5 years and trend of engineering group from each university in 5 years
Set II	Requested data from each University	10 years (2002-2011) with 4 universities	Classified by field of education Top 3 Male-Dominated (3 from 25 Fields of Education) 48 Computing 52 Engineering and engineering trades 58 Architecture and building	narrow but deep: Investigate trend of 3 field of education of each university in 10 years

The secondary data are separated into two parts: data set I (from MUA) and data set II (from universities in Bangkok and periphery).

1) Data set I (from MUA)

Data set I shows shallow but wide view of the change (Ministry of University Affairs, 2012). The number of graduated of all group of education in all universities in Thailand has been collected for 5 years (from 2006 to 2010).

Table 4.3 List of universities in data set I

Name of University	Type of University
Kasetsart University	Public
Thammasat University	Public
Srinakharinwirot University	Public
Silpakorn University	Public
Chulalongkorn University	Autonomous
King Mongkut's University of Technology Thonburi	Autonomous
King Mongkut's University of Technology North Bangkok	Autonomous
Mahidol University	Autonomous
Krirk University	Private
Kasem Bundit University	Private
Mahanakorn University of Technology	Private
Rangsit University	Private
Siam University	Private
University of the Thai Chamber of Commerce	Private
Huachiew Chalermprakiet University	Private
Chandrakasem Rajabhat University	Private
Dhonburi Rajabhat University	Rajabhat
Bansomdejchaopraya Rajabhat University	Rajabhat
Phranakhon Rajabhat University	Rajabhat
Suan Dusit Rajabhat University	Rajabhat
Suan Sunandha Rajabhat University	Rajabhat

Table 4.3 List of universities in data set I (cont.)

Name of University	Type of University
Rajamangala University of Technology Tawan-Ok Chakrabongse Bhuvanarth Campus	Rajamangala University of Technology
Rajamangala University of Technology Tawan-Ok Uthenthawai Campus	Rajamangala University of Technology
Rajamangala University of Technology Phra Nakhon	Rajamangala University of Technology
Rajamangala University of Technology Rattanakosin Borpitpimuk Chakkawad Campus	Rajamangala University of Technology
Rajamangala University of Technology Rattanakosin Pohchang Campus	Rajamangala University of Technology
Rajamangala University of Technology Rattanakosin Salaya Campus	Rajamangala University of Technology
Rajamangala University of Technology Suvarnabhumi	Rajamangala University of Technology
Ramkhamhaeng University	Open

The data from MUA divide into 9 groups of education by ISCED (see more about ISCED in Appendix A.)

Table 4.4 ISCED group of education

Group of Education Code	Group of Education
1	Education
2	Humanities and Arts
3	Social Sciences, Business and Law
4	Sciences
5	Engineering, Manufacturing and Construction
6	Agriculture
7	Health and Welfare
8	Services
9	Other

2) Data set II (from university in Bangkok and periphery)

Data set II is derived from all universities in Bangkok and periphery. Four universities sent back the complete number of freshman/graduated student from 2002 to 2011 in male-dominated field of education which Universities had been open more than 10 years. This data shows the gender shift in each university.

Table 4.5 List of universities in data set II

Name of University	Type of University
Chulalongkorn University	Public
Huachiew Chalermprakiet University	Private
South-East Asia University	Private
Sukhothai Thammathirat Open University	Open

The data from universities classified into 3 fields of education in ISCED

Table 4.6 List of top 3 male-dominated fields of education from university

Field of Education Code	Top 3 Male-Dominated Fields of Education	Group of Education Code	Group of Education
48	Computing	4	Sciences
52	Engineering and engineering trades	5	Engineering, Manufacturing and Construction
58	Architecture and building	5	Engineering, Manufacturing and Construction

4.1.2 Result of quantitative study

The number of **graduated** student from MUA, use descriptive method to show the change of gender shift:

4.1.2.1 Result of Quantitative Study Data from MUA

The data from MUA shows that in these 5 years (2006 to 2010)

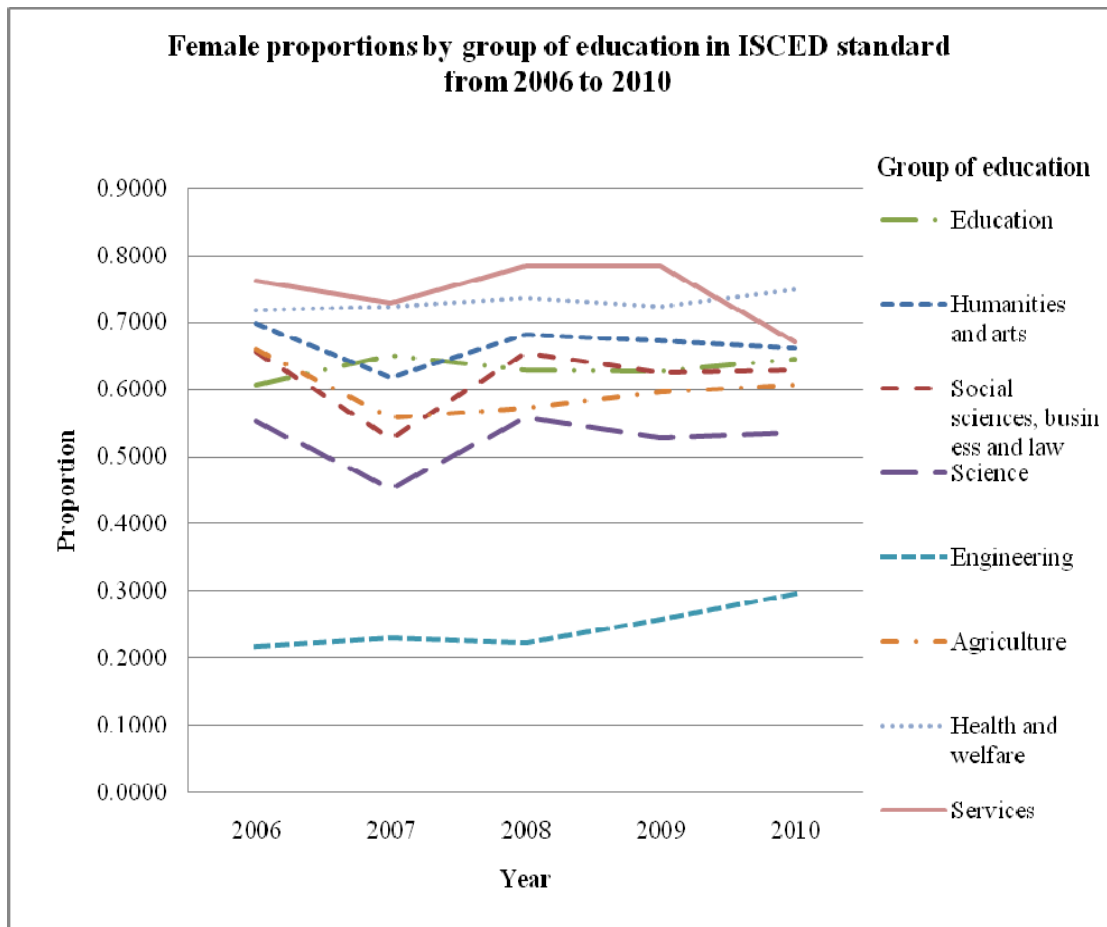


Figure 4.1 Female proportions by group of education from 2006 to 2010

Both of the figures above shows the proportion of male and female graduated in each ISCED in Bachelor degree in Thailand. The data from MUA shows that every major in ISCED except “Engineering” has female students more than half of all students. “Engineering” is the only major that approximately 80% of student is male and has only 20% of female student, which is the lowest female proportion when compared all ISCED while “Services” is the highest female proportion. It is nearly more than 80% or, the number is over five times than the number in Engineering field.

The purpose of this research is focused on female student in male-dominated field of education which clearly pointed to “Engineering”. Its percentage of male student is more than 50% while other fields’ percentage of female student is more than a half. This graph and table below show the proportion of male and female from 2006 to 2010 in Engineering field of education of all universities.

Table 4.7 Proportion of male and female in each field of education from 2006 to 2010

ISCED	Year	Number of Male	Number of Female	Sum of Student	Proportion of Male	Proportion of Female
1 Education	2006	831	1,283	2,114	0.3931	0.6069
	2007	1,792	3,336	5,128	0.3495	0.6505
	2008	581	984	1,565	0.3712	0.6288
	2009	558	940	1,498	0.3725	0.6275
	2010	559	1,019	1,578	0.3542	0.6458
2 Humanities and Arts	2006	2,300	5,325	7,625	0.3016	0.6984
	2007	7,555	12,209	19,764	0.3823	0.6177
	2008	3,058	6,551	9,609	0.3182	0.6818
	2009	2,685	5,541	8,226	0.3264	0.6736
	2010	2,920	5,702	8,622	0.3387	0.6613
3 Social Sciences, Business and Law	2006	17,840	34,040	51,880	0.3439	0.6561
	2007	85,218	95,118	180,336	0.4726	0.5274
	2008	14,513	27,543	42,056	0.3451	0.6549
	2009	17,883	29,799	47,682	0.3750	0.6250
	2010	15,549	26,331	41,880	0.3713	0.6287
4 Sciences	2006	3,372	4,141	7,513	0.4488	0.5512
	2007	9,135	7,537	16,672	0.5479	0.4521
	2008	4,131	5,206	9,337	0.4424	0.5576
	2009	4,106	4,611	8,717	0.4710	0.5290
	2010	4,667	5,399	10,066	0.4636	0.5364
5 Engineering, Manufacturing and Construction	2006	8,759	2,511	11,270	0.7820	0.2180
	2007	14,510	4,432	18,942	0.7689	0.2311
	2008	9,595	2,820	12,415	0.7759	0.2241
	2009	9,360	3,276	12,636	0.7425	0.2575
	2010	9,540	3,633	13,173	0.7049	0.2951

Table 4.7 Proportion of male and female in each field of education from 2006 to 2010 (cont.)

ISCED	Year	Number of Male	Number of Female	Sum of Student	Proportion of Male	Proportion of Female
6	2006	286	555	841	0.3401	0.6599
Agriculture	2007	885	1,120	2,005	0.4414	0.5586
	2008	479	642	1,121	0.4273	0.5727
	2009	433	638	1,071	0.4043	0.5957
	2010	407	630	1,037	0.3925	0.6075
	7	2006	1,267	3,232	4,499	0.2816
Health and Welfare	2007	1,871	4,900	6,771	0.2763	0.7237
	2008	1,323	3,698	5,021	0.2635	0.7365
	2009	1,384	3,637	5,021	0.2756	0.7244
	2010	1,451	4,337	5,788	0.2507	0.7493
	8	2006	628	2,005	2,633	0.2385
Services	2007	1,413	3,786	5,199	0.2718	0.7282
	2008	538	1,947	2,485	0.2165	0.7835
	2009	562	2,025	2,587	0.2172	0.7828
	2010	836	1,698	2,534	0.3299	0.6701

From above table shows the proportion of each year in each field of education between male and female student. Although Engineering is male-dominated field of education ,but the proportion of male is decreasing year by year from 0.7820 in 2006 to 0.7689, 0.7759, 0.7425 and finally, 0.7049 in 2010 and proportion of female have been increasing year by year from 0.2180 in 2006 to 0.2311, 0.2241, 0.2575 and finally, 0.2951 in 2010. The number of increasing is from 22% to 30% in 5 years. It means that the number of graduated female student has been increasing by 8% or over a thousand of students, as the chart below:

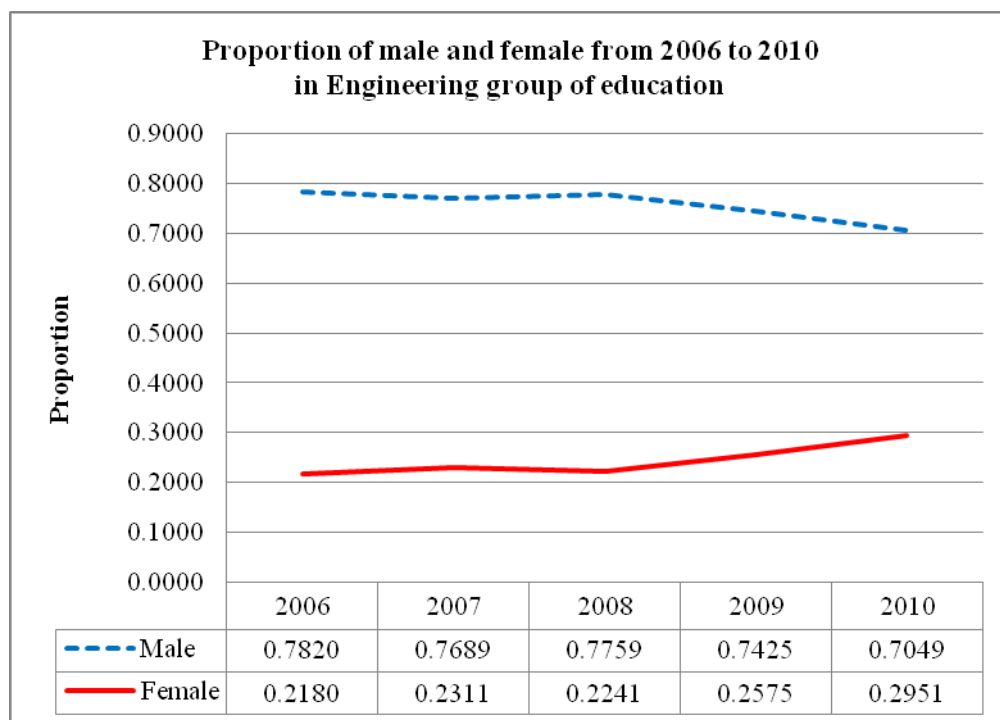


Figure 4.2 Proportion of male and female from 2006 to 2010 in Engineering group of education

Inside the data, when deeply analyzing number of graduated engineering, this is the number of female student by University and Type of University (Public, Private, etc.) from 2006 to 2010 table as below:

Table 4.8 Proportion of female in Engineering of each type of university from 2006 to 2010

Type of University	Name of University	Year	Proportion of Female	Trend
Public	Kasetsart University	2006	0.3177	Increasing
		2007	0.3964	
		2008	0.3287	
		2009	0.3732	
		2010	0.4071	

Table 4.8 Proportion of female in Engineering of each type of university from 2006 to 2010 (cont.)

Type of University	Name of University	Year	Proportion of Female	Trend
Autonomous	Thammasat University	2006	0.3907	Increasing
		2007	0.5000	
		2008	0.3971	
		2009	0.3938	
		2010	0.4407	
	Srinakharinwirot University	2006	0.3116	Increasing
		2007	0.5231	
		2008	0.4402	
		2009	0.3991	
		2010	0.4866	
Silpakorn University	2006	0.4428	Increasing	
	2007	0.5647		
	2008	0.5191		
	2009	0.5329		
	2010	0.5607		
Autonomous	Chulalongkorn University	2006	0.3326	Fluctuate
		2007	0.3768	
		2008	0.2947	
		2009	0.3580	
		2010	0.3353	
	Mahidol University	2006	0.4184	Decreasing
		2007	0.3816	
		2008	0.3450	
		2009	0.3346	
		2010	0.3674	

Table 4.8 Proportion of female in Engineering of each type of university from 2006 to 2010 (cont.)

Type of University	Name of University	Year	Proportion of Female	Trend
Public	King Mongkut's University of Technology Thonburi	2006	0.2452	Increasing
		2007	0.3700	
		2008	0.3032	
		2009	0.3729	
		2010	0.3682	
	King Mongkut's University of Technology North Bangkok	2006	0.1386	Increasing
		2007	0.1662	
		2008	0.1363	
		2009	0.1683	
		2010	0.1569	
Private	Kasem Bundit University	2006	0.0332	Increasing
		2007	0.0678	
		2008	0.0687	
		2009	0.0597	
		2010	0.0641	
	Mahanakorn University of Technology	2006	0.0772	Increasing
		2007	0.0846	
		2008	0.0676	
		2009	0.1103	
		2010	0.1184	
Rangsit University	2006	0.2700	Increasing	
	2007	0.3319		
	2008	0.2759		
	2009	0.3125		
	2010	0.4231		

Table 4.8 Proportion of female in Engineering of each type of university from 2006 to 2010 (cont.)

Type of University	Name of University	Year	Proportion of Female	Trend
Rajabhat	Siam University	2006	0.1436	Decreasing
		2007	0.0678	
		2008	0.0385	
		2009	0.0208	
		2010	0.0318	
	University of the Thai Chamber of Commerce	2006	0.4922	Decreasing
		2007	0.2800	
		2008	0.3673	
		2009	0.4015	
		2010	0.3676	
	Chandrakasem Rajabhat University	2006	0.3529	Fluctuate
		2007	0.0947	
		2008	0.5106	
		2009	0.4545	
		2010	0.2273	
Phranakhon Rajabhat University	2006	0.0291	Fluctuate	
	2007	0.0800		
	2008	0.0800		
	2009	0.0948		
	2010	0.0968		
Suan Sunandha Rajabhat University	2006	0.1456	Increasing	
	2007	0.3261		
	2008	0.3713		
	2009	0.3716		
	2010	0.4038		
Rajamangala University of Technology	Rajamangala University of Technology Uthenthawai Campus	2006	0.1474	Fluctuate
		2007	0.0000	
		2008	0.0550	

Table 4.8 Proportion of female in Engineering of each type of university from 2006 to 2010 (cont.)

Type of University	Name of University	Year	Proportion of Female	Trend
		2009	0.1119	
		2010	0.1622	
	Rajamangala University of Technology Phra Nakhon	2006	0.2408	Fluctuate
		2007	0.2429	
		2008	0.2222	
		2009	0.2072	
		2010	0.2668	
	Rajamangala University of Technology Suvarnabhumi	2006	0.0473	Fluctuate
		2007	0.0757	
		2008	0.0756	
		2009	0.0858	
		2010	0.0547	
Open	Ramkhamhaeng University	2006	0.2404	Fluctuate
		2007	0.1233	
		2008	0.2609	
		2009	0.1940	
		2010	0.2288	

From table above, data shows the differences among Type of University, which are Public, Autonomous, Private, Rajabhat, Rajamangala University of Technology, and Open.

As big pictures of Public and Autonomous Type, all university except King Mongkut's University of Technology Thonburi and King Mongkut's University of Technology North Bangkok have female proportion of 0.3 or 30% of the entire student. While Private University, Rajamangala University of Technology, and Open University have proportion of female less than 20% in average accept Ringgit University. University of the Thai Chamber of Commerce in Private Type, and

Rajamangala University of Technology Phra Nakhon have proportion of female more than 20% to 40% of the entire student.

For Public and Autonomous Type of University, Silpakorn University has the highest female student proportion. It is about half of student (50%) in Engineering field. The lowest proportion of female in this type of University in King Mongkut's University of Technology North Bangkok is less than 0.17 or 17%.

For Private Type, The highest proportion of female student was University of the Thai Chamber of Commerce. Its average proportion is at 0.38 or 38%. The lowest proportion of female student in Private Type was Kasem Bundit University. Its average proportion is at 0.058 or 5.8%.

For Rajamangala University of Technology, the highest female proportion is under a quarter of student or by 0.23 in average. The lowest proportion of female student is 0.0678 in average.

For Rajabhat University Type, the proportion of female is not yet stable in each year. Surprisingly, only at Suan Sunandha Rajabhat University has the proportion of female student which dramatically increases from 0.1456 to 0.4038 or 25%. For Phranakhon Rajabhat University, The number also increases slightly. It changes from 0.0291 to 0.0968 or 7%.

4.1.2.2 Result of quantitative study data from university

For the second part of quantitative study which data collected from each University individually, data classified by field of education, which are Computing, Engineering, and Architecture, to describe the change. All universities data is as below:

Table 4.9 Name of university and type of data/field of education which have the data

Name of University	Data of	Engineering	Architecture	Computing
Chulalongkorn University	Graduated	2002-2011**	2002-2011**	2002-2011**
Huachiew Chalermprakiet University	Freshman	-	-	2001-2012**
South-East Asia University	Graduated	2001-2011**	-	-
Sukhothai Thammathirat Open University	Graduated	-	-	2001-2011**

** From year ... to year

Data from all universities above is analyzed and classified by field of education, which is Computing, Engineering, and Architecture, to describe the change.

Table 4.10 List of top 3 male-dominated fields of education from university

Code	Field of Education	Code	Group of Education
48	Computing	4	Sciences
52	Engineering and engineering trades	5	Engineering, Manufacturing and Construction
58	Architecture and building	5	Engineering, Manufacturing and Construction

Computing

Computing field of education get data from Chulalongkorn University (2002-2011), Huachiew Chalermprakiet University (2001-2012), and Sukhothai Thammathirat Open University (2001-2011)

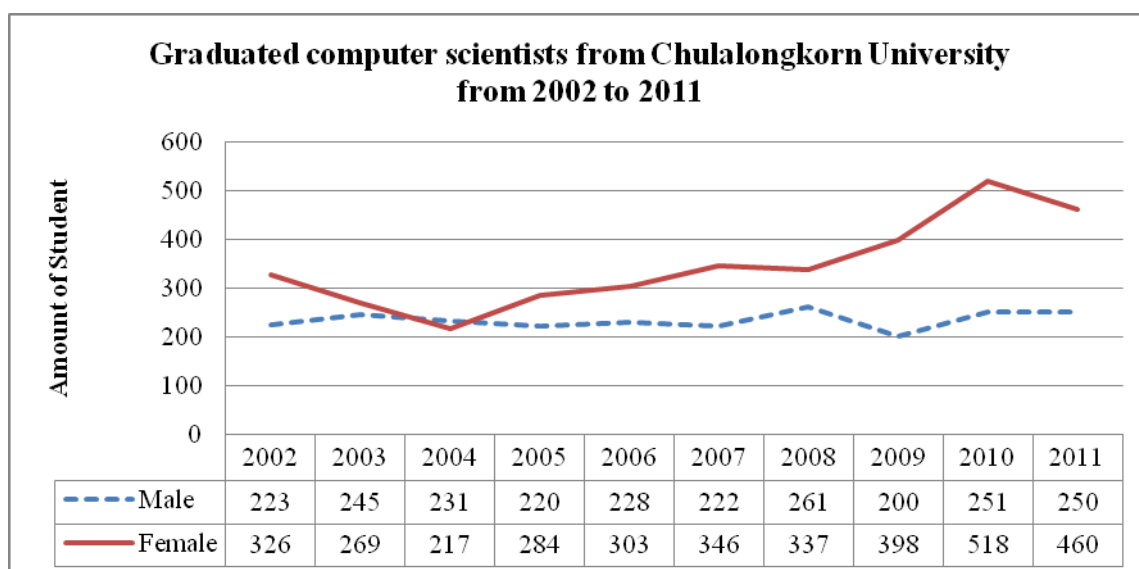


Figure 4.3 Graduated computer scientists from Chulalongkorn University from 2002 to 2011

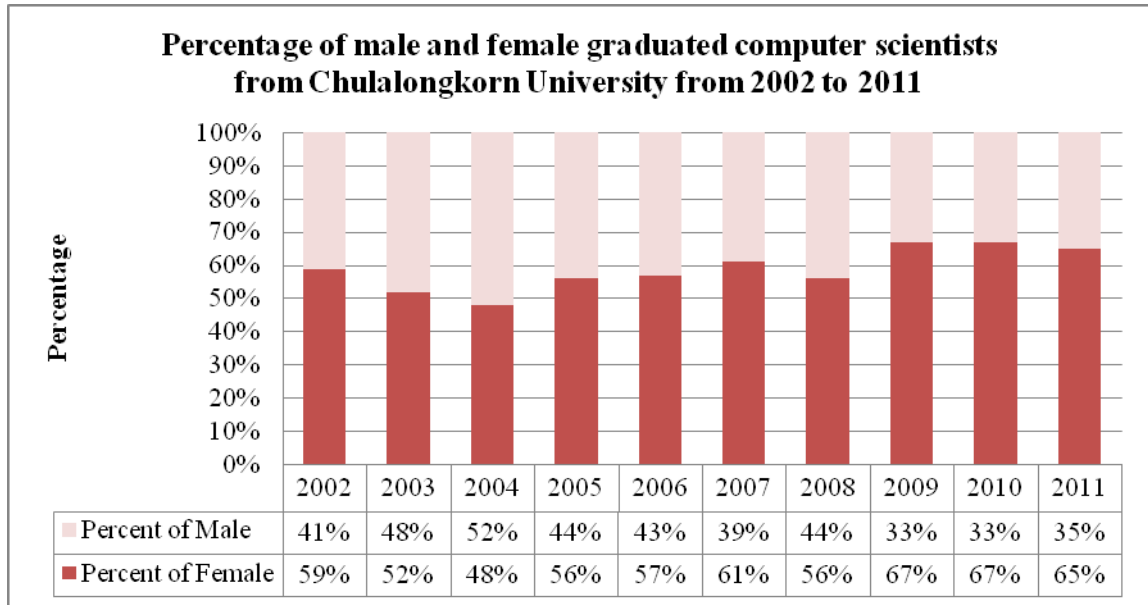


Figure 4.4 Percentage of male and female graduated computer scientists from Chulalongkorn University from 2002 to 2011

Above graph of Chulalongkorn University, It shows that the number of female student in computing field in ten years ago is more than half except in 2004, which is the year of the change in entrance system. This event caused many errors in entrance results and the decreasing number of female student only in that year. Apart from that, the number of female has increased every year from 59% in 2002 to 65% in 2011. The graph shows the increasing line which dropped only in 2004 and then up again in 2005 and every year since then.

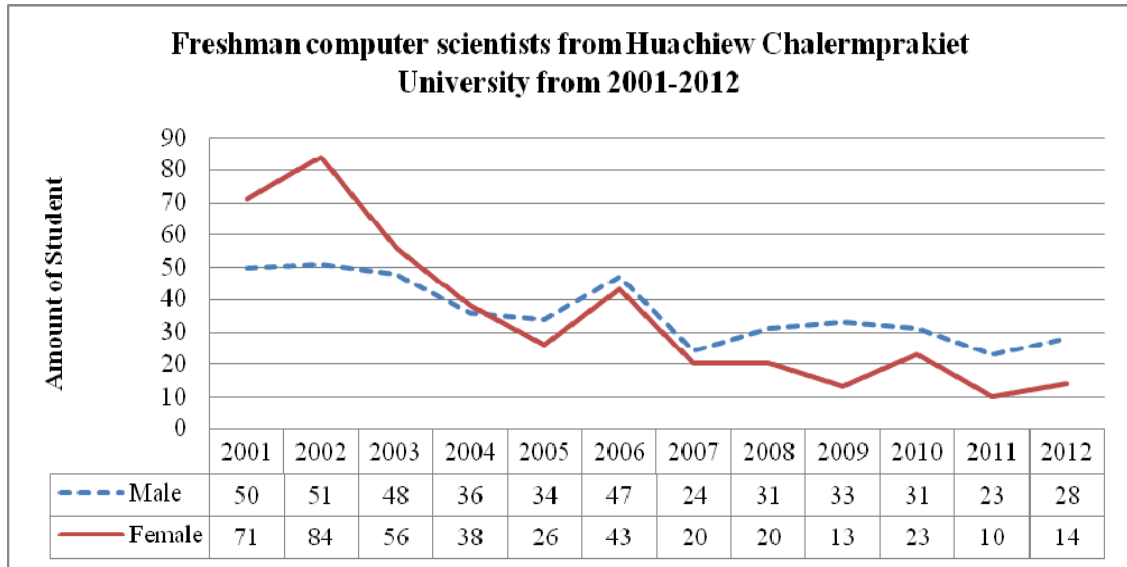


Figure 4.5 Freshman computer scientists from Huachiew Chalermprakiet University from 2001-2012

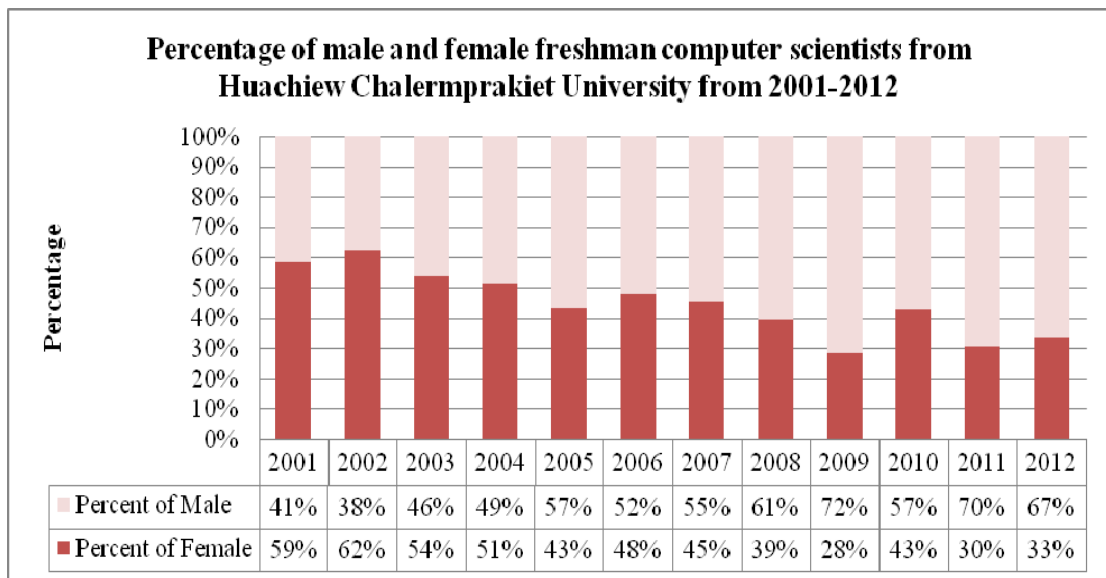


Figure 4.6 Percentage of male and female freshman computer scientists from Huachiew Chalermprakiet University from 2001-2012

Huachiew Chalermprakiet University’s computing field, the number of student in both male and female has decreased over the past few year since 2005. It is

because the new major in this field opened (Biology-Science). From 2001 to 2004, number of female student is higher than male student, which is over 50 percent. However, after 2005, percentage of female student was dropped to below 50 percent. Nevertheless, it can be assumed that percentage of female student still higher than 30% of all students.

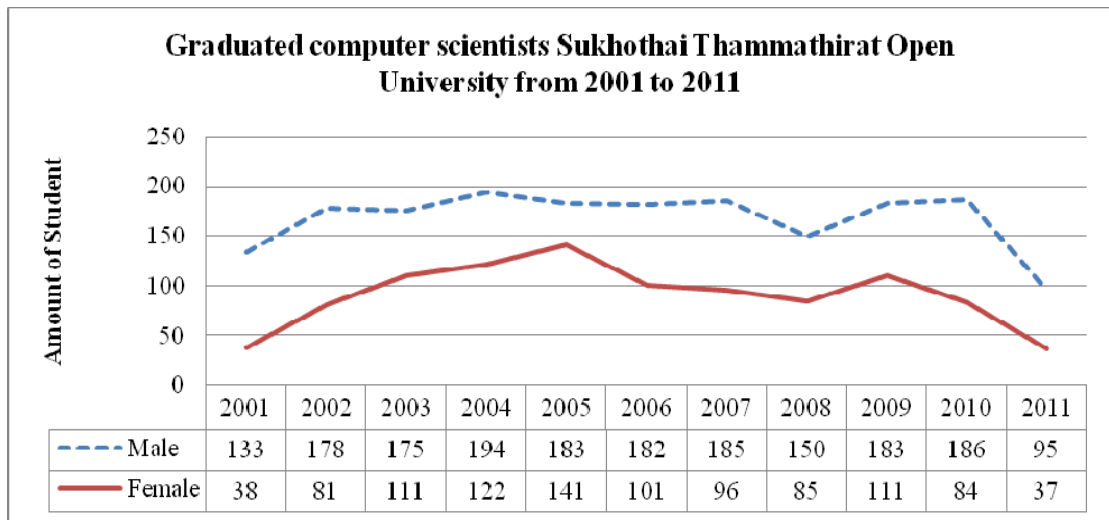


Figure 4.7 Graduated computer scientists Sukhothai Thammathirat Open University from 2001 to 2011

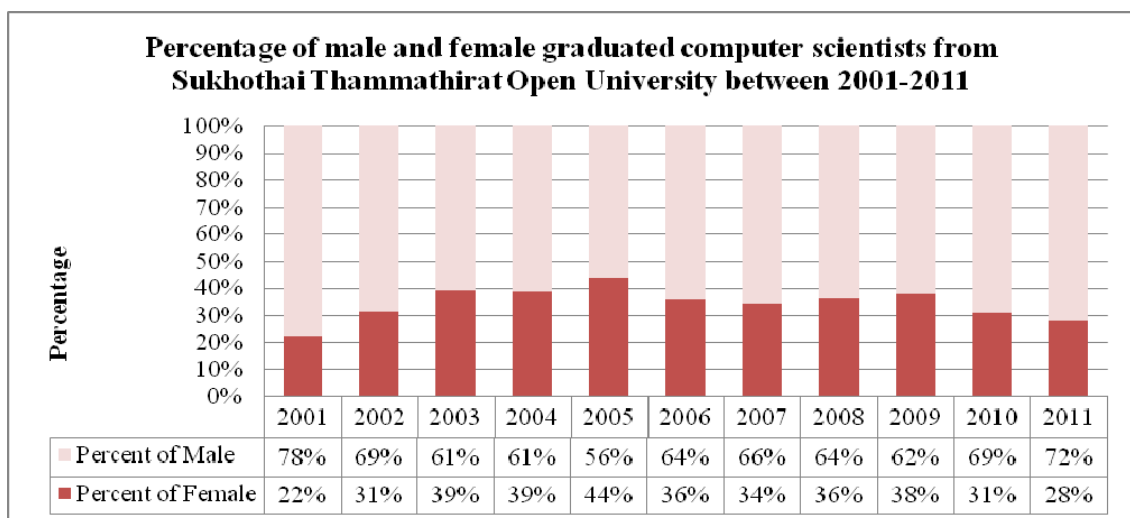


Figure 4.8 Percentage of male and female graduated computer scientists from Sukhothai Thammathirat Open University between 2001-2011

From above graph and chart showing percentage of female in Computing of Sukhothai Thammathirat Open University from 2001 to 2011, the pattern of percentage of female student is still difficult to analyze. Because of this type of this university is an Open University which everyone not only high school student can enter to this university. So, the number of student in this university is changed every year. Yet, we still see some interesting number in 2001 to 2005 that percentage of female student has grown every year. Even though in 2006 to 2011, number of female decreased, it still stayed higher than 28%.

Data from all universities in computing field shows that in past ten years, Computing field have still had the number of female higher than 30% especially in public university such as Chulalongkorn University which has a high competition. It still has percentage of female student higher than 50%.

Engineering

Engineering field of education receives data from Chulalongkorn University (2002-2011) and South-East Asia University (2001-2011)

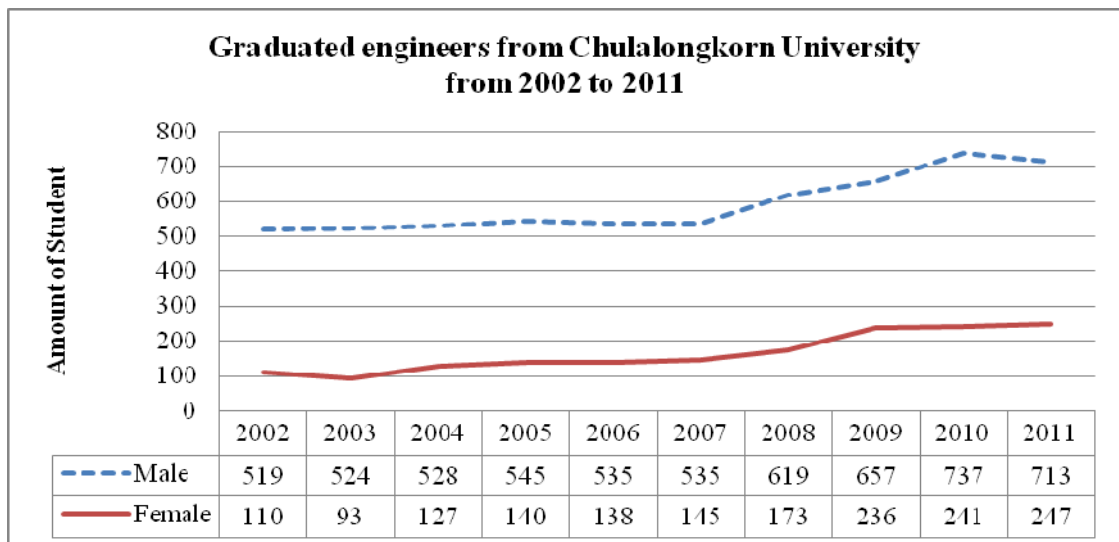


Figure 4.9 Graduated engineers from Chulalongkorn University from 2002 to 2011

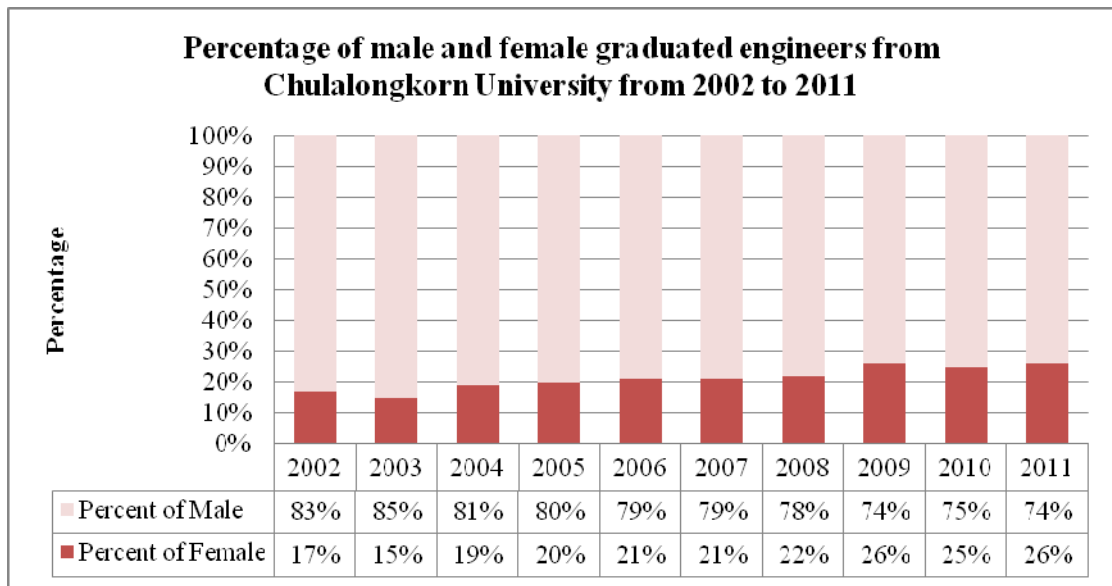


Figure 4.10 Percentage of male and female graduated engineers from Chulalongkorn University from 2002 to 2011

Both above graph shows trend of female student in Engineering field of education in Chulalongkorn University from 2002 to 2011 or ten years ago. Trend of female engineering has increased every year from 110 people to 247 people (or from 17% to 26%) in ten year. It is about double grow-up rate within 10 years.

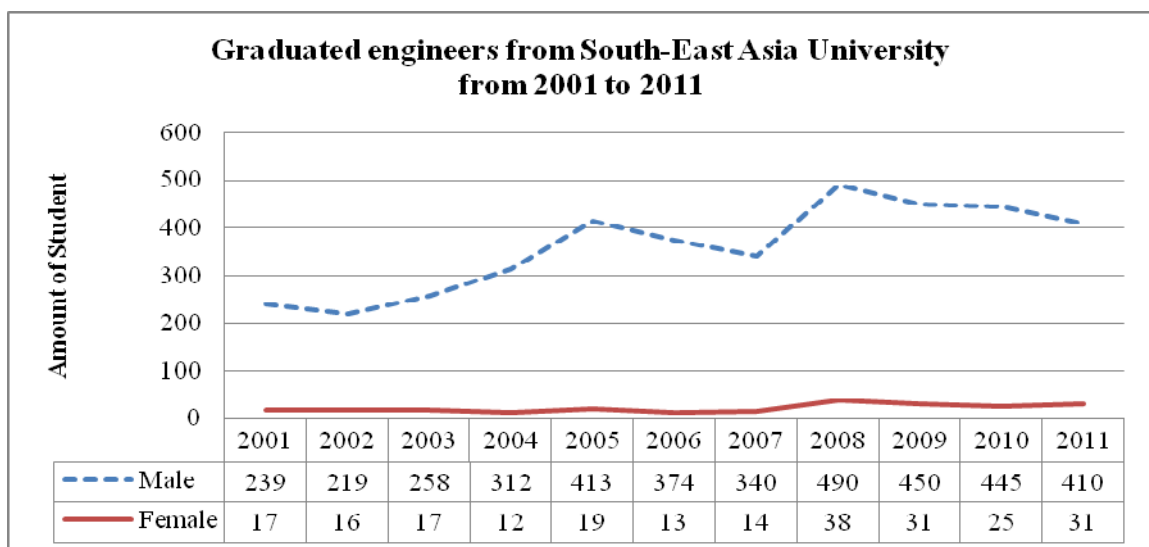


Figure 4.11 Graduated engineers from South-East Asia University from 2001 to 2011

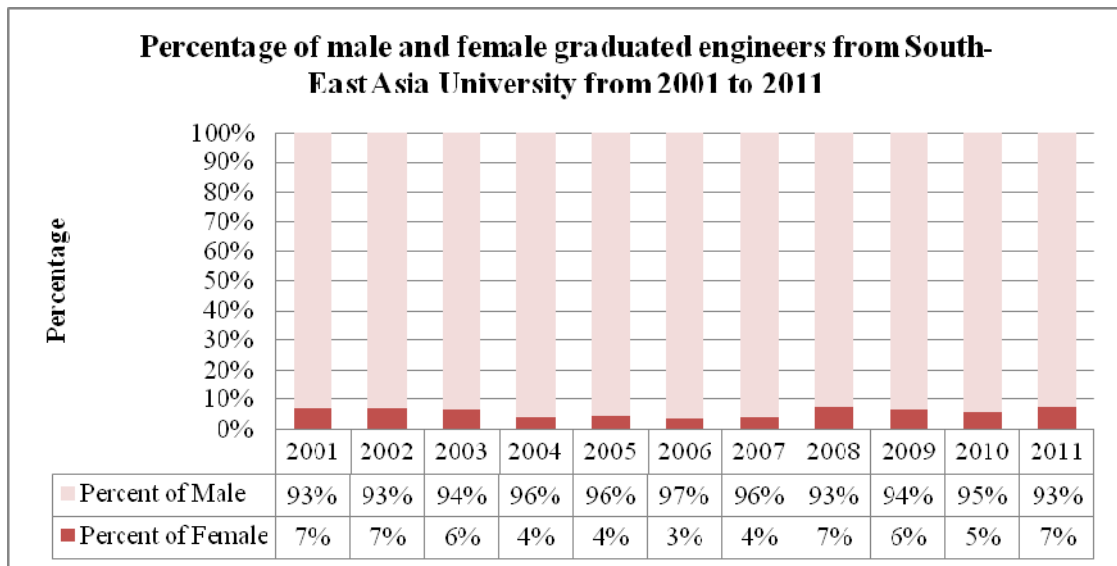


Figure 4.12 Percentage of male and female graduated engineers from South-East Asia University from 2001 to 2011

When looking at percentage of female student in engineering in South-East Asia University has fluctuated since from 2001 to 2011 or 11 years ago. In 2001, female was only 7% of student and still in the same rate. In 2006, percentage of female dropped to 3% of student. But when we look at the line graph number of female, the number has been increasing every year from 17 persons to 31 persons or almost double in 11 years but the number of male also increased twice in 11 years. So, percentage of female is not changed much after 11 years pass.

After studying the number and percentage of female student in each university in the past ten years, we found that the first place of male-dominated field is engineering. Its percentage of female student has risen more than 9% in over the last ten years especially in public university. Still, in private university, percentage of female is not stable.

Architecture

Architecture field of education get data from only one university which is Chulalongkorn University from 2002 to 2011.

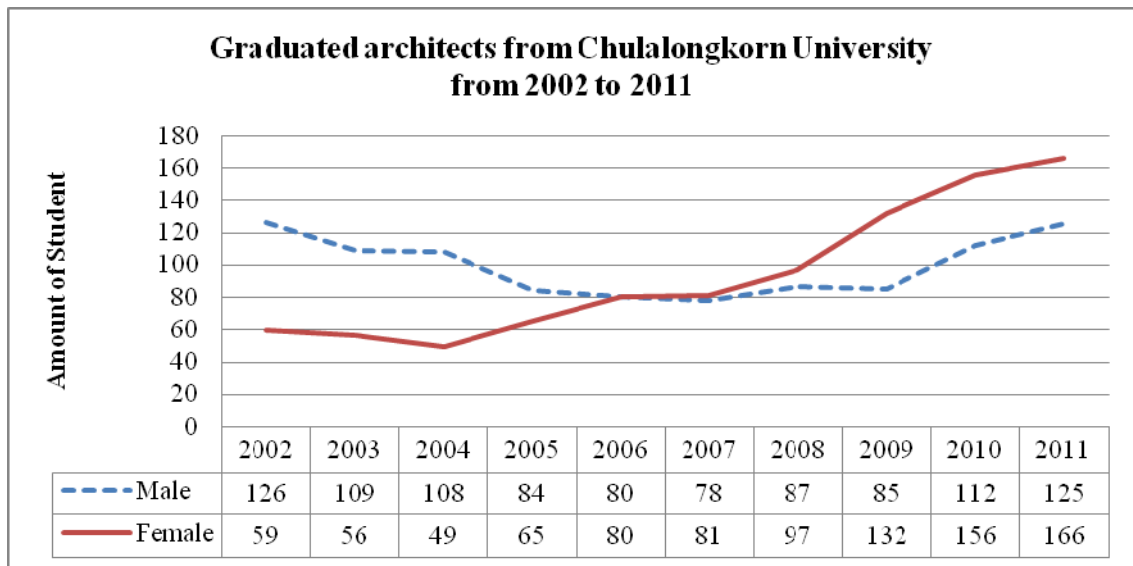


Figure 4.13 Graduated architects from Chulalongkorn University from 2002 to 2011

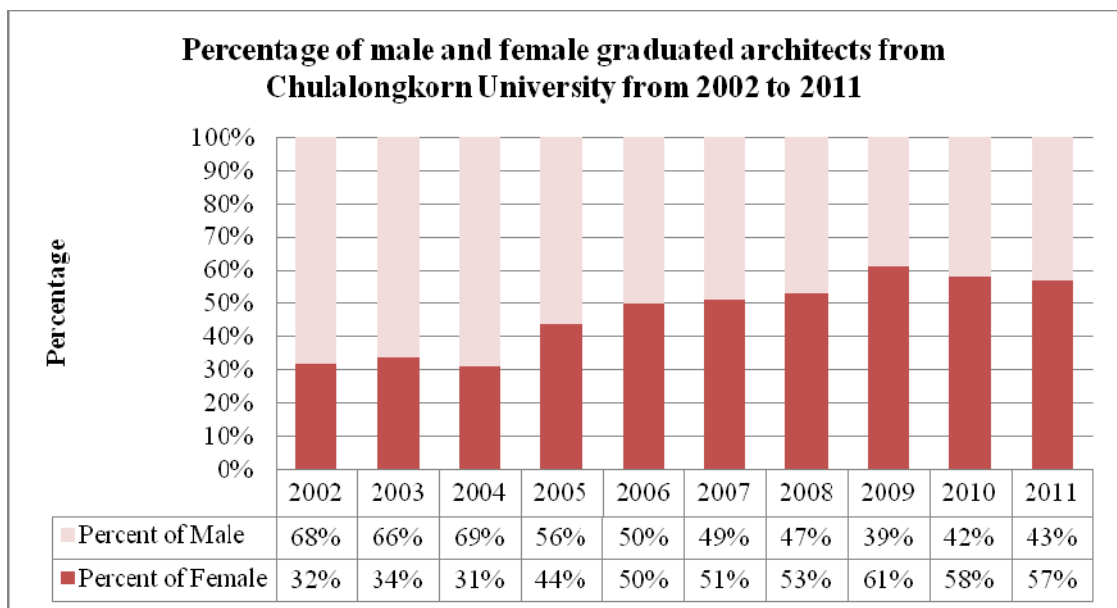


Figure 4.14 Percentage of male and female graduated architects from Chulalongkorn University from 2002 to 2011

Female architect in Chulalongkorn University also has grown up every year with a rapidly increasing percentage from 32% in 2002 to 57% in 2011. As you can see from line graph above, it shows the number of female increasing start from

2002, 32% to 50% which can be explained as the equality between female and male in 2006. From 2007 to 2011, female students are more than male student. In 2011, architect student was finally at the percentage of 57% of female.

In conclusion, all top 3 male-dominated fields of education: Computing, Engineering, and Architecture in every university, percentage of female student has risen in over the ten years, and tends to increase continuously especially in public university. Computing has the percentage of female student about 40% to 60%. Engineering has female student about 20% to 30%. Architecture percentage of female is rapidly changed in past ten years from 32% to 57% or more than half of student. Above data are showing empirical evidence of gender shift in Thailand.

4.2 Qualitative study

For the second research question which is “2) What people, who labor producers, labor users, and female workers in top 3 male-dominated fields of education, thought about the change, the cause of this phenomenon and the effect also the plan to deal with the change?” researcher go to in-depth interview question (see more in Appendix B.) with the labor producers, labor users, and female workers in top 3 male-dominated fields of education about the change, the cause, the effect and the plan to deal with this phenomenon. This is part of **qualitative study** which uses content analytical data from in-depth interview from those people.

4.2.1 Characteristics of qualitative sample

These are the characteristics of research group of sample derived from in-depth interview in gender shift issue (see more about question in Appendix B.)

Table 4.11 Characteristics of in-depth interview sample

Interview Sample	Female	Male	Avg. Age (Year)	Avg. Work (Year)
Producers	3	7	40.3	10.6
Users	3	7	46.5	16.8
Female Workers	10	0	41.1	12.3

Sample Interview 30 persons in three categories: labor producers, labor users, and female workers

1.) **Labor producers** (10 persons) are Ministry of Education, President or Director of male-dominated occupation association, Dean in Universities of male-dominated field of education. They are 3 females and 7 males, average age 40.3 years old have and work experiences average 10.6 years.

2.) **Labor users** (10 persons) are business owner, human resource manager, councils and manager of team in male-dominated field of work organization. They are 3 females and 7 males, average age 46.5 years old and have work experiences average 16.8 years.

3.) **Female workers** (10 persons) are female who works in male-dominated field. They are both single and married. They are 10 females, average age 41.1 years old and have work experience average 12.3 years.

4.2.2 Result of qualitative data

In order to answer the research's assumptions of how the current situation Gender Shift is, what factors are derived, what the effects are, and how the prepared plan for this kind of occurrence should be, we then interviewed people who are directly involved with the occurrence of Gender Shift whether producers, workers, and working women totally 30 people. And the topics for an interview have been categorized as, first, Gender Shift in educational system, Gender Shift in labor employment system, and, last, interesting related studies to this issue. From these three main categories, they also have been grouped into four sub-topics as Gender Shift situation, factors that influence Gender Shift situation, the impacts of Gender Shift, and existing supporting policies and new supporting policies that should exist. This result is only in top 3 male-dominated fields and in Bangkok and periphery area. The details are as follows.

In educational system

Information gained in this section is based on interview from ten key informants who experts working on related fields as we considered that they can illustrate a clear picture in this topic. The main contributors to this information

includes specialist from Ministry of Education, Dean of the Faculty of Engineering, experts from the Faculty of Architecture and the Faculty of Computer Science of various universities, and professors. The studied results provide picture in the following order;

Situation

Table 4.12 *Gender shift situation in educational system*

Questions	Scale		
	Better	Same	Badly
1. What is the situation of gender equity in your university? Why? How?	10/10	0/10	0/10
	Increasing	Same	Decreasing
2. What is statistical data with female student in your organization? Why? How?	10/10	0/10	0/10
	More than half	Half/half	Still less than half
3. Did you have any interesting statistics of female student in your university?	8/10	1/10	1/10

The number of female students is surprisingly increased in educational system especially in the faculty of Male-Dominated Field such as Engineering, Architecture, and Computer Science. There are empirical evidences of some

quantitative researches proved that the amount of female students substantially increase in every Field of Education. Even though in Male-Dominated faculty where there is the greater number of male students, it still shows an enlargement in number of female students.

Factor

Table 4.13 *Factors of gender shift situation in educational system*

4. What is a turning point of changing from male to female student in your university? Why? How?	
Number of Female is higher from birth and male dead earlier or go to vocational study	8/10
Female students tend to be more willing learner and more diligent	9/10
Increase of service sector and suitable major for female	5/10
Better recognition of women capabilities is also a keystone. gender is not a barrier to an employment anymore	7/10
Not sure	1/10

By interviewing relating deans or professors from many universities or even people from Ministry of Education views the reason behind an increasing amount of female students in educational system as the greater female's birth rate than male. But, in fact female is always lower birth rate, but when they grow up to be teenager, men are more rashness and more at risk hence some of them died because of accident then in education have higher female student. Moreover, when they pursue their studies, some of them choose a professional school or a vocational education then there is higher number of female students than male students in university entrance exam.

Apart from the greater number in university entrance exam, female students tend to be more responsibility in study and exam preparing thus, in most of any competitive examinations, women can do better and either pass entrance exam than men in an equal competition rate.

The changes that have created an enlargement of jobs in service sector even in diverse Male-Dominated Fields that suitable for female engineers more than male engineers. Some jobs require delicacy not strength which women can provide more understanding and perform some specific jobs better than men. This makes more demand of women workers in employment and then makes more women choose to study in Male-Dominated Field

Moreover, better recognition of women capabilities is also a keystone. A more openness of labor market and plenty examples of well-known women in society make changes in people's attitudes so they believe that gender is not a barrier to an employment anymore. Women have courage to choose their study lines that men have studied and women nowadays believe that there is more parity between male and female.

Effect

Table 4.14 *Effect of gender shift situation in educational system*

5. What about effect of gender shift in your university? Why? How?	
Increase of women in labor market	9/10
A need to pursue higher education of women	10/10
More strict in maid selection, remain single longer, delay marriage and having a baby	9/10
Educational institutions with selective admission process are taking men before women in male-dominated faculties because of the lower number of male students such as Engineering	4/10

Table 4.14 *Effect of gender shift situation in educational system (cont.)*

Question	Scale		
	A lot of change	Some change	Not change
6. Is there any changing pattern of study occurring in your university? Why? How?	0/10	0/10	10/10

The greater number of female students results in a significant increase of women in labor market. In addition, women are more educated also results in women are willing to study in a higher level. Mate selection is more stringent. Hence, women are delaying their marriage and delaying in having a baby. Even though there are more female students come to occupy a seat in universities, male students in some faculties or field are still required. Thus, male students get better chances of studying in male-dominated faculty and have less strict criteria in admissions compared to female students.

Policy

Table 4.15 *Supporting policy of gender shift in educational system*

Questions	Scale		
	Difference	Same	Not Sure
7. Did male and female student are difference in study? How?	9/10	1/10	0/10
	A lot	Some	None
8. Are there influences of the policy for female's student increasing? Why? How?	0/10	0/10	10/10

Table 4.15 *Supporting policy of gender shift in educational system (cont.)*

Questions	Scale		
	Difference	Same	Not Sure
	Yes	No	Not sure
9. Are your policies adjusted for responding changing number of female in male-dominated field? How?	0/10	7/10	3/10

In our educational system, most universities agreed that there are more female students and, in some faculties or some fields, there are more than half of female students. However, most universities do not have any policies supporting this issue because during learning both female and male students do not differ from each other much. The differences that can easily notice are female students are more diligent and delicate, have higher willingness to learn, and work based on reality than male students. Whereas male students are more unique and creative, have greater strength, and are not easily get nervous like female students.

During class, both advantages and disadvantages of individual gender can be fulfilled by each other unlike under working conditions that are more competitive. Any tasks those are too harsh for female students or seem to be risk, male students will help supporting them so informants do not see any important policies required to support this issue.

Many lady professors agreed that when they were studying, they can perform their tasks like men. But in reality, it depends on individual lines of work. The works that need strength or have high risk, they really cannot perform, those lady professors admitted. However, there are many lines of jobs in women's opinions that they have advantage over men when they graduated such as line manager which want female engineer than male engineer because business owner want someone delicate

In labor market*Situation***Table 4.16** *Gender shift situation in labor market*

Questions	Scale		
	Better	Same	Badly
1. What is the situation of gender equity in your organization?	20/20	0/20	0/20
	Increasing	Same	Decreasing
2. What is statistical data with female workers in your organization?	20/20	0/20	0/20
	More than half	Half/half	Still less than half
3. Did you have any interesting statistics of female workers in your organization?	17/20	2/20	1/20

Anyone who relates to graduates senses a significantly increase of women's amount in labor market and within his organization. More women apply for a job than men which lead to the bigger proportion of women in workplace than men, mostly greater than half in proportion. But even with more women in labor market do, in recruiting people or in getting promotion, men continue to be more selected than women in men's careers. However, it will difference upon each organization, for examples, in a government service or state enterprises, men and women are equal during recruitment process but men will receive better opportunity to get promotion or

get management positions under the same working contribution conditions. Most private companies still have an existing of selective recruitment by choosing more men graduates than women and men will get better chance in promotion. The reasons behind this circumstance are nothing about gender but the contributions to work of men and the outputs. As married women or women with children will usually dedicate more time to family and focus on their children then they do not fully dedicate themselves for work and their performance are not outstanding like men do. Furthermore, Thailand is a country with seniority in a workplace that recognizes people by their ages more than their capabilities. Most of older generations in male-dominated fields are presently in top positions because their longer working time. In some cases where women are good at working because they have a support from their cousins to do the housework so they can pay great contributions to work and create remarkable achievements until people recognize. And this is a part of Gender Shift phenomenon

Factor

Table 4.17 *Factors of gender shift situation in labor market*

4. What is a turning point of changing from male to female workers in your organization? Why? How?	
The higher proportion of female students educational institutions	19/20
Double-income family economic system	13/20
A more society openness and gender equality	12/20

We should return and consider the source of labor entering the labor market which is the amount of graduates from all educational institutes in order to understand why the number of women workers is increased essentially. Academy produces workers to the labor market called Labor Producers. Hence, the greater proportion in number of female students in those educational institutes mean the greater proportion in number of female labors in the labor market.

Additionally, the increase of female workers in current labor market associates with the present economic system in Thailand which unable to make ends meet. Raising a child nowadays cost much more than in the past. So that, part of the increase in female labors is a married women have to help earning some money for their families' living or we called Double Income Family. Sometimes, women can earn more than men and finally become Main Breadwinner of that family.

Lastly, the increase of female workers in current labor market is a wider acceptance and a higher sexual equality then ladies have shifted to major positions in both business and political aspects. Women have more opportunities to express their potentials and this brings out their pride and self-confident and be a notable example of many other women to follow.

Effect

Table 4.18 *Effects of gender shift situation in labor market*

5. What about effect of gender shift in your organization? Why? How?	
Women have greater purchasing power and decision making power, be able to take care themselves and increasing in self-esteem	16/20
More entrepreneurs willing to hire more women workers and it began to be difficult for men to look for a job.	14/20
Single women and married status	Delay Married 19/20 Fostering marriage 1/20
Married women defer to have a baby. They also spend less time with spouse on sexual activities	17/20 (*women who work in private organization)
The expecting ladies may easily miscarry baby because of tension	1/20
During pregnancy, the stress from mother can affect the baby	17/20
After delivering a baby, time pressure and tension from work have directly impacts to both physical and mental health of baby	17/20

Table 4.18 *Effects of gender shift situation in labor market (cont.)*

Without understanding and communication, potential conflicts or even divorce may be able to ruin a marriage life	15/20
Many women have better career advancement, earn greater income and have more stable job than men, then they are switching in roles.	13/20
Suppression of men shall or shall not have a minor wife in order to make a little pride in themselves.	12/20

Table 4.18 *Effects of gender shift situation in labor market (cont.)*

Question	Scale		
	A lot of change	Some change	Not change
6. Is there any changing pattern of working for working women occurring in your organization? Why? How?	0/20	3/20	17/20

The impact of more women entering the labor market, by looking an overall picture, seems not to have any differences. But, in reality, what is noticeably enlarged is women's purchasing power. Many fashion merchandises can be sold very easily and new brands are created every day. Once the ladies can earn money, they have their own purchasing power and have fashion competition in the workplace so those working women need more make up and dress up.

The increase of women in labor market makes difficulties for men. It began harder for them to find a job in many professions because there are more

women candidates, women get better test scores and additionally women have many skills more suited to the task. Men fall to difficult situation.

For entrepreneurs who employ women as workers in vocational professions in the occupation of men previously, they admit more in women's abilities and agree to use advantages of female gender in some areas. Those entrepreneurs tend to hire more women workers than men. As more and more women are employed, it will lead to a change in social structure and role of individual family. The more female labors increase, the more male labors unemployed causing the switch in roles within family.

By investigating more on impacts of having more women workers entering labor market, we can split into two cases; single women case and married women with children case.

In the very first case, single women decided to stay single longer and may not be married or delaying their marriage since single women enter labor market, start working and are able to earn their living. They claim with many reasons such as lacking of time to meet anyone, unable to find the right one who suits them, the good man is difficult to meet, do not want to have marriage problems or family problems, happy with working, happy enough with themselves, and etc. On the other hand, some single women want to get married for their safety. This case happens with women who have to work in other provinces far from their homes or in areas that are not safe for their travelling. There are plenty of sexual harassment cases because they move to work in upcountry as a teacher or being an engineer in provincial's industries. Hence, those single women decided to get married with the one who can take care their security or even someone have to give up on one's love and get married with someone who live closely or who have high influence in the area. However, most single women choose more on the first situation which is living single life longer and focusing only on their jobs.

For the latter case, going out to work of a married woman similar to working two shifts as working in a company and working at home. More power is required since it is like having two jobs and allocation of time and energy is now burdensome to manage. If they are unable to manage their time properly, lots of problems can easily happen. The complications of work-life balancing mainly depend

on the form of organization. Women working in government services or state enterprises will contain less stress or pressure since those kinds of organizations are flexible and do not have dismissal policy. Women can perform their tasks along with take care their families. The working hours are not strict, only they can complete their jobs in time, and the working expectation is not high (Depending on the individual tasks and responsibilities). Whereas private companies have dismissal and lay-off policy, all employees have to compete with each other to create an outstanding performance, have full responsibilities for their acts to meet company's expectations of the effectiveness and efficiency. Especially those who work with specific goals like sales staff; a lot more pressure is pushed. As a result, women who work under high-stress conditions of private companies face infertility problem from working too harsh and stressful conditions. It is hard to fully contribute to job for some who have babies since they believe in mother's instinct and believe that they can provide better care to their babies than father. For those who do not have children yet, it might be difficult to have baby since lack of time having sexual activities and stressful conditions created lower fertility rate.

Those stressful conditions not only affect women themselves but also their children because stress can influence babies' mood during pregnancy and even may seriously harm babies after delivering them. With stress conditions derived from work and less time spent with children, they cannot complete their mother's jobs such as home caring, cooking for children, raising their children, and nurturing their children. Without any substitutes complete these tasks, both children's physical and mental health will be directly affected. The apparent delay in the development of children can be noticed and may find different disorder conditions. There are advantages of Thai culture of living in extended family and relatives are dependent. As a result, their grandparents and relatives will look after children while their parents go for work. Parents have more confidence and better pleased to leave their children with their relatives more than Day Care or nurseries as well as saving cost. Children in teenager period and building up their identity, who their parents have no time for their children, may become a problem child. They may mimic bad behaviors from others. From those mentioned above, working women clearly have direct impact on their children. Or that in some countries like Japan, this condition is called "Bad Mother".

The most interesting point is an impact on their husband or partner. Without proper communication or good management, less time and stress conditions of working women can cause conflict in the family and may lead to the divorce. Because most men still expect women who can either working for money and doing housework including serving her husband. If women are too tired from working and cannot do as men expected perfectly, it can cause an argument. Moreover, most men cannot accept if the women become leadership of family or equivalent to men. This is because the social value of Thailand regarding men's leadership. We are all familiar with some bad insults like follower, henpecked husband, pimp, fancy man, and etc. Women are more confident because of be able to earn more income or to have higher positions than men. If women cannot make her husband feel that he is superior or the leader of the house, the divorce may be an end since most men strongly believe in their dignity. Another case that happens a lot in Thai's society and turning to be social problems nowadays is to be unfaithful by having minor wife so they can play a leadership role in that small home. This causes countless problems in modern society.

The last point but very important is the question raised after women going for work and do not have time to do housework, who will be taking care of children in case that they do not have any supports from relatives. They normally have an agreement between each other whether whom will take home care and who will go for work. They usually consider based on appropriateness of the company's security, responsibilities, and the balance of time schedule. The one who earns less income or earns equal income but less in company's security including having more available time should nurture their children and home. There are many couples in present that woman earn more income and have more stability in working, she then becomes Breadwinner of the family while man becomes Care Taker of home. This role switching has been increasingly recognized in Thai's society and this phenomenon also called Gender Shift.

Welfare

Graduates or employees consider not only salary but also welfare provided by company when they select their jobs. Some companies provide high salary but give little benefits. Many people often choose certain level of salary but there are plenty of

benefits. Except the very rare case that provides very high salary, so the welfares are overlooked. To have more or less in amount of those benefits depends on the forms of organization, the sizes of organization, and policies of executives.

Types of organizations can be categorized into government service, state enterprise, and private sector. Government service supplies more benefits especially medical treatment fee for employees themselves along with their parents, spouse and children. Most state enterprises support only employees' spouse and children and do not cover medical treatment fee of their parents. For private companies give benefits to only their employees which are considered very low in benefits compared with government service and state enterprise organization. Even though the salary is lower, many view those welfares as stability in life.

Another point that causes different amount of benefits is the size of organization. In large organization or in a big branch with a number of employees, more services are available for their employees than small and medium-sized enterprises. For example, in some large companies, nursery, fitness room, laundry, etc. are accommodated for staffs. These services are available in large companies since they earn enough profits until it is a worthwhile investment compared to the number of employees who use these services.

The last element that will make a difference in welfares is executives' policies whether they are Thais or foreigners. In most cases, a foreign company normally views their staffs as a kind of company's resources and human resource is an extremely valuable resource especially in service areas. Thus, various types of benefits will be well prepared in order to support staffs' working conditions to the best. Their employees can wholly focus on their tasks. Large international organizations have greater potential in servicing benefits such as relaxing zone, coffee corner, sport center, game center, laundry service, bathroom (in case that their employees have to work round the clock), fitness room, religious facilities, etc. Moreover, as the greater trend of more women employees, there are some services supporting women working environments like nursery, breastfeeding room, laundry, etc. so woman now can fully concentrate on the jobs.

Despite of having more or less welfares, informants from both employer and employee of various organizations agreed that their **provided welfares are**

sufficient. Most people believe that the claim for more benefits especially on women’s welfares in male-dominated lines will reduce women’s recruiting opportunities. An overall cost is lower when hiring men employees when additional women’s welfares do not need to be provided.

Policy

Table 4.19 *Policy supporting of gender shift situation in labor market*

Questions	Scale		
	Difference	Same	Not Sure
7. Did male and female worker are difference in working? How?	17/20	3/20	0/20
	A lot	Some	None
8. Are there influences of the policy for female’s working increasing? Why? How?	0/20	0/20	20/20
	Yes	No	Not sure
9. Are your policies adjusted for responding changing number of female in male-dominated field? How?	0/20	19/20	1/20

Anyone who needs graduates acknowledges an increase of women workers in labor market. The number of women employees in their organization also

dramatically expands. Some companies have more women employees than men and most of employees in some companies are women. However, information acquired from an interview reveals that majority enterprises do not have supporting policies on this gender shift issue, as they did not see any significant importance of this issue.

An entering to labor market of many women indicates a social change. Women's 24 hours in taking care of home and family in the past will be allocated at least 8 hours per day for work then they have less time in taking care of home while the amount of housework do not decrease at all (in case that men did not help lighten the load). Women likely work two shifts. If they cannot have a proper work-life balance, it may lead to many consequences both for women themselves and their families. Equally concerns not only go to women with families and children but also unmarried women. An entering to labor market of women causes more delay in their marriage life or higher number of childless couples called lower Birth Rate. The lower birth rate will hugely impact the nation due to the lack of qualified citizens. Moreover, those low quality childbirths from an uneducated or unemployment group of people turn out to be a great burden to society.

To have policies supporting women's works therefore is necessary and urgent because their impacts are at national level both present and future as it makes good outcome in women's work-life balance and future children with quality. Yet most organizations did not have any supporting policies or expect to have this kind of policies to help or support their women employees. Even though there are not any written policies, does not mean that there are not any help or flexibility for women employees to easily play mother role and employee effectively. In many organizations depended on corporate size and culture, the supports are quietly provided to this group of women employees, for example, coming late for work or leaving early is not being counted as absent. Or, to work late and to work on weekends is not being assigned to married women so they can spend their time with families. Particularly small organizations which people normally work together like siblings, they can negotiate for their desired work schedule or even sometimes they can Work at Home. This kind of supports is hospitality and kindness of bosses, executives, or owners also known as the culture of the organization itself.

There are obvious differences of having working flexibility within small organizations or in government sectors to have more flexibility working environment compared with large organizations or private sectors due to an unequal of expected working efficiency and effectiveness. The working system in large organization especially private companies is very systematic. With higher paid salary, companies expect their employees to achieve very high performance. Differ from small enterprises especially working with government sectors where the salary is quite low. The layoff is impossible or is very exceptional case then women who work in government sectors can balance their work and their life very well. They have less stress than women working in private organizations.

Organization, owner, and female employees themselves are all think that female workers have to manage the proper allocation themselves and aiding policies are not required. Because the policies that women can perform less work or have the right to design their own working time more than men may make the companies loss then companies try to recruit more men. Unless the government will launch any policies to assist the company with greater number of female workers to compensate company suffers in forms of grants, or any privileges on taxes in hiring pregnant women or women with children.

In summary, most organizations do not currently have assisting policies on this gender shift issue and tend to not have them and believe that it is not necessary. Time management because of the differences between men and women is an issue to be resolved by the female workers themselves. Meanwhile, many organizations help filling up those gaps that arises by nature.

Table 4.20 Summary of the qualitative interviews

	Education	Labor
Situation	The number of female students are dramatically increased in educational system	<ol style="list-style-type: none"> 1. A significant greater amount of female in the labor market 2. More female candidates than male 3. Recruiting and promoting procedures devote to employee with outstanding performance and high work contribution that is firstly a man. The next is a single woman and lastly a married woman with children. However, it depends on individual organization. 4. There are good examples of workingwoman in the Gender Shift family, who can highly contribute to job, create remarkable achievements and make career advancement.
Factor	<ol style="list-style-type: none"> 1. Some men meet a fatal accident 2. Some men select a vocational education 3. Women have more willingness to learn and more diligent than men 4. A shift to more service jobs 5. An acceptance of women abilities is greater 	<ol style="list-style-type: none"> 1. The higher proportion of female students educational institutions 2. Double-income family economic system 3. A more society openness and gender equality

Table 4.20 Summary of the qualitative interviews (cont.)

	Education	Labor
Effect	<ol style="list-style-type: none"> 1. Increase of women in labor market 2. A need to pursue higher education of women 3. More strict in maid selection, remain single longer, delay marriage and having a baby 4. Educational institutions with selective admission process are taking men before women in male-dominated faculties because of the lower number of male students such as Engineering 	<ol style="list-style-type: none"> 1. Women have greater purchasing power and decision making power, be able to take care themselves and increasing in self-esteem 2. More entrepreneurs willing to hire more women workers and it began to be difficult for men to look for a job. Due to an increase of female employees, the unemployed males are marked up caused role switching phenomenon in family. 3. Single women delay their marriage or most of them remain single. However, life's security might be a motive in fostering marriage of some women especially women who move to work in upcountry. 4. Married women defer to have a baby. They also spend less time with spouse on sexual activities due to the tiredness and the stress from work which will be more or less based on organizations' norm. The delaying pregnancy also hinders those quality citizens of the nation. 5. The expecting ladies may easily miscarry baby because of tension 6. During pregnancy, the stress from mother can affect the baby

Table 4.20 Summary of the qualitative interviews (cont.)

Education	Labor
	<p>7. After delivering a baby, time pressure and tension from work have directly impacts to both physical and mental health of baby. Without a support from relatives in family to take care the children with love, some may become a wreck in the future.</p> <p>8. Without understanding and communication, potential conflicts or even divorce may be able to ruin a marriage life as man expectations in woman to perform her duty thoroughly.</p> <p>9. Many women have better career advancement, earn greater income and have more stable job than men, then those available men can perform the Care Taker job for family instead of women who perform as the Bread Winner. So now, they are switching in roles.</p> <p>10. Inferiority in position of men, lacking of good communications and paying admiration between spouses, may produce suppression in men. They then shall or shall not have a minor wife in order to make a little pride in themselves. This issue is also a social problem.</p>

Table 4.20 Summary of the qualitative interviews (cont.)

	Education	Labor
Policy	Obvious assisting policies are not provided yet since this is not an issue	<ol style="list-style-type: none"> 1. Both women and employers agreed upon a sufficient of existing welfares and by claiming more benefits of women may reduce competitive opportunity in labor market 2. Most organizations nowadays do not have assisting policies supporting this change and tend to not be provided in future. Since it is considered as an important issue. It is women workers responsible to proper allocate and manage their lives whereas many organizations help to fill the gap arises quietly.

Case study on the role division from the working mom interview

According to the studies 8 of 10 female workers who work in male-dominated field and be the main income of their family, the researcher found the common point of Gender Shift formation which is divided into the form before having gender shift, the formation and transition, time duration, current situations, various roles, future trend, and issues found in role swapping.

Table 4.21 The pattern prior having gender shift

Question	Father works in public sectors while mother woman works for private company.	Both father and mother work for private or public enterprise but mother has higher working position or work for more stable company.	Father is unemployed or suddenly gets ill while mother is still working
1. What is the reason to having gender shift in your family? (if any)	3/8	4/8	1/8

The Gender Shift situation in any couples has a common point as both of them are working before getting married and most of couples share the same or close workplace. Thus, they found each other, get close to each other, and agreed to get married. After married, they continue working as usual with minor changes in their living pattern during marriage. The clear alteration will be seen when they have a baby.

The formation of those living changes starts from having baby. Many families live together as extended family and have reliable relatives in the proximity so they can help taking care of the young. Even though they have senior relatives taking care of their children, parents are required to spend their time for their children together. The amount of time spending on their children depends on their profession and type of organizations, for instance, if father works for government sector while mother works for private sector, father can spend more time taking care of their children. There are three forms of transitions;

- 1) Father works in public sectors while mother woman works for private company.
- 2) Both father and mother work for private or public enterprise but mother has higher working position or work for more stable company.
- 3) Father is unemployed or suddenly gets ill while mother is still working

According to the above forms, it is male’s responsibilities in performing a child care and doing housework in some of the time (Part-Time) or even Full-Time. So female continues working and earning for family’s living.

Table 4.22 Period of time to switching role

Question	A couple day or a few month	More than 6 months	More than a year
2. How long to switching role?	2/8	3/8	3/8

The time duration in role switching transition as Gender Shift is vary depending on factors of changes. If those are uncontrollable factors such as unemployment or a sudden sickness of a man or any unpredictable circumstances, the time duration of this transition will be only days or a few months. On the other hand, if those are controllable factors or a plan such as a man’s resigning or both working and taking care of family by a man, the time duration for transition will be more than six months or years.

Table 4.23 Current situations after role switching

3. How is everything after role switching?
Most decisions will be made by women instead of men 7/8
Women can now fully performed and make good achievements quickly in their careers. 4/8

As events mentioned above occur, roles in family are changed or switched. Women’s role is Breadwinner to go out for work and earn majority income for family whereas men can neither work or not. So, men have to admit a caregiver role in taking care of family, doing housework, and raising their children instead of women.

Hence, the role in an economic aspect is mainly women as a major source of income for the family. It’s then normal that most decisions will be made by women

instead of men except in any trivial decisions like buying personal effects, those decisions turn to belong to men.

After the role altering circumstance occurred, women have more time contributing to their jobs accompanying with women's high capabilities, women can now fully performed and make good achievements quickly in their careers. Unlike those who have to work along with taking care family that cannot dedicate to the tasks thoroughly.

Table 4.24 Future trend

4. In your opinion, what is the next trend in labor market?

This will cause a cycle driving female to 6/8
become a core of the family

This higher demand of female workers 7/8
and the lower demand of hiring male
workers

Women can completely contribute to work after role switching and achieve advancement in their working very well. This will cause a cycle driving female to become a core of the family. The man can fully return contributing to their jobs once their children grown up but with lower salary than women anyway. Some men are happy enough to stay at home, being not to work, or being freelance then women are still the core of family's income.

Since women's employer discovered working abilities of women that they can make remarkable achievements including having good communication skills, having high responsibilities, and being delicates, there is more need in recruiting female workers. This higher demand of female workers and the lower demand of hiring male workers results in an enforcement in many families to have this kind of role altering between male and female. Then, women become more breadwinner and men become more and more caretaker.

Table 4.25 Impacts of role shifting

5. What is the impact of role shifting in your family?	
Child's health depend on dad's caring	4/8
Man have depression	6/8

In accordance with role switching in family, the problems found when women are going out for earning family's living while men are in charge of all housework can be separated into two parts; the children and the men.

A present of today's technology helps working mom storing milk for the later use by father to feed their baby. Mom herself still believes in her mother instinct that can respond to the baby faster and has greater delicacies in baby care. Especially for a daughter, raised by father causes male's characteristics to her and she may be accustomed with being touched by a man. Once she grows up as a teenager, she might not preserve oneself much. Hence in many families, mom will try her best in providing knowledge about female health care or instruct about girl's stuffs instead of dad.

For the man or husband part, we usually find problems with the lack of pride in him as he is attached with old society values that the man should be family's leader. Particularly woman pays disrespectful to her husband, the man feels more impairment leading to be depression, be introvert, or finally have minor wife. This problem can be alleviated if the society admits more in role altering. Presently, most women need to adjust and adapt how they speak and act upon men both inside and outside home. To honor the men, praise them, and admire their actions may be the easiest solutions to this problem.

CHAPTER V

DISCUSSION

Findings from this research are discussed and grouped into four parts according to these of the qualitative resulted as 1) Situation in education and labor market 2) Factor of gender shift 3) Effect of gender shift and 4) Plan for gender shift

5.1 Situation in education and labor market

From studying the proportion of male and female students in top 3 male-dominated fields of education (Computing, Engineering, Architecture) between the academic years 2001-2011, found proportion of female student in those top 3 male-dominated field of education is increasing in ten years especially in public and autonomous university. Computing has proportion of female student increasing more than 40%-60% and increased every year. Engineering has proportion of female student lower than 20% .Yet, the rate has increased every year. Architecture has rapidly increased from 32% to 57% in the past 10 years.

Not only the result from quantitative study but also the qualitative data from interview shows continually increasing number of female in every organization. It has a chance to promote and get higher income than male in the same field.

The result is accordance to the hypothesis, the proportion of male and female students that entered to undergraduate level in top 3 male-dominated fields of education (Computing, Engineering, Architecture) in Thailand between the academic year 2001-2011 of universities in Bangkok and periphery has increased.

5.2 Factor of gender shift

Interview data shows people’s opinion that female has higher birth rate but in fact female actually has lower birth rate. In 2011, number of male live birth was 409,699 persons, while number of female live birth was 385,332 persons (Office of Permanent Secretary, 2011b) but when they grow up to be teenager, men are more rashness and more risky to die because of accident. From statistics 2011 of Office of Permanent Secretary, at the age of 15-29, the number of male died from accident was more than female about 8 to 2 (male 13,810 persons, female 4,296 persons) so, in education the number of female student is higher (Office of Permanent Secretary, 2011a). Moreover, when they pursue their studies, some of them choose a professional school or a vocational education. That leads to the number of female students is higher than male students in university entrance exam. Statistics from Ministry of Education shows in 2011 that the number of male in preschool and primary school is higher than female student. But in secondary school female student is higher than male student. Number of male student is higher in vocational and high vocational certificate (Office of Vocational Education Commission, 2011). Below table shows male decision of study in vocational instead of secondary school and number of female is higher from bachelor to master degree.

Table 5.1 Number of thailand student classified by level and sex 2011

Level	Male	Female	Total	Level	Male	Female	Total
Preschool	814,447	764,778	1,579,225				
Primary school	2,265,502	2,124,637	4,390,139				
Lower secondary school	1,120,745	1,130,175	2,250,920				
Upper secondary school	520,330	791,651	1,311,981	Vocational certificate	418,837	296,064	714,901
Bachelor Degree	634,918	979,713	1,614,631	High vocational Certificate	172,422	133,204	305,626
Diploma	5,291	9,930	15,221				
Master Degree	67,576	105,259	172,835				
Doctoral Degree	9,832	10,528	20,360				

Source: Office of Vocational Education Commission

Not only the number of female is higher in exam but also the high responsibility of female that tends to be more in class and in workplace (Treiman & Terrell, 1975). This facts speed up the number of female in university and number of graduated female student to the labor market.

Otherwise, transforming to service sector is decreasing the gap between male and female in power of muscle to use other skill like communication ,and looking which female is more suitable to work in service sector. (Brun et al., 2009; M. Frederikse et al., 2000; Harasty et al., 1997; Office of the National Economic and Social Development Board, 2012). Also,more gender equality in education makes number of female increase in education. The more number of female students causes the more number of female labors.

Not only increasing number of female in education, but also economics issues that change model to double-income family. This findings accordance to study of Takeda which shows Japan's government launch "Double income family" policy for economics issue and make wife going out to work helping their husband finding income (Takeda Hiroko, 2011). In Thailand, it is not the government policy but current economics issue make wife going to work and be another income for family. And gender equality also make number of female labors increase in labor market (Reskin, Hartmann, Issues, & Council, 1986).

5.3 Effect of gender shift

Effects of this phenomenon are divided into three sides: female's self, family, and nation.

For female's herself, they decide to get higher education also in Thailand, which means the number of female in higher education is higher than male. From statistics of Office of Vocational Education Commission shows the number of female in master degree is 105,259 persons while number of male in master degree has only 67,576 persons. In doctoral degree, there is 10,528 female doctors while there is 9,832 male doctors (National Center for Education Statistics, 2009; Office of Vocational Education Commission, 2011).

Not only the higher degree of female, but most of them have a chance to go to work after graduated to use the knowledge they have learned and get very well-paid. The power of buying and decision is also higher in female. This finding is accordance to both paper from the United Nations Entity for Gender Equality and the Empowerment of Women and TIMES magazine which said that power of female is higher both decision and buying (the United Nations Entity for Gender Equality and the Empowerment of Women, 1995; TIME, 2012).

The power of buying and decision bring the self-esteem together (Habeck et al., 2010). Women feel their value and can take care of themselves. So, many of female are delayed marriage because they did not have to hurry to find someone to take care of her family. They can wait for someone they love or suitable enough. Thailand statistics from Department of Provincial Administration shows number of marriage license from 484,569 couples in 1993 decreased to 285,944 in 2010 as shows in figure below (Department of Provincial Administration, 2011). Also “Thai Health 2012” publication of Institute for Population and Social Research, Mahidol University shows proportion of unmarried of male and female is increasing every year (Pramote Prasartkul & Patama Vapattanawong, 2012). But there are some female who has to marry faster than they plan because of working in dangerous place such as provincial. They need someone who stronger than her to take care of.

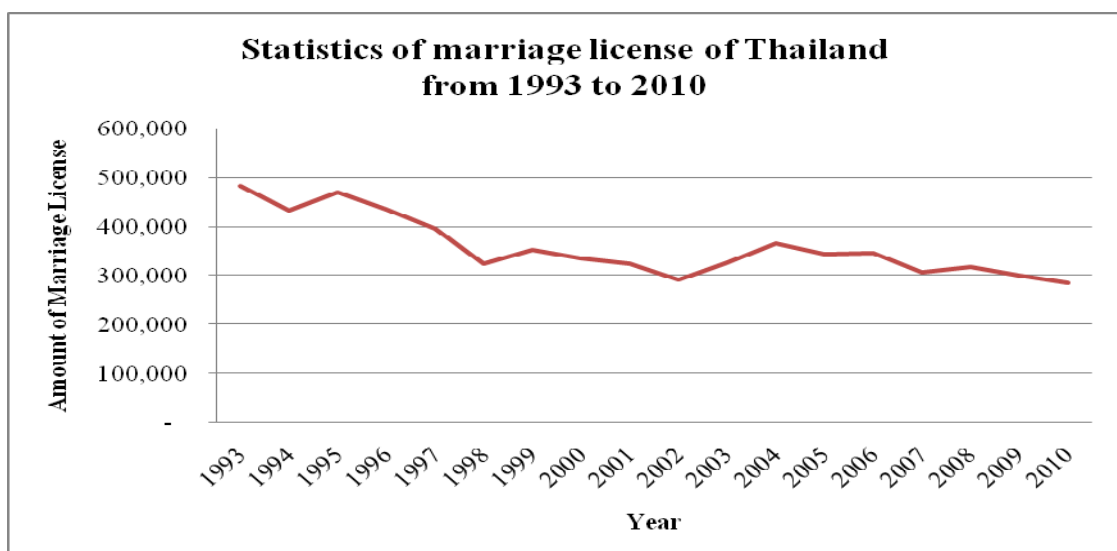


Figure 5.1 Statistics of marriage license of Thailand from 1993 to 2010

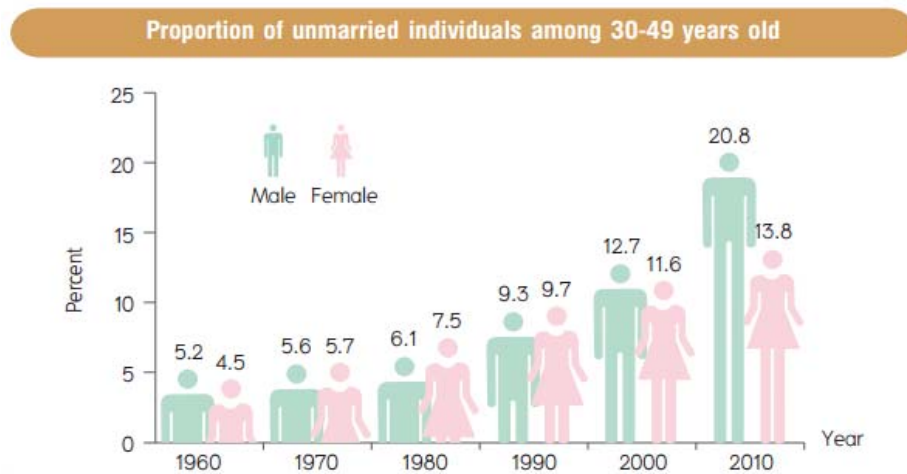


Figure 5.2 Proportion of unmarried individuals among 30-49 years old

Source: Population and Housing Census 1960, 1970, 1980, 1990, 2000, and 2010 (advance report)

And the last big effect is miscarrying from work pressure of women who work in private company in sale position or other position which expected high performance. This finding is accordance to study of Alder and team. The documentary study shows the relation between pressure and miscarriage. (Alder, Fink, Bitzer, Hosli, & Holzgreve, 2007)

For family or child and husband, previously, female is a care taker who taking care of family. When they go to work and have to leave child to his/her father, nanny or grandparents. In case of gender shift or gender role shift, father is the main care taker who taking care of child. So, child's health depends on his/her father (Lamb, 2010). And when male has to be care taker which social value is less than breadwinner. So, male's self-esteem is decrease. Not only the social value of care taker but also the female's deportment that may be make male feel bad because social norm male should be leader of family (Habeck et al., 2010). This feeling can lead to divorce or have concubine. This findings is the same as study of Kitson showing that one of the reason of divorce is gender role conflict (Kitson, 1992). But gender role is change as time, society, economic, and culture. And now gender role is slowly changing as time in Thailand, but care taker still less social value than bread winner. And culture still expect male to be leader of family and female for family care taker.

For nation, the increasing of female labor and business owner is showed the effect in lower birth rate. “Thai Health 2012” publication of Institute for Population and Social Research, Mahidol University said “Thailand’s birth rate dropped to 760,000 births per year from more than a million births thirty years ago. Meanwhile the mortality rate is now at 400,000 per year. The gap between birth rates and death rates has shrunk very quickly.” (Pramote Prasartkul & Patama Vapattanawong, 2012). When mother goes out to work and not trust the standard of nursery, so child’s development is now based on grandparent or nanny’s hand who may or may not have experience of child care but surely have no child development knowledge. Human resource of Thailand in the future is not quality as it should be. The report of UNESCO Bangkok also said “An assessment of the quality of pre-school education indicated that only 40 % of 3 to 5 year old children received adequate preparation for readiness in learning before attending primary school. Although Thailand has a very high percentage of young children attending child development centers, the massive transfer of child development centers under the authority of LAOs could impose potential issues. If such centers are not supported properly through strengthening capacity and management, the quality of early childhood development and young children’s preparation for primary schooling can be seriously affected” (UNESCO Bangkok, 2011). For top 3 male-dominated fields are the drive of innovation of nation but gender gap makes it decreasing. This finding accordance to the study in United State that women in Science, Technology, Engineering, and Math is increasing but under represent and those career is drive nation innovation and gender gap is the big obstacle of nation innovation (Beede et al., 2011).

5.4 Plan for gender shift

The record also found that all organization in Thailand have no plan for gender shift although all of them know number of female is increasing in top 3 male-dominated fields. In key information’s opinions, they think this is a responsibility of female labors to manage their time, schedule, and life. Some of business owner has

changed some working pattern for working mom by considering case by case and not only writing but acting. Demanding special treat will decrease female competition. This finding is not such surprising because to prepare special treat , some money must be paid. So, company will do only the nation policy. It means the policy makers should order something that helps our nation. This finding also shows the happy of owner with female workers and higher demand of female workers. So, this demand will increase of female labor in labor market and man who is in trouble on finding job. This trend accordance to the study of Habeck in Russia (Habeck et al., 2010).

CHAPTER VI

CONCLUSION AND SUGGESTION

6.1 Conclusion of the study

This research aims to find empirical evidences of gender shift in Thailand through two research questions which are 1.) Has the proportion of male and female students that enter to undergraduate level in top 3 male-dominated fields of education in Thailand between the academic year 2001-2011 of universities in Bangkok and periphery changed? (If any) how does it change? And 2.) What people, who labor producers, labor users, and female workers in top 3 male-dominated fields of education, thought about the change, the cause of this phenomenon and the effect also the plan to deal with the change?

First is quantitative study which studies the proportion of male and female students entering to undergraduate level in top 3 male-dominated fields of education (Computing, Engineering, Architecture) between the academic year 2001-2011 among universities in Bangkok and periphery. This quantitative study uses the data from two data sets; data set I from Ministry of University Affairs and data set II from each university. Descriptive analysis was proceeded, and the results were illustrated through charts and graphs.

Second is qualitative study which researcher had an in-depth interview to labor producers, labor users, and female workers in top 3 male-dominated fields of education for 30 persons about current situation in their organization, and how their organization meets this phenomenon. What the factor and effect both to organization, to female workers, and to her family from their opinion is. What is their organization's plan to handle this phenomenon? Content analysis was proceeded.

The results are as below:

Situations

From studying the proportion of male and female students in top 3 male-dominated fields of education (Computing, Engineering, Architecture) between the academic years 2001-2011, found

- Proportion of female student approximately 80% of every **group of education** except engineering has female student averages 20% of all students.

- Proportion of female student in engineering group of education classified by the type of university. Proportion of female student about 30% to 50% in almost private and autonomous type of university except King Mongkut's University of Technology Thonburi and King Mongkut's University of Technology North Bangkok. While private Universities, Rajamangala, University of Technology, and open university have proportion of female less than 20% in average

- Any number of proportions, proportion of female student increases in almost university.

- In each male-dominated field of education in case study
 - Proportion of female student in **computing** is more than 40%-60% of students within 10 years ago. The number has increased every year especially in public and autonomous type of university.

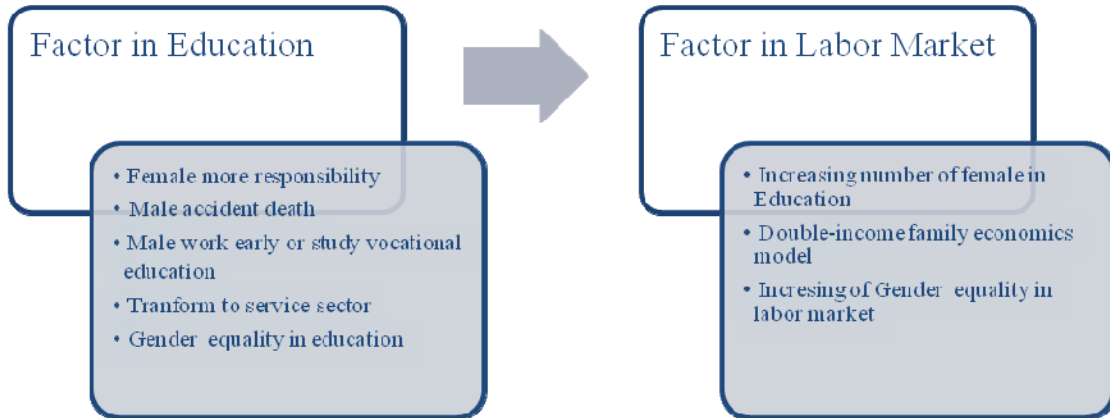
- Proportion of female student in **engineering** is less than 20% but the rate has increased every year especially in public and autonomous type of university.

- Proportion of female student in **architecture** has rapidly increased from 32% to 57% in the past 10 years. From the number that less than a half become higher than a half of all students.

From the interview, the data shows continually increasing number of female in every organization and have a chance to promote and get higher income than male in the same field.

Factors

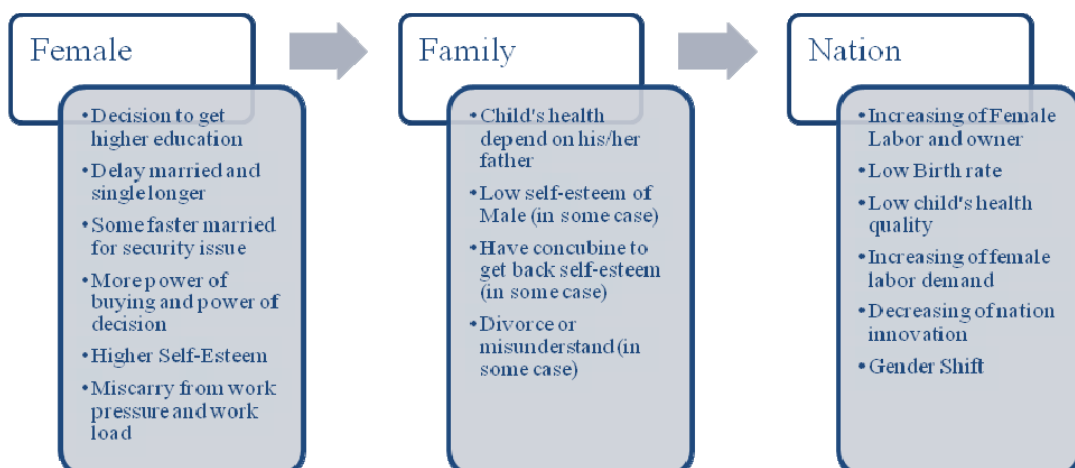
From in-depth interview researcher found this flow chart factors



Interview data shows the fact of people ‘s thought that female is higher birth rate. In fact female is always lower birth rate (Office of Permanent Secretary, 2011b) but male dies in accident and works early or study in vocational education. Transforming to service sector, and more gender equality in education make number of female increase in education. The more number of female students causes the more number of female labors. Not only increasing number of female in education, but also economics issues that change model to double-income family and gender equality that make number of female labors increase in labor market.

Effects

From in-depth interview, researcher found this flow chart effects



Effects of this phenomenon divided into three sides: female's self, family, and nation. Negative or positive effect depends on how both male and female accept and balance their life together and their social value.

Plans

Both labor producers and labor users haven't prepared to handle this change. In all key information's opinion, they think this is a responsibility of female labors to manage their time, schedule, and life. Demanding special treat will decrease female competition.

Trends

From the result of research study, increasing of female student will raise the number of female workers significantly in Thai labor market. Since women's employer discovered working abilities of women that they can make remarkable achievements including having good communication skills, having high responsibilities, and being delicates, there is more need in recruiting female workers. This higher demand of female workers and the lower demand of hiring male workers results in an enforcement in many families to have this kind of role altering between male and female. Then, women become more Bread Winner and men become more and more Care Taker. Earning and household head must suddenly change to be "in-hand" of female.

6.2 Suggestions of the study

From the result of the research shows empirical evidence of gender shift in Thailand by studying the proportion of male and female students that enter to undergraduate level in top 3 male-dominated fields of education between the academic year 2001-2011 of universities in Bangkok and periphery. The data shows that it is increasing every year especially in Public and Autonomous Universities.

6.2.1 Suggestions for policy formation

For government, although the finding shows women and all organizations would agree that existed welfare is enough, and women should be the only one who balances their own life and time. Because business owner don't want to waste their money and women need job. Government is the one who can help those female workers on working and child caring for the profit of nation and every level. Researcher has proposed that the policy maker in every level has to prepare the plan to help all those female labors. Government must have enough standard nursery care for her children like in Japan and Singapore. This will help female work without worrying about their children and create high quality human resource for the nation's competition.

Moreover, government should set up an organization to be responsible for this gender issues to show how much they should concern for this problem. This organization should promote the social value of care taker which will be good for male and female who take this role will not low-self esteem anymore. From this finding that higher demand of female workers and social is face to the shift with the gender role. This organization will be part of changing social value and highlight work-life balance that will effect to birth rate for the nation and family's health.

6.2.2 Suggestions for research

First, there must be more research about gender shift, for examples, how bad mothers affect to a child? Or did really good father can replace working mom? The nation need more intensive study to find further effects of "Gender Shift" phenomenon in both negative and positive side to female and family well-being in longitudinal study.

Second, there should be scenario building research to forecast what will happen if percentage of female students and female workers still keep increasing every year. What will happen to birth rate, divorce rate, and etc?

6.3 Research limitation

These are limitations of research strategy which have to use the historical data, but this historical data does not collect by Ministry of University Affair or University themselves. Ministry of University Affair does not collect data before 2006 and collect the data from 2006 in group of education not field of education which better delicate to see this change. Some universities have no historical data or not fully or not classified by sex and field of education.

The historical data is important for finding pattern and forecasting for the future of everything. Thailand still have problem in data management to get profit from historical data. This will be a suggestion for every organization to design and provide tool for their data and information management to get profit from their experiences.

REFERENCES

- Ackerman, P. L. (2006). Cognitive sex differences and mathematics and science achievement. [Comment]. *Am Psychol*, *61*(7), 722-723; discussion 725-726. doi: 10.1037/0003-066X.61.7.722
- Alder, J., Fink, N., Bitzer, J., Hosli, I., & Holzgreve, W. (2007). Depression and anxiety during pregnancy: a risk factor for obstetric, fetal and neonatal outcome? A critical review of the literature. *J Matern Fetal Neonatal Med*, *20*(3), 189-209. doi: 10.1080/14767050701209560
- Amato, P. R., & Previti, D. (2003). People's Reasons for Divorcing. *Journal of Family Issues*, *24*(5), 602-626. doi: 10.1177/0192513x03254507
- Ankney, C. D. (1992). Sex differences in relative brain size: The mismeasure of woman, too? *Intelligence*, *16*(3-4), 329-336. doi: 10.1016/0160-2896(92)90013-h
- Armour, S. (2005, 2/17/2005). Pregnant workers report growing discrimination Retrieved 23 August, 2012, from http://www.usatoday.com/money/workplace/2005-02-16-pregnancy-bias-usat_x.htm
- Baron-Cohen, S., Knickmeyer, R. C., & Belmonte, M. K. (2005). Sex differences in the brain: implications for explaining autism. *Science*, *310*(5749), 819-823. doi: 10.1126/science.1115455
- Beede, D., Julian, T., Langdon, D., George, McKittrick, Khan, B., & Doms, M. (2011). Women in STEM: A Gender Gap to Innovation. *Report of U.S. Department of Commerce, Economics and Statistics Administration*(04-11).
- Benbow, C. P., Lubinski, D., Shea, D. L., & Eftekhari-Sanjani, H. (2000). Sex differences in mathematical reasoning ability at age 13: their status 20 years later. *Psychol Sci*, *11*(6), 474-480.
- Benbow, C. P., & Stanley, J. C. (1983). Sex differences in mathematical reasoning ability: more facts. *Science*, *222*(4627), 1029-1031.

- Billington, J., Baron-Cohen, S., & Wheelwright, S. (2007). Cognitive style predicts entry into physical sciences and humanities: Questionnaire and performance tests of empathy and systemizing. *Learning and Individual Differences, 17*(3), 260-268. doi: 10.1016/j.lindif.2007.02.004
- Brabeck, M., & Brown, L. (1997). Feminist theory and psychological practice. In J. W. N. G. Johnson (Ed.), *Shaping the future of feminist psychology: Education, research, and practice* (pp. 15-35). Washington, DC, US: American Psychological Association.
- Bren, L. (2005). Does Sex Make a Difference? *FDA Consumer Magazine*(July-August 2005).
- Brun, C. C., Lepore, N., Luders, E., Chou, Y. Y., Madsen, S. K., Toga, A. W., & Thompson, P. M. (2009). Sex differences in brain structure in auditory and cingulate regions. [Research Support, N.I.H., Extramural]. *Neuroreport, 20*(10), 930-935.
- Burt, C. L., & Moore, R. C. (1912). The mental differences between the sexes. *Journal of Experimental Pedagogy, 1*(273-284), 355-288.
- Cahill, L. (2005). His Brain, Her Brain. *Scientific American Magazine*(April 25, 2005), 40-47.
- Carcio, H. N. (1998). *Management of the infertile woman*. Philadelphia: Lippincott.
- Cattan, P. (1991). Child-Care Problems: An Obstacle to Work. *Monthly Labor Review, 114*(10), 3-9.
- Chalidaporn Songsampam. (2008). Gender Way : Definition and Framework Concept Retrieved 13 August, 2012, from <http://www.teenpath.net/data/event/40003/Teen01/content-001.html>
- Chapman, J. W. (1988). Cognitive-motivational characteristics and academic achievement of learning disabled children: A longitudinal study. *J Educ Psychol, 80*(3), 357-365. doi: 10.1037/0022-0663.80.3.357
- Colom, R., Garcia, L. F., Juan-Espinosa, M., & Abad, F. J. (2002). Null sex differences in general intelligence: evidence from the WAIS-III. [Comparative Study Research Support, Non-U.S. Gov't]. *Span J Psychol, 5*(1), 29-35.

- Cookson, J. (2010). How Female Economic Power Improves Society Retrieved 20 August, 2012, from <http://bigthink.com/women-and-power/how-female-economic-power-improves-society>
- Costa, P. T., & McCrea, R. R. (1992). *Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI)*: Psychological Assessment Resources.
- Cotter, D. A., Hermsen, J. M., & England, P. (2008). Moms and jobs: Trends in mothers' employment and which mothers stay home. *In American families: A multicultural reader, 2nd.*
- Cotter, D. A., Hermsen, J. M., & Vanneman, R. (2009). End of the gender revolution website Retrieved 13 August, 2012, from <http://www.bsos.umd.edu/socy/vanneman/endofgr/cpsempsex.html>
- Cotter, D. A., Hermsen, J. M., & Vanneman, R. (2011). The end of the gender revolution? Gender role attitudes from 1977 to 2008. *AJS, 117*(1), 259-289.
- Coy, P. (2012). Men Are Becoming the Undereducated Gender Retrieved 13 August, 2012, from <http://www.businessweek.com/articles/2012-04-11/men-are-becoming-the-undereducated-gender>
- Department for Professional Employees. (2010). Library Workers: Facts & Figures. *Fact Sheet 2010*
- Department of Provincial Administration. (2011). Statistics of marriage license of Thailand from 1993 to 2010 Retrieved 16 April, 2013, from http://www.cps.chula.ac.th/pop_info_2551/Image+Data/Pic/Data/marriage.pdf
- Diekman, A. B., & Goodfriend, W. (2006). Rolling with the Changes: A Role Congruity Perspective on Gender Norms. *Psychol Women Q, 30*(4), 369-383. doi: 10.1111/j.1471-6402.2006.00312.x
- EEOC. (2012). Pregnancy Discrimination Charges EEOC & FEPAs Combined: FY 1997 - FY 2011 Retrieved 25 August, 2012, from <http://www.eeoc.gov/eeoc/statistics/enforcement/pregnancy.cfm>
- England, P. (2010). The Gender Revolution: Uneven and Stalled. *Gender & Society, 24*(2), 149-166. doi: 10.1177/0891243210361475

- Fenstermaker, S., & West, C. (2002). *Doing Gender, Doing Difference: Inequality, Power, and Institutional Change*: Taylor & Francis.
- Fine, C. (2011). *Delusions of Gender: How Our Minds, Society, and Neurosexism Create Difference*: W. W. Norton.
- Floro, M. S., & Meurs, M. (2009). Global Trends in Women's Access to "Decent Work". *Dialogue on Globalization*, N 43(May 2009).
- Forbes. (2006-2009, 2011). World's Most Powerful Women Retrieved 13 August, 2012, from <http://www.forbes.com/profile/angela-merkel/>
- Frech, A., & Damaske, S. (2012). The Relationships between Mothers' Work Pathways and Physical and Mental Health. *Journal of Health and Social Behavior*.
- Frederikse, M., Lu, A., Aylward, E., Barta, P., Sharma, T., & Pearlson, G. (2000). Sex differences in inferior parietal lobule volume in schizophrenia. *Am J Psychiatry*, 157(3), 422-427.
- Frederikse, M. E., Lu, A., Aylward, E., Barta, P., & Pearlson, G. (1999). Sex differences in the inferior parietal lobule. *Cereb Cortex*, 9(8), 896-901.
- Frontera, W. R., Hughes, V. A., Lutz, K. J., & Evans, W. J. (1991). A cross-sectional study of muscle strength and mass in 45- to 78-yr-old men and women. [Research Support, U.S. Gov't, Non-P.H.S.]. *J Appl Physiol*, 71(2), 644-650.
- Galea, L. A. M., & Kimura, D. (1993). Sex differences in route-learning. *Personality and Individual Differences*, 14(1), 53-65. doi: 10.1016/0191-8869(93)90174-2
- Gardner, S. F., & Stowe, C. D. (2006). The Impact of a Gender Shift on a Profession: Women in Pharmacy.
- Gilbert, P. (1998). Gender and schooling in new times: The challenge of boys and literacy. *The Australian Educational Researcher*, 25(1), 15-36. doi: 10.1007/bf03219663
- Glezer, H., & Wolcott, I. (1998). Work and family life: Reciprocal effects. *Family Matters*.
- Glick, P., & Sahn, D. E. (1998). Maternal labour supply and child nutrition in West Africa. *Oxf Bull Econ Stat*, 60(3), 325-355.

- Glucksmann, A. (1981). *Sexual dimorphism in human and mammalian biology and pathology*. London ; New York: Academic Press.
- Goldin, C. D., & Research, N. B. o. E. (1989). *The role of World War II in the rise of women's work*: National Bureau of Economic Research.
- Goy, R. W., McEwen, B. S., & Neurosciences Research Program. (1980). *Sexual differentiation of the brain : based on a work session of the Neurosciences Research Program*. Cambridge, Mass.: MIT Press.
- Gustafsson, A., & Lindenfors, P. (2004). Human size evolution: no evolutionary allometric relationship between male and female stature. [Research Support, Non-U.S. Gov't]. *J Hum Evol*, 47(4), 253-266. doi: 10.1016/j.jhevol.2004.07.004
- Habeck, J., Povoroznyuk, O., & Vaté, V. (2010). *Gender Shift in the North of Russia*: Field and International Study Program, College of Human Ecology, Cornell University and Department of Sociology and Anthropology, Central Connecticut State University.
- Hacker, A. (2003). *Mismatch: The Growing Gulf Between Women and Men*: Simon & Schuster.
- Hall, J. A., & Kimura, D. (1995). Sexual orientation and performance on sexually dimorphic motor tasks. *Arch Sex Behav*, 24(4), 395-407.
- Halpern, D. F. (2011). *Sex Differences in Cognitive Abilities*: Psychology Press.
- Halpern, D. F., Benbow, C. P., Geary, D. C., Gur, R. C., Hyde, J. S., & Gernsbacher, M. A. (2007). The Science of Sex Differences in Science and Mathematics. *Psychological Science in the Public Interest*, 8(1), 1-51. doi: 10.1111/j.1529-1006.2007.00032.x
- Harasty, J., Double, K. L., Halliday, G. M., Kril, J. J., & McRitchie, D. A. (1997). Language-associated cortical regions are proportionally larger in the female brain. [Research Support, Non-U.S. Gov't]. *Arch Neurol*, 54(2), 171-176.
- HarperBusiness. (2009). *Women Want More: How to Capture Your Share of the World's Largest, Fastest-Growing Market*

- Harshman, R. A., Hampson, E., & Berenbaum, S. A. (1983). Individual differences in cognitive abilities and brain organization, Part I: Sex and handedness differences in ability. [Research Support, Non-U.S. Gov't]. *Can J Psychol*, 37(1), 144-192.
- Heaton, R. K., Ryan, L., Grant, I., & Matthews, C. G. (1996). Demographic influences on neuropsychological test performance. In I. G. K. M. Adams (Ed.), *Neuropsychological assessment of neuropsychiatric disorders (2nd ed.)* (pp. 141-163). New York, NY, US: Oxford University Press.
- Ho, K. C., Roessmann, U., Straumfjord, J. V., & Monroe, G. (1980). Analysis of brain weight. I. Adult brain weight in relation to sex, race, and age. [Comparative Study]. *Arch Pathol Lab Med*, 104(12), 635-639.
- Hutton, W. (2006). Thanks to Mao, Zhang Yin's a billionaire Retrieved 13 August, 2012, from <http://www.guardian.co.uk/commentisfree/2006/oct/15/comment.china>
- Hyde, J. S., & Mertz, J. E. (2009). Gender, culture, and mathematics performance. *Proceedings of the National Academy of Sciences*, 106(22), 8801-8807. doi: 10.1073/pnas.0901265106
- Iwamura Nobuko. (2010). *Kazoku no katte-desho!: Shashin 274-mai de miru shokutaku no kigeki*, Tokyo: Shinchōsha.
- Jintana Boonbongkarn. (2012). Women New Generation (สาวยุคใหม่). *Kwanruen*, 967, 150-151.
- Johnston, L. D. (2012). History lessons: Understanding the decline in manufacturing Retrieved 20 August, 2012, from <http://www.minnpost.com/macro-micro-minnesota/2012/02/history-lessons-understanding-decline-manufacturing>
- Kanchana Tangchonlatip. (2005). Gender Differentials In Migration To Bangkok.
- Kelsey, W. P., 3rd, Kimmes, N. S., Williams, D. E., Ogunleye, A. O., Ault, J. T., & Barkmeier, W. W. (2009). Gender-based differences in satisfaction with academic preparation and practice experiences. *J Dent Educ*, 73(4), 464-470.
- Kimura, D. (2000). *Sex and Cognition*: MIT Press.
- Kitson, G. C. (1992). *Portrait of divorce : adjustment to marital breakdown / Gay C. Kitson with William M. Holmes*. New York :: Guilford Press.

- Kotz, D. (2012). Infertility in Obese Women May be Due to Damaged Egg, Brigham Study Finds. (September 13 , 2012).
- Lamb, M. E. (2010). *The Role of the Father in Child Development*. Wiley.
- Lamontagne, J. F., Engle, P. L., & Zeitlin, M. F. (1998). Maternal employment, child care, and nutritional status of 12-18-month-old children in Managua, Nicaragua. [Research Support, Non-U.S. Gov't]. *Soc Sci Med*, 46(3), 403-414.
- Lash, S. (2010). Pregnancy discrimination claims on the rise in U.S. 03/14/2010. Retrieved 13 August, 2012, from <http://www.dolanmedia.com/view.cfm?recID=575592>
- Leslie, J. (1988). Women's work and child nutrition in the Third World. *World Development*, 16(11), 1341-1362. doi: 10.1016/0305-750x(88)90209-4
- Lewin, T. (2008, July 25, 2008). Math Scores Show No Gap for Girls, Study Finds Retrieved 13 August, 2012, from <http://www.nytimes.com/2008/07/25/education/25math.html>
- Liarskaya, E. (2010). Women and the Tundra: Is There a Gender Shift on Yamal? , 28(2 (2010)).
- Lindsey, L. L. (2010). *Gender Roles: A Sociological Perspective* (5th ed.): Prentice Hall.
- Lord, W. (2007). NEO-PI-R - A Guide to Interpretation and Feedback in a Work Context Retrieved 13 August, 2012, from <http://www.unifr.ch/ztd/HTS/infest/WEB-Informationssystem/en/4en001/d590668ef5a34f17908121d3edf2d1dc/hb.htm>
- Maccoby, E., & D'Andrade, G. (1966). *The Development of Sex Differences*: Stanford University Press.
- Maccoby, E., & Jacklin, C. (1974). *The Psychology of Sex Differences: -Vol. I: Text*: Stanford University Press.
- Majeres, R. L. (1983). Sex differences in symbol-digit substitution and speeded matching. *Intelligence*, 7(4), 313-327. doi: 10.1016/0160-2896(83)90007-7
- Maughan, R. J., Watson, J. S., & Weir, J. (1983). Strength and cross-sectional area of human skeletal muscle. [Research Support, Non-U.S. Gov't]. *J Physiol*, 338, 37-49.

- McBurney, D. H., Gaulin, S. J. C., Devineni, T., & Adams, C. (1997). Superior spatial memory of women: Stronger evidence for the gathering hypothesis. *Evolution and Human Behavior, 18*(3), 165-174. doi: 10.1016/s1090-5138(97)00001-9
- McCarthy, D. (1946). Language development in children *Manual of child psychology* (pp. 476-581). Hoboken, NJ, US: John Wiley & Sons Inc.
- McGuinness, D., Olson, A., & Chapman, J. (1990). Sex differences in incidental recall for words and pictures. *Learning and Individual Differences, 2*(3), 263-285. doi: 10.1016/1041-6080(90)90006-3
- Miller, A. E., MacDougall, J. D., Tarnopolsky, M. A., & Sale, D. G. (1993). Gender differences in strength and muscle fiber characteristics. *Eur J Appl Physiol Occup Physiol, 66*(3), 254-262.
- Ministry of University Affairs. (2002). Number of Freshman Student 2002. *Number of Student in 2002 categorize by field of education and sex* Retrieved 23 October, 2011, from <http://www.info.mua.go.th/>
- Ministry of University Affairs. (2012). Number of Freshman and Graduated Student from 2006 to 2010 Retrieved 23 October, 2011, from <http://www.info.mua.go.th/>
- National Center for Education Statistics. (2009). *Projections of Education Statistics to 2019*. National Center for education statistics.
- National Statistical Office. (1999). Table 47: Percentage distribution of employed persons by industry , August 1996-1998 Retrieved 13 August, 2012, from <http://web.nso.go.th/eng/en/stat/gender/table/etab47.htm>
- National Statistical Office. (2010). *Key Findings: The 2009 Reproductive Health Survey*. Thailand.
- National Statistical Office. (2012). *Key Statistics of Thailand 2012*. Thailand.
- NECTEC & NSTDA. (2009). Thailand's Size Survey Retrieved 13 August, 2012, from http://www.sizethailand.org/region_all.html
- Nicholson, K. G., & Kimura, D. (1996). Sex differences for speech and manual skill. *Percept Mot Skills, 82*(1), 3-13.
- Office of Permanent Secretary. (2011a). Public Health Statistics 2007-2011. *Number of Deaths Percentage and Age-sex Specific Death Rate per 1,000*

- Population by Sex, 2007 - 2011* Retrieved 7 April, 2013, from http://bps.ops.moph.go.th/Healthinformation/statistic54/2.2.3_54.pdf
- Office of Permanent Secretary. (2011b). *Public Health Statistics 2011. Number of Live births and Crude Birth Rates per 1,000 Population by Region and Sex, 2007 - 2011* Retrieved 7 April, 2013, from <http://bps.ops.moph.go.th/index.php?mod=bps&doc=5>
- Office of the National Economic and Social Development Board. (2012). *Gross Domestic Product: Q2/2012*.
- Office of Vocational Education Commission. (2011). *Statistics of student classified by level and sex 2011* Retrieved 7 April, 2013, from <http://techno.vec.go.th/%E0%B8%9B%E0%B8%A3%E0%B8%B0%E0%B8%8A%E0%B8%B2%E0%B8%AA%E0%B8%B1%E0%B8%A1%E0%B8%9E%E0%B8%B1%E0%B8%99%E0%B8%98%E0%B9%8C/%E0%B8%A3%E0%B8%B2%E0%B8%A2%E0%B8%A5%E0%B8%B0%E0%B9%80%E0%B8%AD%E0%B8%B5%E0%B8%A2%E0%B8%94%E0%B8%82%E0%B9%88%E0%B8%B2%E0%B8%A7/tabid/766/ArticleId/1023/-2555.aspx>
- Penner, A. M. (2008). Gender differences in extreme mathematical achievement: an international perspective on biological and social factors. *AJS, 114 Suppl*, S138-170.
- Peters, M., Laeng, B., Latham, K., Jackson, M., Zaiyouna, R., & Richardson, C. (1995). A redrawn Vandenberg and Kuse mental rotations test: different versions and factors that affect performance. *Brain Cogn, 28(1)*, 39-58. doi: 10.1006/brcg.1995.1032
- Power, H. (2000). *The Gender Shift From The Nurses' Perspective*.
- Pramote Prasartkul, & Patama Vapattanawong. (2012). Thai Population and Health Indicators Taking the pulse of Thailand's Populational Health. *Thai Health 2012* 1. from http://www.hiso.or.th/hiso/picture/reportHealth/ThaiHealth2012/eng2012_4.pdf
- Reskin, B. F., Hartmann, H. I., Issues, C. W. E. R. S., & Council, N. R. (1986). *Women's Work, Men's Work: Sex Segregation on the Job*: National Academies Press.

- Rogers, C. R., & Koch, S. (1959). *A Theory of Therapy, Personality, and Interpersonal Relationships: As Developed in the Client-centered Framework*. McGraw-Hill.
- Rosenthal, M. S. (2002). *The fertility sourcebook* (3rd ed.). Chicago: Contemporary Books.
- Rosser, R. A., Ensing, S. S., Gilder, P. J., & Lane, S. (1984). An information-processing analysis of children's accuracy in predicting the appearance of rotated stimuli. *Child Development*, 55(6), 2204-2211. doi: 10.2307/1129792
- Rushton, J. P., & Ankney, C. D. (1996). Brain size and cognitive ability: Correlations with age, sex, social class, and race. *Psychonomic Bulletin & Review*, 21-36.
- Ryle, R. (2012). *Questioning gender : a sociological exploration*. Thousand Oaks: Pine Forge Press.
- SCB. (2011). Adaptive Guide for Thai Business in Labor Market Changed. *Insight*.
- Schwartz, D. W., & Karp, S. A. (1967). Field dependence in a geriatric population. *Percept Mot Skills*, 24(2), 495-504.
- Serbin, L. A., Poulin-Dubois, D., Colburne, K. A., Sen, M. G., & Eichstedt, J. A. (2001). Gender stereotyping in infancy: Visual preferences for and knowledge of gender-stereotyped toys in the second year. *International Journal of Behavioral Development*, 25(1), 7-15. doi: 10.1080/01650250042000078
- Silverman, I., Choi, J., & Peters, M. (2007). The hunter-gatherer theory of sex differences in spatial abilities: data from 40 countries. *Arch Sex Behav*, 36(2), 261-268. doi: 10.1007/s10508-006-9168-6
- Sorensen, A. (2004). Rosie the Riveter: Women Working During World War II Retrieved 20 August, 2012, from <http://www.nps.gov/pwro/collection/website/rosie.htm>
- Spelke, E. S. (2005). Sex differences in intrinsic aptitude for mathematics and science?: a critical review. [Meta-Analysis]. *Am Psychol*, 60(9), 950-958. doi: 10.1037/0003-066X.60.9.950

- Steele, J., James, J. B., & Barnett, R. C. (2002). Learning in a Man's World: Examining the Perceptions of Undergraduate Women in Male-Dominated Academic Areas. *Psychol Women Q*, 26(1), 46-50. doi: 10.1111/1471-6402.00042
- Sudarat Kunakitkumjorn. (2003). The study of impact of role ambiguity and role conflict on quitting intent of male and female non-managerial hotel employees in Bangkok.
- Takeda Hiroko. (2011). Who's Afraid of 'Bad Mothers'? *Politique étrangère*, 76.
- Terman, L. M. (1916). *The Measurement of Intelligence: An Explanation of and a Complete Guide for the Use of the Stanford Revision and Extension of the Binet-Simon Intelligence Scale*: Houghton Mifflin.
- The American Society For Reproductive Medicine. (2003). Age and Fertility: A Guide for Patients. *American Society For Reproductive Medicine (Patient Information Series)*
- The American Society For Reproductive Medicine. (2008). Diagnostic Testing for Male Factor Infertility. *The American Society for Reproductive Medicine*.
- The Economist. (2009). Female power. *Women in the workforce*, from <http://www.economist.com/node/15174418>
- the United Nations Entity for Gender Equality and the Empowerment of Women. (1995). *Women in Power and Decision-making Diagnosis*. Paper presented at the The United Nations Fourth World Conference on Women, Beijing, China. <http://www.un.org/womenwatch/daw/beijing/platform/decision.htm>
- TIME. (2012). The Growing Buying Power of Women. *Woman Power: The Rise of the Sheconomy* Retrieved 13 August 2012, from <http://www.time.com/time/interactive/0,31813,2031700,00.html>
- Treiman, D. J., & Terrell, K. (1975). Sex and the process of status attainment: A comparison of working women and men. *American Sociological Review*, 174-200.
- U.S. Bureau of Labor Statistics. (2011). *Women in the labor force: a databook*: U.S. Dept. of Labor, Bureau of Labor Statistics.

- U.S. Department of Commerce Economics and Statistics Administration. (2010). Women-Owned Business In The 21st Century.
- U.S.Government. (1964). The Civil Rights Act of 1964 Retrieved 20 August, 2012, from <http://www.eeoc.gov/laws/statutes/titlevii.cfm>
- UNESCO Bangkok. (2011). Early Childhood Care and Education Retrieved 16 April, 2013, from <http://www.unescobkk.org/education/resources/country-profiles/thailand/early-childhood/>
- United Nations Statistics Division. (2010). *The World's Women 2010 : Trends and Statistics*. New York: Department of Economic and Social Affairs.
- Veum, J. R., & Gleason, P. M. (1991). Child Care: Arrangements and Costs. *Monthly Labor Review*, 114(10).
- Voyer, D., Voyer, S., & Bryden, M. P. (1995). Magnitude of sex differences in spatial abilities: a meta-analysis and consideration of critical variables. [Meta-Analysis Research Support, Non-U.S. Gov't]. *Psychol Bull*, 117(2), 250-270.
- Watson, N. V., & Kimura, D. (1991). Nontrivial sex differences in throwing and intercepting: Relation to psychometrically-defined spatial functions. *Personality and Individual Differences*, 12(5), 375-385. doi: 10.1016/0191-8869(91)90053-e
- West, C., & Zimmerman, D. H. (1987). Doing Gender. *Gender & Society*, 1(2), 125-151. doi: 10.1177/0891243287001002002
- WHO. (2009). What do we mean by "sex" and "gender"? *Gender, women and health* Retrieved 13 August, 2012, from <http://www.who.int/gender/whatisgender/en/index.html>
- Williams, C. L., Barnett, A. M., & Meck, W. H. (1990). Organizational effects of early gonadal secretions on sexual differentiation in spatial memory. *Behav Neurosci*, 104(1), 84-97.
- Witelson, S. F., Glezer, II, & Kigar, D. L. (1995). Women have greater density of neurons in posterior temporal cortex. [Comparative Study Research Support, Non-U.S. Gov't Research Support, U.S. Gov't, P.H.S.]. *J Neurosci*, 15(5 Pt 1), 3418-3428.

- Wolcott, I., Hughes, J., & Studies, A. I. o. F. (1999). *Towards Understanding the Reasons for Divorce*: Australian Institute of Family Studies.
- Wood, W., & Eagly, A. H. (2002). A cross-cultural analysis of the behavior of women and men: implications for the origins of sex differences. [Research Support, Non-U.S. Gov't Research Support, U.S. Gov't, Non-P.H.S. Research Support, U.S. Gov't, P.H.S.]. *Psychol Bull*, *128*(5), 699-727.
- Woolley, H. T. (1914). The psychology of sex. *Psychological Bulletin*, *11*(10), 353-379. doi: 10.1037/h0070064
- Worell, J. (2001). *Encyclopedia of Women and Gender: Sex Similarities and Differences and the Impact of Society on Gender*: Academic Press.
- Wyn, R., Ojeda, V., Ranji, U., & Salganicoff, A. (2003). Women, Work, and Family Health: A Balancing Act. *The Kaiser Women's Health Survey*.

APPENDICES

APPENDIX A

INTERNATIONAL STANDARD CLASSIFICATION OF EDUCATION

The International Standard Classification of Education (ISCED) is classification structure for organizing information on education and training maintained by the United Nations Educational, Scientific and Cultural Organization (UNESCO). It is part of the international family of economic and social classifications of the United Nations.

The ISCED was designed in the early 1970s to serve ‘as an instrument suitable for assembling, compiling and presenting statistics of education both within individual countries and internationally’. It was approved by the International Conference on Education (Geneva, 1975), and was subsequently endorsed by UNESCO’s General Conference.

Table 1 Correspondence between ISCED 2011 and ISCED 1997 levels

ISCED 2011	ISCED 1997
ISCED 01	-
ISCED 02	ISCED 0
ISCED level 1	ISCED level 1
ISCED level 2	ISCED level 2
ISCED level 3*	ISCED level 3
ISCED level 4*	ISCED level 4
ISCED level 5	ISCED level 5
ISCED level 6	
ISCED level 7	
ISCED level 8	ISCED level 6
* Content of category has been modified slightly.	

Source: the United Nations Educational, Scientific and Cultural Organization

The previous classification, known as ISCED-1997, was approved by the UNESCO General Conference at its 29th session in November 1997 as part of efforts to increase the international comparability of education statistics. It covers primarily two cross-classification variables: levels (7 proposed) and fields of education. The UNESCO Institute for Statistics has proposed revisions to ISCED (ISCED-2011), which has been approved by UNESCO's General Conference in November 2011 and which will replace ISCED-1997 in international data collections in the next years. ISCED-2011 added two levels, by dividing the tertiary pre-doctorate level into three levels.

In Thailand, Ministry of University Affairs start collects the data by ISCED group and field of study because name of faculty is variety by university. Then, to group all of faculty together to see the trend and statistical of all difference name of faculty, Ministry of University Affairs have to group them by using *International Standard Classification of Education* classified by UNESCO.

From ISCED 1997 to ISCED 2011 they change just *level of education*, not *group of education*. There are 25 fields of education organized in 9 broad groups as follow:

1 Education

14 Teacher training and education science

Teacher training for pre-school, kindergarten, elementary school, vocational, practical, non-vocational subject, adult education, teacher trainers and for handicapped children. General and specialized teacher-training programmes.

Education science: curriculum development in non-vocational and vocational subjects. Educational assessment, testing and measurement, educational research, other education science.

2 Humanities and arts

21 Arts

Fine arts: drawing, painting, sculpture;

Performing arts: music, drama, dance, circus;

Graphic and audio-visual arts: photography, cinematography, music production, radio and television production, printing and publishing; Design; craft skills.

22 Humanities

Religion and theology; Foreign languages and cultures: living or 'dead' languages and their literature, area studies; Native languages: current or vernacular language and its literature; Other humanities: interpretation and translation, linguistics, comparative literature, history, archaeology, philosophy, ethics.

3 Social sciences, business and law

31 Social and behavioural science

Economics, economic history, political science, sociology, demography, anthropology (except physical anthropology), ethnology, futurology, psychology, geography (except physical geography), peace and conflict studies, human rights.

32 Journalism and information

Journalism; library technician and science; technicians in museums and similar repositories; Documentation techniques; Archival sciences.

34 Business and administration

Retailing, marketing, sales, public relations, real estate; Finance, banking, insurance, investment analysis; Accounting, auditing, bookkeeping; Management,

public administration, institutional administration, personnel administration; Secretarial and office work.

38 Law

Local magistrates, 'notaries', law (general, international, labour, maritime, etc.), jurisprudence, history of law.

4 Science

42 Life sciences

Biology, botany, bacteriology, toxicology, microbiology, zoology, entomology, ornithology, genetics, biochemistry, biophysics, other allied sciences, excluding clinical and veterinary sciences.

44 Physical sciences

Astronomy and space sciences, physics, other allied subjects, chemistry, other allied subjects, geology, geophysics, mineralogy, physical anthropology, physical geography and other geosciences, meteorology and other atmospheric sciences including climatic research, marine science, vulcanology, palaeoecology.

46 Mathematics and statistics

Mathematics, operations research, numerical analysis, actuarial science, statistics and other allied fields.

48 Computing

Computings: system design, computer programming, data processing, networks, operating systems – software development only (hardware development should be classified with the engineering fields).

5 Engineering, manufacturing and construction

52 Engineering and engineering trades

Engineering drawing, mechanics, metal work, electricity, electronics, telecommunications, energy and chemical engineering, vehicle maintenance, surveying.

54 Manufacturing and processing

Food and drink processing, textiles, clothes, footwear, leather, materials (wood, paper, plastic, glass, etc.), mining and extraction.

58 Architecture and building

Architecture and town planning: structural architecture, landscape architecture, community planning, cartography; Building, construction; Civil engineering.

6 Agriculture

62 Agriculture, forestry and fishery

Agriculture, crop and livestock production, agronomy, animal husbandry, horticulture and gardening, forestry and forest product techniques, natural parks, wildlife, fisheries, fishery science and technology.

64 Veterinary

Veterinary medicine, veterinary assisting.

7 Health and welfare

72 Health

Medicine: anatomy, epidemiology, cytology, physiology, immunology and immunohaematology, pathology, anesthesiology, pediatrics, obstetrics and gynecology, internal medicine, surgery, neurology, psychiatry, radiology, ophthalmology; Medical services: public health services, hygiene, pharmacy, pharmacology, therapeutics, rehabilitation, prosthetics, optometry, nutrition; Nursing: basic nursing, midwifery; Dental services: dental assisting, dental hygienist, dental laboratory technician, deontology.

76 Social services

Social care: care of the disabled, childcare, youth services, gerontological services; Social work: counseling, welfare not elsewhere classified (n.e.c.)

8 Services

81 Personal services

Hotel and catering, travel and tourism, sports and leisure, hairdressing, beauty treatment, and other personal services: cleaning, laundry, dry-cleaning, cosmetic services, domestic science.

84 Transport services

Seamanship, ship's officer, nautical science, air crew, air traffic control, railway operations, road motor vehicle operations, postal service.

85 Environmental protection

Environmental conservation, control and protection, air and water pollution control, labour protection and security.

86 Security services

Protection of property and persons: police work and related law enforcement, criminology, fire-protection and fire fighting, civil security; Military.

9 Not known or unspecified

(This category is not part of the classification itself but in data collection '99' is needed for 'fields of education not known or unspecified'.)

APPENDIX B

QUESTION OF INTERVIEW

Questions for labor producers

1. What is the situation of gender equity in your university? Why? How?
2. What is statistical data with female student in your university? Why? How?
3. Did you have any interesting statistics of female student in your university?
4. What is a turning point of changing from male to female student in your university? Why? How?
5. What about effect of gender shift in your university? Why? How?
6. Is there any changing pattern of study occurring in your university? Why? How?
7. Did male and female student are difference in study? How?
8. Are there influences of the policy for female's student increasing? Why? How?
9. Are your policies adjusted for responding changing number of female in male-dominated field? How?

Questions for labor users and working women

1. What is the situation of gender equity in your organization? Why? How?
2. What is statistical data with female workers in your organization? Why? How?
3. Did you have any interesting statistics of female workers in your organization? Why? How?
4. What is a turning point of changing from male to female workers in your organization? Why? How?
5. What about effect of gender shift in your organization? Why? How?

6. Is there any changing pattern of working for working women occurring in your organization? Why? How?

7. Did male and female worker are difference in working? How?

8. Are there influences of the policy for female's working increasing? Why? How?

9. Are your policies adjusted for responding changing number of female in male-dominated field? How?

Additional questions for working women

1. What is the reason to having gender shift in your family? (if any)

2. How long to switching role?

3. How is everything after role switching?

4. In your opinion, what is the next trend in labor market?

5. What is the impact of role shifting in your family?

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