Fall 2022

Smart living with artificial intelligence -- potential impact of artificial intelligence on mental well-being

Weiyu Wang
Missouri University of Science and Technology

Department:

SMART LIVING WITH ARTIFICIAL INTELLIGENCE

-- POTENTIAL IMPACT OF ARTIFICIAL INTELLIGENCE ON MENTAL WELL-BEING

by

WEIYU WANG

A THESIS

Presented to the Faculty of the Graduate School of the

MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY

In Partial Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE IN INFORMATION SCIENCE AND TECHNOLOGY

2019

Approved by:

Keng Siau, Advisor
Fiona Nah
Langtao Chen

ABSTRACT

Artificial Intelligence (AI) will result in job replacement and job elimination. Some AI technologies, such as self-driving vehicles, have the potential to disrupt existing industries. Self-driving trucks may replace the 3.5 million truck drivers in the US. Scholars at Oxford University estimated that no less than 47% of American jobs and 54% of those in Europe are at a high risk of being taken over by machines. Routine, repetitive, and predictable jobs are expected to be automated (Siau, 2018). Although new jobs will be created, the unemployment rate may go up in the short term and the emergence of a "useless class" (i.e., permanently jobless) (Harari, 2016) is a real possibility. PwC predicted that about seven million existing jobs could be displaced by AI from 2017-2037, but about 7.2 million jobs could be created. Many of these "expected" new jobs, however, are not in existence yet. The impact of AI on human mental well-being is a grave concern to many.

Previous studies on joblessness are not related to AI-induced joblessness. This research studies the differences between the impact of joblessness induced by AI compared to other reasons. Furthermore, this study would answer three questions: 1) What is the difference between the impact of temporary joblessness and that of permanent joblessness? 2) How would temporary joblessness induced by AI affect human mental well-being? 3) How would permanent joblessness induced by AI affect human mental well-being?

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

Page

LIST OF TABLES

Page

1. INTRODUCTION

Artificial Intelligence (AI) is quickly becoming a part of our lives. There are many AI-based applications in use today such as voice-powered personal assistants (e.g., Siri and Alexa). Some AI technologies such as self-driving vehicles have the potential to disrupt existing industries. Scholars at Oxford University estimated that no less than 47% of American jobs and 54% of those in Europe are at a high risk of being taken by machines. Routine, repetitive, and predictable jobs are expected to be automated (Siau, 2018). Historian Yuval Noah Harari predicted that AI will create a "useless class" of humans, who will not only be unemployed but also unemployable (i.e., cannot find a job anymore). Nevertheless, not everyone is as pessimistic. PricewaterhouseCoopers (PwC) predicted that about seven million existing jobs could be displaced by AI from 2017-2037, but about 7.2 million jobs could be created, giving the UK a net job boost of around 200,000 jobs. Similarly, around 26% of existing jobs in China could be automated in the same time frame, but 38% of new jobs could be created, giving a 12% net gain (PwC, 2018). Many of these "expected" new jobs, however, are not in existence yet.

Studies showed that unemployment has an impact on human health. Psychologists found that involuntary joblessness and mental health have a connection in many ways, such as incomplete psychosocial development and feelings of helplessness (Goldsmith and Diette, 2012). Studies also showed that long-term unemployment has a large negative effect on mental health and lower income is more likely to cause mental illness (Luciano and Meara, 2015). Previous studies on unemployment are not related to AI-induced unemployment. This research studies the differences between the impact of joblessness

induced by AI versus other reasons. Furthermore, this study would answer three questions: 1) What's the difference between the impact of temporary joblessness and that of permanent joblessness? 2) How would temporary joblessness induced by AI affect human mental well-being? 3) How would permanent joblessness induced by AI affect human mental well-being? Finally, we will propose a theory of obtaining and maintaining positive mental well-being in joblessness induced by AI.

Section 2 reviews the previous pieces of literature that introduce AI and human mental health. Section 3 explains the related theory foundations. Section 4 and 5 introduce the research methodology, procedure, and data collection. Section 6 and 7 contain analysis and discussion. Finally, conclusions, practical applications, and limitations and future study are presented in Section 8, 9, and 10, respectively.

2. LITERATURE REVIEW

2.1. ARTIFICIAL INTELLIGENCE AND JOB REPLACEMENT

Artificial Intelligence (AI) is an umbrella concept that was coined in the 1950s. AI systems were believed to be more reliable and realistic (Ema et al., 2016). People expected AI to perform dangerous and laborious tasks in place of humans (Robert, 2017; Kumar et al., 2016). However, some experts believed that AI would turn out to be bad for humanity (Müller and Bostrom, 2016). People feared and rejected AI because of its ability to take over their jobs (Dautenhahn et al., 2005), such as legal writing and truck driving. Today, AI is also entering the domains of health care, legal and financial services, and education. Ages and educational attainment exhibit a negative relationship with the probability of automation. Jobs that require creative intelligence and social intelligence were among the lowest probability of computerization (Frey and Osborne, 2017). Siau (2018) classified jobs into four categories – Routine and Structured, Routine and Unstructured, Non-Routine and Structured, and Non-Routine and Unstructured, as shown in Figure 2.1. Routine and structured tasks are easy to learn and program and can be easily automated. Non-Routine and Unstructured tasks are not cost-effective to learn or program and will have the lowest probability of being automated in the near future.

2.2. HUMAN MENTAL WELL-BEING

Stiglitz's report stressed that the "time is ripe for our measurement system to shift emphasis from measuring economic production to measuring people's well-being" (IEEE, 2017, p.1). Since the beginning of intellectual history, the definition of well-being has

received considerable debate, and theorists found the concept of well-being to be complex and controversial (Ryan and Deci, 2001). Traditionally, mental well-being has been characterized as the absence of psychological illness (Perugini et al., 2017). Since the World Health Organization (WHO) introduced the concept in 1948, many pieces of research of mental well-being have been conducted, and different models of well-being have been created by researchers.

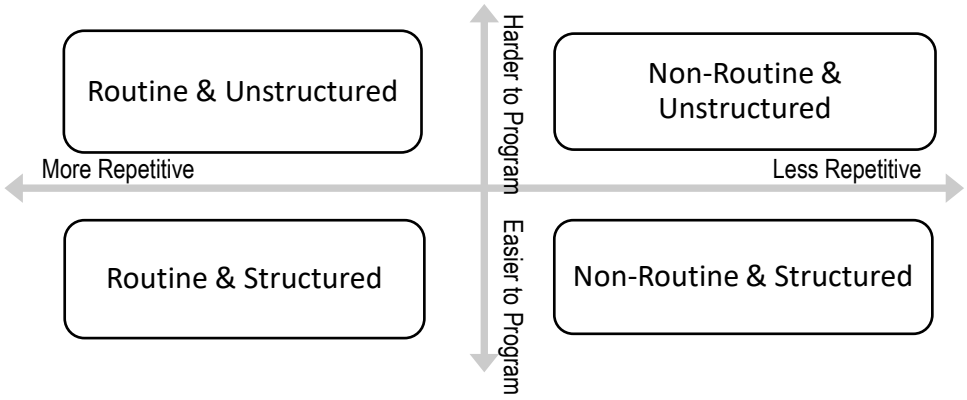


Figure 2.1. Job Categories

According to WHO, “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 2016, p.1), and “Mental health is a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community” (WHO, 2014, p.1). In the research field of psychology, the discussion on mental well-being is burgeoning. Current research on well-being has been derived from two general perspectives: the hedonic and eudaimonia (Ryan and Deci, 2001).

2.2.1. Hedonic Well-Being. The hedonic perspective of well-being was defined as feeling good (Keyes and Annas, 2009), reflecting the view that well-being consisted of pleasure or happiness (Ryan and Deci, 2001). Most research within the hedonic psychology has used assessment of subjective well-being (SWB), which consists of three distinct but related components: positive affect, negative affect, and cognitive evaluations such as life satisfaction (Diener et al., 1999). In some research, the positive affect and negative affect are referred to as emotional well-being, meaning "the emotional quality of an individual's everyday experience -- the frequency and intensity of experiences of joy, stress, sadness, anger, and affection that make one's life pleasant or unpleasant" (Kahneman and Deaton, 2010).

2.2.2. Eudaimonia Well-Being. Eudaimonia perspective of well-being was defined as functioning well (Keyes and Annas, 2009), conveying the belief that well-being consisted of fulfilling one's true nature (Ryan and Deci, 2001). Different theories were integrated into eudaimonia perspective of well-being. Ryff's (1989) theory of psychological well-being (PWB) aimed at defining positive psychological functioning. He described well-being as "the striving for perfection that represents the realization of one's true potential" (Ryff, 1995, p.100). To be specific, he presented a multidimensional approach to measure PWB, the key factors of which are autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. Autonomy measured "self-determination, independence and the regulation of behavior from within" (Ryff, 1989, p.1071). Environmental mastery measured the ability of an individual to "choose or create environments suitable to his or her psychic conditions" (Ryff, 1989, p.1071). Personal growth measured the need to "actualize oneself and realize one's potentialities" (p.1071).

Positive relations with others measured the “warm, trusting interpersonal relations” and the feelings of empathy (p.1071). The purpose in life measured an individual’s sense of directedness and internality. Self-acceptance measured “acceptance of self and of one’s past life” (p.1071). Another study indicated that eudaimonia well-being is related to personal growth and fulfillment at an individual level (Perugini et al., 2017).

Self-determination theory (SDT) (Ryan and Deci, 2000) was another perspective that embraced the concept of eudaimonia. Whereas Ryff used six factors to define well-being, SDT theorized that fulfillment of three basic psychological needs—autonomy, competence, and relatedness—is essential for psychological growth and well-being.

The third typical theory was Keyes’s social well-being, defining an appraisal of one's circumstance and functioning in society (Keyes, 1998). Keyes (2002, p.209) argued, “Whereas psychological well-being represents more private and personal criteria for evaluation of one’s functioning, social well-being epitomizes the more public and social criteria whereby people evaluate their functioning in life.”

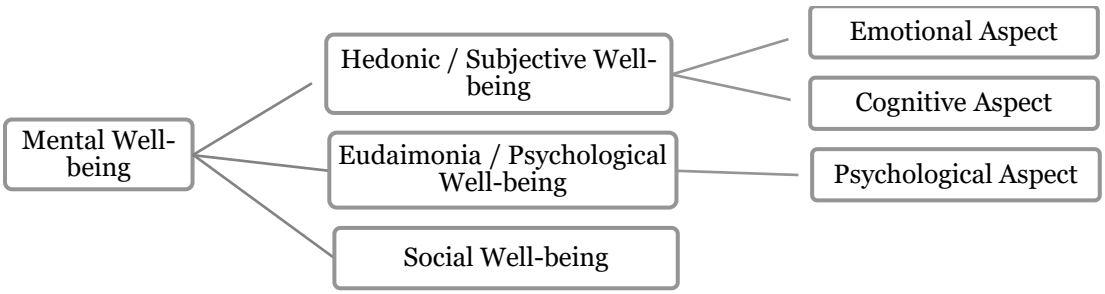


Figure 2.2. Classification of Mental Well-Being

According to the reviews of the literature, the most common classification of mental well-being is shown in Figure 2.2, and the definition is shown in Table 2.1.

Table 2.1. Definition of Well-being

Concept	Definition	Reference
Mental well-being	The absence of psychological illness	Perugini et al., 2017
Mental health	A state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community	WHO, 2014
Hedonic well-being	Feeling good	Keyes and Annas, 2009
	Pleasure or happiness	Ryan and Deci, 2001
Subjective well-being	Positive affect, negative affect, and cognitive evaluations such as life satisfaction	Diener et al., 1999
Emotional well-being	The emotional quality of an individual's everyday experience—the frequency and intensity of experiences of joy, stress, sadness, anger, and affection that make one's life pleasant or unpleasant	Kahneman and Deaton, 2010
Eudaimonia well-being	Functioning well	Keyes and Annas, 2009
	Fulfilling one’s true nature	Ryan and Deci, 2001
	Personal growth and fulfillment at an individual level	Perugini et al., 2017
Psychological well-being	The striving for perfection that represents the realization of one’s true potential	Ryff, 1995
Social well-being	An appraisal of one's circumstance and functioning in society	Keyes, 1998

3. CONCEPTUAL AND THEORETICAL FOUNDATIONS

3.1. PSYCHOLOGICAL NEEDS AND MASLOW'S HIERARCHY

Ryan and Deci (2000) proposed that the fulfillment of basic psychological needs is likely to enhance a person's well-being. The six dimensions of PWB are also regarded as universal human needs that foster well-being (Tay and Diener, 2011). In addition, Maslow's (1943) hierarchy of needs proposed that there is a general consequence of the gratification of five basic needs: physiological needs, safety needs, belonging and love needs, esteem needs, and self-actualization needs. The most basic consequence of satisfaction of any need was that "this need is submerged, and a new and higher need emerges" (Maslow et al., 1987, p.33). The first four levels of needs are often referred to as deficiency needs, which if not met will cause anxiousness and tension, while the top-level need is known as the growth need (McLeod, 2017).

Some basic physiological and psychological needs are required. Fulfilling these needs would improve well-being where deprivation of them would hurt well-being. For instance, the research by Diener et al. (2010), in which the focus was on the role of income in predicting SWB, indicated that basic and psychosocial need fulfillment were found to be a channel by which income raises life evaluation. Social and respect needs are strongly related to positive feelings, while basic needs are strongly related to life evaluation (Tay and Diener, 2011). The comparison of different theories is shown in Table 3.1.

There are 748 studies that have employed Ryff's psychological well-being scales till June 2018, when we got the Ryff's Psychological Scale. Table 3.2 list some of those studies

which have been published in top 30 psychology journals, according to Scimago Journal & Country Rank.

Table 3.1. Psychological Needs

Six Dimension of Psychological Well-Being (Ryff and Keyes, 1995)	**Maslow's Hierarchy of Needs (Maslow, 1987)**	**Basic Psychological Needs (Ryan and Deci, 2000)**	**Universal Needs (Tay and Diener, 2011)**
	Physiological Need		Basic Needs for Food and Shelter
	Safety Need		Safety and Security
Positive Relations	Belonging and Love Need	Relatedness	Social Support and Love
Environmental Mastery	Self - esteem Need	Competence	Mastery and Growth
	Esteem from others		Feeling Respected and Pride in Activity
Personal Growth	Self-actualization need		
Autonomy		Autonomy	Self-direction and Autonomy
Self-acceptance			
Purpose in Life			

Table 3.2. Research Used Six Dimension of Psychological Well-Being

Reference	Subject of the study
Fleeson and Baltes, 1998	This study explored the usefulness of a lifespan-theory based suggestion about personality-related measurement instruments, whether information contained in personality or personality-related instruments (SDPWB) may be extended by considering other lifetime target ages.
Gruhn et al., 2008	This study reported findings of a longitudinal-sequential study on emotion-cognition relations throughout the lifespan ranging from 10 years to 87 years and examined person characteristics (such as age and SDPWB) as predictors of interindividual differences in intraindividual change in empathy.
Hardy and Segerstrom, 2017	This study tested the hypothesis that less intra0individual variability and more psychological flexibility in affect predicts better psychological (depression, anxiety, and SDPWB) and physical health.
Heller et al., 2013	This study tested the hypothesis that the ability to engage the neural circuitry of reward may promote well-being and mediate the relationship between well-being and health.

Table 3.2. Research Used Six Dimension of Psychological Well-Being (cont.)

Hill and Turiano, 2014	This study sought to exam whether purpose in life (one dimension of SDPWB) promotes longevity across the adult years.
Hill et al., 2016	This study examined whether purpose in life ((one dimension of SDPWB) provides financial value to individuals.
Kokko et al., 2013	This study examined how the personality traits of neuroticism, extraversion, conscientiousness, openness, and agreeableness are linked to Psychological well-being.
Kushlev and Dunn, 2015	This study conducted the experimental field investigation directly examine how the frequency of checking email affects well-being, including environmental mastery (one dimension of SDPWB)
Pasupathi et al., 2015	This study examined links between the way people narrate interpersonal harm experiences and their emotions, as well as the relationships between emotions and identity-centrality perceptions and measures of well-being.
Sahdra et al., 2011	This study examined the impact of training-induced improvements in self-regulation, operationalized in terms of response inhibition, on longitudinal changes in self-reported adaptive socioemotional functioning. PWB was part of Adaptive functioning (AF), which was operationalized as a single latent factor underlying self-report.
Sheldon, 2004	This study hypothesized that shifts towards intrinsic and away from extrinsic values would be associated with increases in psychological well-being and self-determination.
Sherman et al., 2011	This study addressed the psychological factors associated with variation in personality-behavior congruence, considering both overall congruence and distinctive congruence.
Urry et al., 2004	This study demonstrated the dispositional positive-affect and an approach-oriented behavioral style separately contribute to eudaimonic and hedonic well-being, using self-report and electrophysiological methods.

4. RESEARCH METHODOLOGY

Grounded theory is used to collect and analyze the interview data. Cognitive mapping approaches are adopted to help reveal the relationships among different mental well-being statuses.

4.1. GROUNDED THEORY

Grounded Theory (GT) is a systematic methodology in the social sciences, especially when the study begins with a question or even just the collection of qualitative data (Wiki, N.A.). The methodology of GT was developed by Glaser and Strauss in 1967, describing a qualitative research method used in the research of Awareness of Dying (Glaser and Strauss, 1967). Grounded theory is defined as "a qualitative strategy of inquiry in which the researcher derives a general, abstract theory of process, action, or interaction grounded in the views of participants in a study" (Creswell, 2009, p.13 and p.229). It was used to investigate the actualities in the real world and analyze the data without a hypothesis (Glaser and Strauss, 1967). Grounded theory is often adopted to formulate theories based on existing phenomena. Furthermore, it can be used to discover participants' concerns and the way they try to resolve them.

A complete grounded theory research design often contains eight elements: 1) question formulating, 2) theoretical sampling, 3) interview transcribing and contact summary, 4) data chunking and data naming – coding, 5) developing conceptual categories, 6) constant comparison, 7) analytic memo and, 8) growing theories (Ke and Wenglensky, 2010). Grounded theory data collection is usually done by interviews. Other methods, such

as focus groups, informal conversation, and observations, can also be used. Grounded theory data analysis aims to search out the concepts behind the actualities by looking for codes, concepts, and categories.

Three types of coding are often used when engaging in a grounded theory analysis. Open coding, or substantive coding, forms the initial categories of information from the studied phenomenon. Written data from transcripts are conceptualized line by line during this stage. Axial coding assembles the data in a new way after open coding, "by making connections between categories" (Strauss and Corbin, 1990). In this stage, a central phenomenon is identified, and causal conditions are explored. Selective coding integrates the categories in the axial coding model. The result of this stage is a substantive-level theory relevant to a specific problem (Ke and Wenglensky, 2010). We should note that these three types of coding are not necessarily sequential. They can be overlapped and iterated.

4.2. CONCEPT-MAPPING APPROACHES

The concept-mapping approach shows concepts and relationships between concepts in a graphical concept map. The six-step concept-mapping approaches by Shen et al. are adopted (2018). The six-step (preparation, generating statements, structuring statements, concept-mapping analysis, interpreting concept maps, and utilizing concept maps) will be described in detail later, in the research procedure section and results and discussion section. This approach is developed and specified by Trochim (1989), Kane and Trochim (2007), and Trochim and McLinden (2017). This approach provides clear procedures for collecting data and allows systematically statistically analysis (Shen et al., 2018). We conducted our study to identify different mental well-being statuses considering the impact of joblessness

induced by AI on our participants, and then try to ground a theory about how people can get and maintain positive mental well-being in joblessness induced by AI.

4.3. HYPOTHETICAL SCENARIO

Hypothetical scenario methodology is commonly used in the study of genetic susceptibility testing uptake estimation to assess testing interest and estimate upcoming service needs (Persky et al., 2007). The benefit is that this method allows investigators to manipulate important test characteristics and contextual variables to have a better understanding of the test. The challenge is to provide the narrative (which is used to describe the scenario) as realistically as possible. The objective of the method is to "elicit the cognitive and affective processes that would likely occur in real-life decision-making, and, in so doing, maximize predictive accuracy (Persky et al., 2007, p.728.) The method has been used by researchers in many other disciplines, such as emotional intelligence (Salovery and Grewal, 2005; Andre et al., 2004), leadership assessment (Charbonneau and Nicol, 2002), peer pressure (Steinberg and Monahan, 2007), and challenge-seeking (Yeager et al., 2016). We use hypothetical scenario methodology in set up interview questions.

5. RESEARCH PROCEDURE

In this study, we use a research method that combines quantitative and qualitative approaches. The objective is to understand the impact of AI on personal mental well-being, considering the effect of AI on job replacement and employment rate. The study includes two sections: a questionnaire section and an interview section.

We used convenience sampling for this work. This type of sampling is also known as grab sampling or availability sampling. The only criterion for convenience sampling is that people are available and willing to participate. A simple random sample is not required. The main pool of subjects is faculty members, staff, and students in a public university. Subjects are asked whether they would like to participate in the study. If so, they would be asked to sign in a google schedule sheet to arrange a one-by-one meeting for the study. Convenience sampling may cause sampling error and bias, affecting the representation of the population. But it also provides numerous advantages, such as cost-effectiveness, and speedy sampling, and ready availability. In this study, 52 subjects in total participated and 50 of their responses are qualified for the analysis. Two subjects were discarded because they failed the attendance check questions.

The research sequence is as follows. Each subject was asked to complete a questionnaire at the beginning of the study. After that, an introductory video was played to provide basic knowledge of AI's development and application in the working area. The one-by-one interview was then conducted and audio-recorded. The audio-recording was permitted by the subjects. The whole study lasts for about one to one-and-a-half hours for each subject.

According to human mental well-being theories discussed in Section 2, subjective well-being (SWB) and psychological well-being (PWB) are more private and personal criteria. This research aims to study the personal mental well-being; thus, the design of the experiment and the scales of questions focus on two aspects of mental well-being: the SWB and PWB. Section 5.1 and 5.2 introduce the questionnaire and interview process in detail.

5.1. QUESTIONNAIRE

The questionnaire is completed by participants on Qualtrics. The questionnaire includes three parts. Part I includes fifty-four questions that measure human psychological well-being. The scale is adopted and modified from Ryff's (1989, 2014) scales of psychological well-being. Part II includes fourteen questions focusing on happiness. The scales are adopted from the Warwick-Edinburgh Mental Well-being scale (Tennant et al., 2007), which is a 14-item scale with 5 response categories, from none of the time to all of the time. A higher score means the individual has a higher level of happiness. Part III includes demographic questions measuring age, gender, marital status, highest degree, major, and employment status. The demographic information allows us to compare the mental well-being of different groups of people.

To analyze the questionnaire answers, we classify each subject into a group and count how many subjects are in the group. The classification criteria depend on the research question and are discussed in the Result and Discussion Section below.

5.2. INTERVIEW

The interview section includes 22 main questions. The main purpose of the interview is to collect initial values from participants about how their mental well-being states will change if they become jobless because of AI. Two scenarios are given. In the first scenario, AI is powerful enough to replace a human job, but there are still many other job options. We call it temporary joblessness induced by AI. In the second scenario, AI is powerful enough to replace most human jobs and a human can hardly find a job. We call it permanent joblessness induced by AI. Within these two main scenarios, we have several questions created according to the survey questions from Part I and Part II. In addition to these questions, we also asked questions about participants' views on AI replacing human jobs, how their jobless state will affect their physiological and psychological needs, their opinions on future AI and robots, and their opinions on the future of humanity and society. Structured interviews and qualitative interviews method are mixed in this study.

Statistical analysis methods will be used to analyze the quantitative data. The design, data collection, and analysis for the interview follow the five-phased-cycle introduced by Yin (2015): 1) compiling, 2) disassembling, 3) reassembling and arraying, 4) interpreting, and 5) concluding. To analyze the interview answers, we use the word cloud and concept mapping methods.

6. RESULT AND DISCUSSION

6.1. THE IMPACT OF TEMPORARY JOBLESSNESS INDUCED BY AI ON PSYCHOLOGICAL WELL-BEING

In this section, we compared people's PWB before receiving Scenario I (we call it Before Scenario I in the following content) to people's PWB after receiving Scenario I (we call it After Scenario I). The result of Before Scenario I is the ratio of participants with positive responses to the questionnaire (i.e., Positive Response Ratio = Count of participants with positive response/ Count of total participants). The result of After Scenario I is the ratio of participants with a positive response to the interview questions. Figure 6.1 shows the result.

As shown in Before Scenario I, most participants (above 90%) have positive PWB and all six aspects of PWB. However, after considering the impact of AI replacing their jobs, the positive response ratio decreased significantly. In general, our conclusion is that people's psychological well-being would be negatively affected by the temporary joblessness induced by AI. The following sections will compare the differences among different groups of participants in detail.

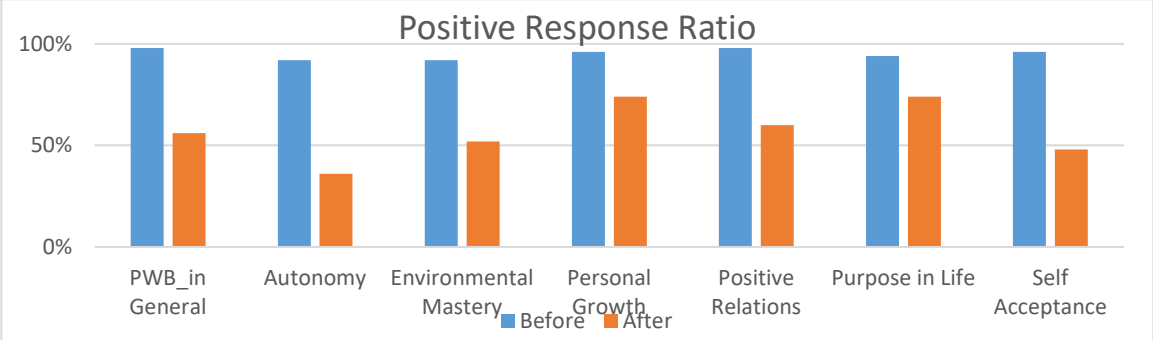


Figure 6.1. Positive Response Ratio

Table 6.1. cites some of the explanations of why participants have positive or negative response considering AI's impact on temporary joblessness.

Table 6.1. Participants' Narrative

	High	Low
Autonomy	Job is just part of life, as long as you can get money to live, it doesn't matter; If AI takes over my job it's not the end of the world, I will learn something that help me keeping forward; I'm a determined person; I'm not necessarily worried what other think about me, as long as they don't visualize me as an awful human being;	I will not be as objective as before; I cannot control my own life; The loss of income would affect independence; I would depend on other people until I find something; I'm not an independent person and it would be helpful to have people around for help;
Environmental Mastery	Having a job is not that important in the long run, I'd like to by my boss at some point; I don't think my job lost will do anything on my competence; My primary priority would be going out and finding another job; It's really a mindset, people have to be able to set goals to accomplish something; I have to figure out stuff and there are always opportunities.	Because of the anxiety, I won't be interested in any affairs; I would probably knock down my confidence because something artificial can do my job better than me; My effectiveness would reduce for sure. I won't be very competitive because AI can do the work that five people can do; I won't feel many challenges and won't work that hard, and some depression mood will affect my action. I can see a lot of defection or lethargy and feel defeated.
Personal Growth	It always worth trying new things in life; New experiences are always crucial to realize your potential; That would give me time to get new experience, finding a new job or traveling; I like the potential; I would like to go around and try new things. If AI replace me, I should either match it or do better than it. As human being, we should have the attitude of open and collaborate with others;	If something bothers me a lot, I can't focus on anything else; I don't think I could take that big change, because by that point I would be so tired of school; If I don't have something to do or I can't find something interested me, I would get really boring; I have to be open to new ideas or my job would be gone.

Table 6.1. Participants' Narrative (cont.)

Positive Relations with others	I don't see the impact of AI on this; My empathy to others won't change; The relationship might be stronger than before, because most people will be experiencing job loss as I do; People I have in my life for are always there for me and they will try to help me get back on my feet; It's good to maintain relations with others and have that support system; I would still like to keep relations because never burn bridges, it does not help anything. I will have more time for social network;	It will affect dramatically. No money and job, no sense of safety, then the relationship will be affected; If other people still have job, I feel I am out of the place; It would be embarrassed if my job is replaced; I don't think I would be in a very good mood and I would not talk normally as I used to be; I will loss trust with others; If you lose your job, you lose your income and confidence, and that puts a huge shift on any relationship; I think it strain relationships, because I may feel regret for not choosing a position that are still available, and money is always a factor and stress that affect relations; When I was in bad situation, I just don't like to connect with other people; I might not talk to people as much unless they lose their job too.
Purpose in Life	My new goal will be finding a new job; I need to put my attention elsewhere; I'm a goal-oriented person and I will always have goals depend on different situation; It would be even important when the job is taking over; The goals might change; It could lead you to new experiences life that you wouldn't have with a job; Always have goals, you never know what's lying around the corner; The most important thing is being happy and looking on the bright side of things;	I will get shocked and have no goal; Maybe just stay at home and play games; It took me 17 years to finally decide what to do now, if AI take that from me, I will feel lost; You just going to say well and don't do anything because you don't know what to do anymore; I feel like my boss is a machine and that makes me feel aimless;
Self-Acceptance	I will be positive to learn new things; I would be disappointed but I'm strong enough to adapt and overcome it; I would possess positive attitude because without that I cannot go anywhere; I wouldn't doubt myself for it because I'm not any less smart; I cannot change it, so I have to adjust to it, and I always keep positive attitude toward job and life; I would just kind of hook back my morale; I don't' need to be necessarily disappointed with myself, just kind of disappointed in the circumstances;	I can't be positive because I will have nothing to do; I would have to view it as the job I was doing was something a trained monkey could do, so it made me feel not good about what I've been doing; I feel like I didn't do that good and that's why I got my job been taking over; I feel hopeless and disappointed, and AI put a damper on my college and career; I feel disappointed cause you don't know what else to do; I spent all this time studying/preparing for this, I guess I would just kind of hook back my morale;

6.1.1. The Impact of Temporary Joblessness Induced by AI on Psychological Well-Being, Grouped by Age. We looked at the impact of temporary joblessness induced by AI on PWB in different age groups. As shown in Figure 6.2, the positive PWB response ratio before scenario I of both age groups is very high. Ninety-six percentage and 100% of participants have positive PWB responses for the age groups 18-24 and 25 and up, respectively. However, the ratio drops significantly considering the impact of AI on temporary joblessness. Only 41.4% of participants aged between 18 to 24 have positive PWB. Seventy-six percentage of participants older than 25 still have positive PWB. The distribution of positive responses to the six dimensions of PWB will be shown and explained in the following section.

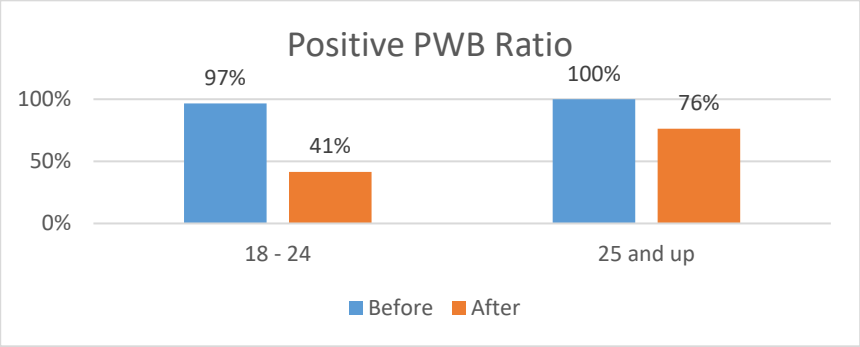


Figure 6.2. The Impact of AI on PWB, Grouped by Age

Figure 6.3 shows the comparison of the six specific aspects of PWB in the different age groups. As we can see, all six aspects have a decreased ratio when considering the impact of AI. In general, participants with age 25 or up have a higher ratio of participants with a positive response in all the six aspects of PWB. Table 6.2 shows the decreased

percentage of the number of participants with positive responses. For the age group 18-24, more than half of the participants are negatively affected by autonomy and self-acceptance.

Figure 6.3. Positive Response Ratio of Six Aspects of PWB in Different Age Group

Table 6.2. Count of participants with positive responses_Age

		Before	After	Total	Decreased By
PWB in total	Age 18-24	28	12	29	55%
	Age 25-up	21	16	21	24%
Autonomy	Age 18-24	27	8	29	66%
	Age 25-up	19	10	21	43%
Environment Mastery	Age 18-24	25	14	29	38%
	Age 25-up	21	12	21	43%
Personal Growth	Age 18-24	28	18	29	34%
	Age 25-up	20	19	21	5%
Positive Relations	Age 18-24	28	15	29	45%
	Age 25-up	21	15	21	29%
Purpose in Life	Age 18-24	28	20	29	28%
	Age 25-up	19	17	21	10%
Self-Acceptance	Age 18-24	27	12	29	52%
	Age 25-up	21	12	21	43%

6.1.2. The Impact of Temporary Joblessness Induced by AI on Psychological Well-Being, Grouped by Gender. As shown in Figure 6.4, most participants in both age groups have positive responses. A hundred percentage and Ninety-two percentage of participants have positive PWB for female and male, respectively. However, the ratio drops significantly considering the impact of AI on replacing their jobs. Only 58.3% of female participants will stay with positive PWB. 53.8% of male participants had positive PWB only.

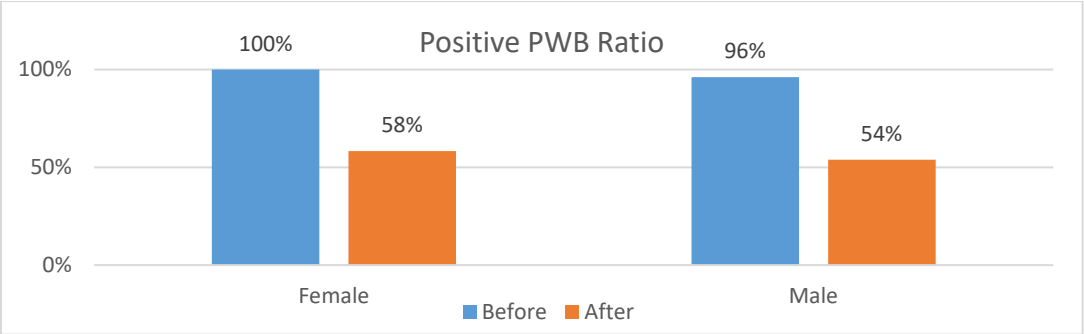


Figure 6.4. The Impact of AI on PWB, Grouped by Gender

Figure 6.5 shows the comparison of the six specific aspects of PWB in different gender groups. As shown in Figure 6.5, more male participants have a positive response to environment mastery than a female when considering AI's impact. For all the other five aspects, more females tend to have a positive response. As shown in Table 6.3, more than half of females are negatively affected by autonomy, and more than half of males are negatively affected by autonomy and self-acceptance.

Figure 6.5. Positive Response Ratio of Six Aspects of PWB in Different Gender Group

Table 6.3. Count of Participants with Positive Responses_Gender

		Before	After	Total	Decreased By
PWB in total	Female	24	14	24	41.7%
	Male	25	14	26	42.3%
Autonomy	Female	21	9	24	50%
	Male	25	9	26	62%
Environment Mastery	Female	22	11	24	46%
	Male	24	15	26	35%
Personal Growth	Female	24	20	24	17%
	Male	24	17	26	27%
Positive Relations	Female	24	15	24	38%
	Male	25	15	26	38%
Purpose in Life	Female	23	19	24	17%
	Male	24	18	26	23%
Self-Acceptance	Female	23	13	24	42%
	Male	25	11	26	54%

6.1.3. The Impact of Temporary Joblessness Induced by AI on Psychological Well-Being, Grouped by Marital Status. As shown in Figure 6.6, a positive response rate for PWB of both groups are initially very high. Ninety-seven percentage of single participants and a hundred percentage married, and other participants have positive responses. However, the ratio drops significantly considering the impact of AI on replacing their jobs. Only 48.7% of single participants stay with positive responses, and only 81.8% of other participants still have positive responses.

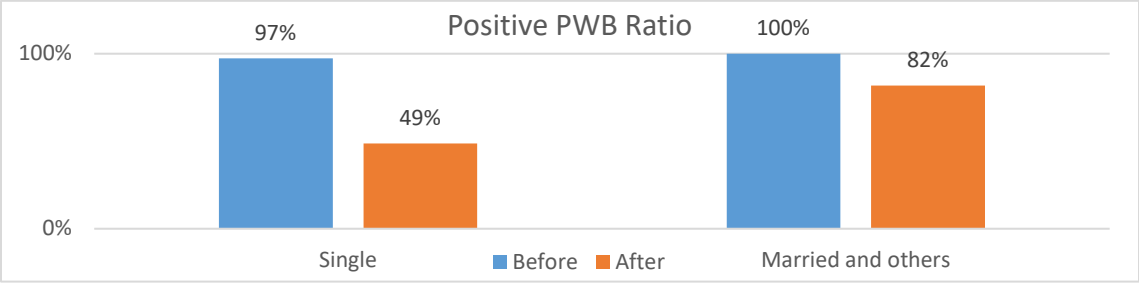


Figure 6.6. The Impact of AI on PWB, Grouped by Marital Status

Figure 6.7 shows the comparison of the six specific aspects of PWB for participants with different marital statuses. As shown, married and other participants tend to have a high ratio of participants that have positive responses when considered AI's impact. As shown in Table 6.4, more than half of singles are negatively affected by autonomy and self-acceptance.

Figure 6.7. Positive Response Ratio of Six Aspects of PWB in Different Marital Status

Table 6.4. Count of Participants with Positive Responses _Marital Status

		Before	After	Total	Decreased By
PWB in total	Single	38	19	39	49%
	Married and others	11	9	11	18%
Autonomy	Single	36	12	39	62%
	Married and others	10	6	11	36%
Environment Mastery	Single	35	18	39	44%
	Married and others	11	8	11	27%
Personal Growth	Single	38	27	39	28%
	Married and others	10	10	11	0%
Positive Relations	Single	38	21	39	44%
	Married and others	11	9	11	18%
Purpose in Life	Single	37	28	39	23%
	Married and others	10	9	11	9%
Self-Acceptance	Single	37	16	39	54%
	Married and others	11	8	11	27%

6.1.4. The Impact of Temporary Joblessness Induced by AI on Psychological Well-Being, Grouped by Highest Degree. As shown in Figure 6.8, participants with a positive response for PWB of both groups are initially very high. Ninety-seven percentage of participants with a bachelor's degree have a positive response. A hundred percentage of participants with a master's or higher degree have a positive response. However, the ratio drops significantly considering the impact of AI on replacing their jobs. Only 41.4% of participants with a bachelor's degree still have a positive response, while that percentage is 76% for participants with a master's degree and Ph.D. degree.

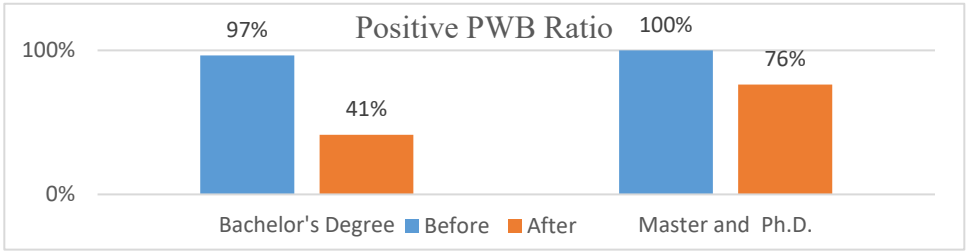


Figure 6.8. The Impact of AI on PWB, Grouped by Highest Degree

Figure 6.9. shows the comparison of the six specific aspects of PWB for participants with different highest degree. As shown, except for Purpose in Life, participants with a doctorate or higher degree tend to have positive responses compared with other groups. As shown in Table 6.5, more than half of participants with a bachelor's degree are negatively affected by autonomy and self-acceptance.

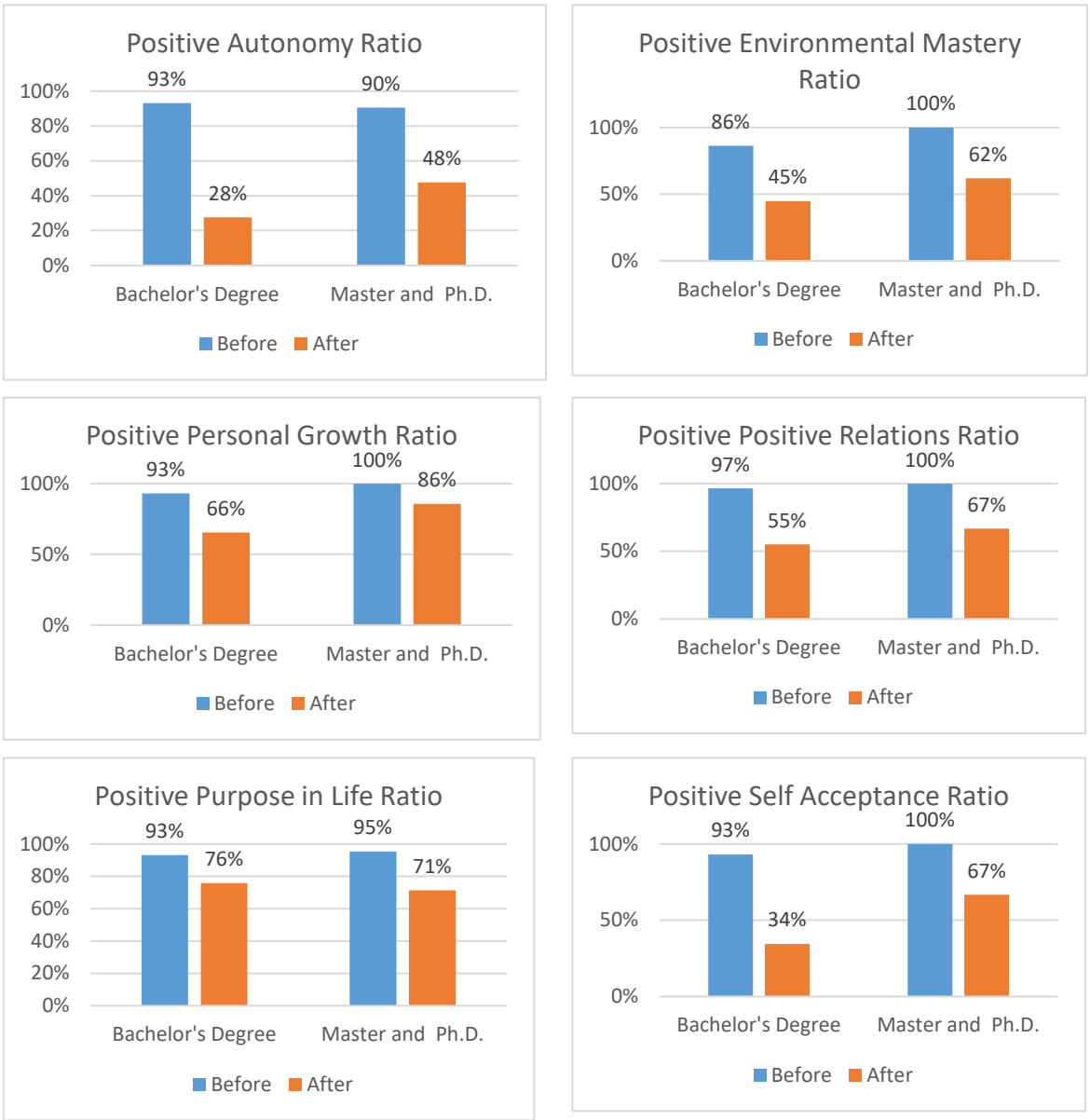


Figure 6.9. Positive Response Ratio of Six Aspects of PWB in Different Degree Group

Table 6.5. Count of Participants with Positive Responses _Degree

		Before	After	Total	Decreased By
PWB in total	Bachelor's degree	28	12	29	55%
	Master and Ph.D.	21	16	21	24%
Autonomy	Bachelor's degree	27	8	29	66%
	Master and Ph.D.	19	10	21	43%
Environment Mastery	Bachelor's degree	25	13	29	41%
	Master and Ph.D.	21	13	21	38%
Personal Growth	Bachelor's degree	27	19	29	28%
	Master and Ph.D.	21	18	21	14%
Positive Relations	Bachelor's degree	28	16	29	41%
	Master and Ph.D.	21	14	21	33%
Purpose in Life	Bachelor's degree	27	22	29	17%
	Master and Ph.D.	20	15	21	24%
Self-Acceptance	Bachelor's degree	27	10	29	59%
	Master and Ph.D.	21	14	21	33%

6.1.5. Chi Square Test. We used a chi-square test for independence to determine whether Age, Gender, Marital Status, or Degree is related to mental well-being. And we choose 0.05 as significance level. The results are listed in Table 6.6.

Using Age and PWB as an example, the null hypothesis is that Age and PWB are independent. In other words, knowing the Age of the participant doesn't help us predict whether the participant has a positive response to PWB or a negative response. Before and After mean that before considering AI's impact on joblessness and after considering AI's impact on joblessness, respectively.

As we can see, only five p-values are less than 0.05 and are marked with three stars. For those five categories, we reject the null hypothesis. To be specific, considering AI's impact, there is a relation between age and PWB, between age and personal growth, between marital status and self-acceptance, between degree and PWB, and between degree and self-acceptance.

Table 6.6. P-value

		PWB	Autonomy	Environment Mastery	Personal Growth	Positive Relation	Purpose in Life	Self-Acceptance
Age	Before	0.390	0.735	0.076	0.815	0.390	0.372	0.219
	After	0.014***	0.145	0.307	0.024***	0.160	0.401	0.219
Gender	Before	0.332	0.260	0.933	0.166	0.332	0.600	0.954
	After	0.750	0.832	0.522	0.148	0.730	0.682	0.485
Marital Status	Before	0.592	0.880	0.268	0.329	0.592	0.625	0.443
	After	0.051	0.147	0.254	0.148	0.094	0.679	0.017***
Degree	Before	0.390	0.735	0.076	0.219	0.390	0.754	0.219
	After	0.014***	0.145	0.225	0.108	0.413	0.230	0.025***

To accurately approximate the P-value, the size of the sample must be large enough for the Chi-Square distribution. In other words, every expected value of the number of sample observations in each level of the variable is at least 5. Most of the p-values as shown in Table 6.6 are not less than the significance level; one reason is that we didn't have enough samples. In the future studies, we should collect more data.

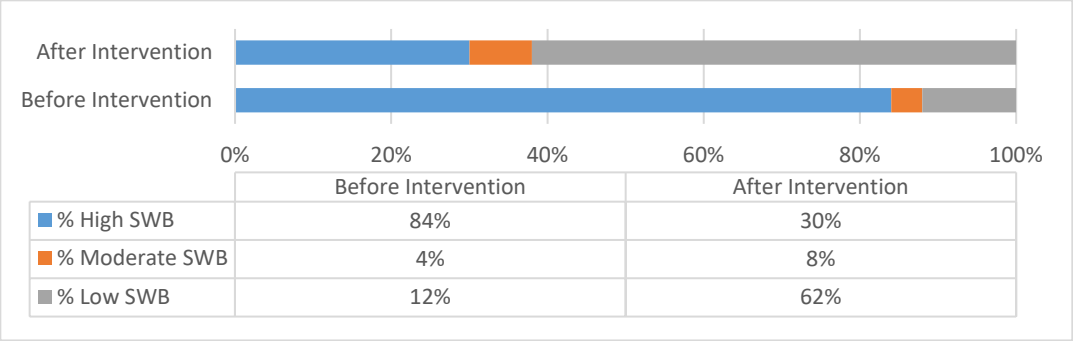
6.2. THE IMPACT OF PERMANENT JOBLESSNESS INDUCED BY AI ON PSYCHOLOGICAL WELL-BEING.

Figure 6.10. shows the general EWB before and after considering the impact of AI caused permanent joblessness. As we can see, before the scenario, most participants (about 84%) have high EWB. However, after the scenario, only 30 % participants have a high EWB and 62 % participants have a low EWB. The details are shown in Figure 6.11.

Figure 6.11. shows that more than 60 % of participants feel interested in new things, loved, optimistic, self-determining, useful, and have logic thinking.

Figure 6.12. shows that after considering AI caused permanently jobless, more than 60 % of participants are still interested in new things, interested in people, and have the ability to overcome difficulty. However, the feeling of depression, stress and worthlessness affected more than 50 % of participants.

Figure 6.13. shows that compared with the initial status, more participants feel interested in new things and new people and would like to overcome difficulties. There are three popular reasons: 1) they get more time to learn new skills, interact with others, and overcome difficulties, 2) to seek psychological comfort from each other, and 3) to discover new opportunities. Nevertheless, more people will feel depressed, stressed, and worthless than feeling optimistic.



	Before Intervention	After Intervention
% High SWB	84%	30%
% Moderate SWB	4%	8%
% Low SWB	12%	62%

Figure 6.10. Impact of Jobless Permanently Because of AI on EWB

6.3. DIFFERENCES BETWEEN UNEMPLOYMENT INDUCED BY AI VERSUS OTHER REASONS

Figure 6.14 shows the word cloud of the keywords that participants mentioned about the difference between being unemployed by AI and some other reason. Word cloud are a popular visualization tool to interpret qualitative data, quickly perceiving the most prominent terms by size.

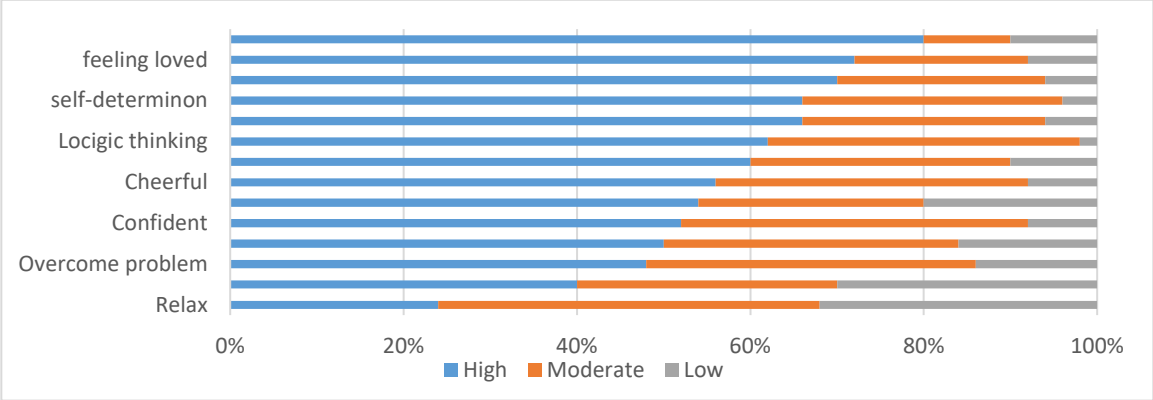


Figure 6.11. EWB Before Considering AI's Impact

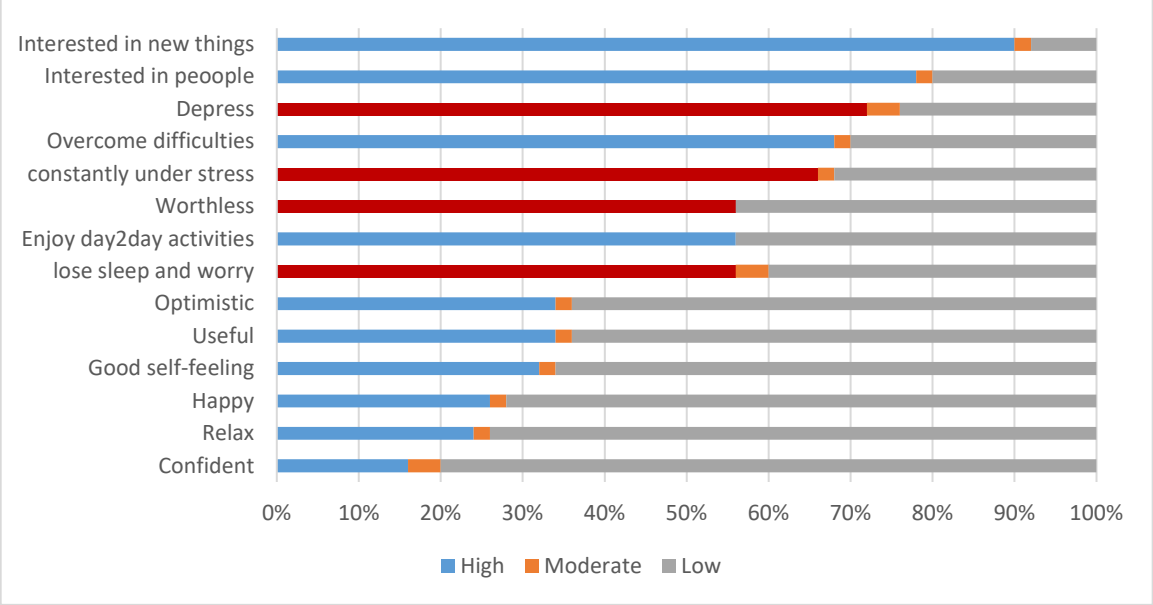
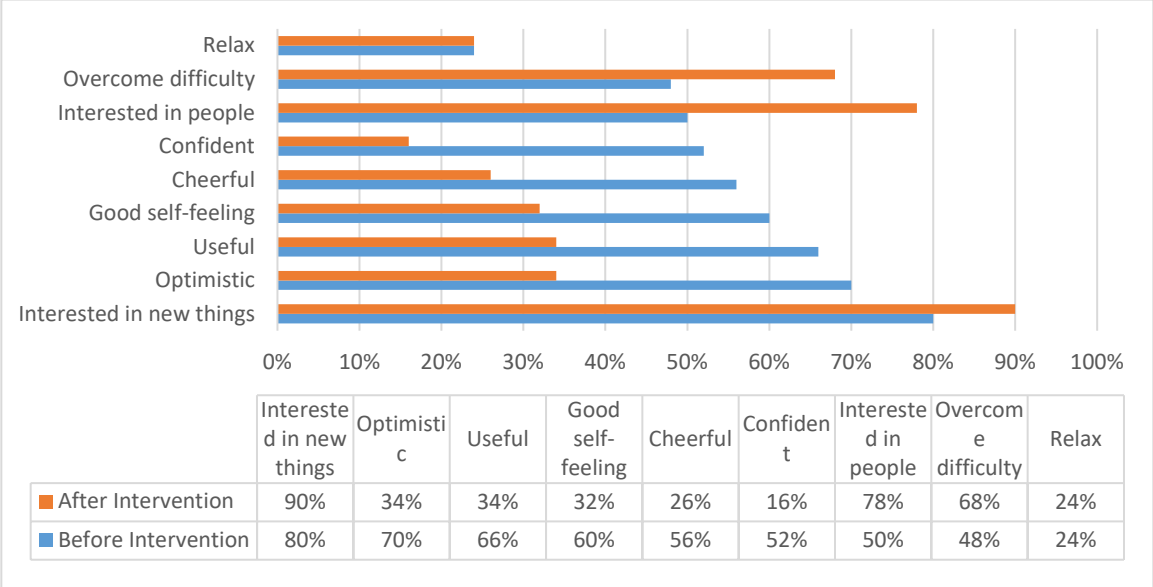


Figure 6.12. EWB After Considering AI's Impact

Eight participants mentioned that there is no difference because the final outcome is that they lose their job and unemployment per se is a depressing thing. Five people mentioned that the impact of AI is wider and irreversible. Four people feel better if it is AI to replace their job because in that case, losing the job is not their fault and is out of that control. If replaced by other humans, they will feel less competitive and that makes them

feel worse. Participants think that there is less hope to compete with a machine than to compete with another human.



	Interested in new things	Optimistic	Useful	Good self-feeling	Cheerful	Confident	Interested in people	Overcome difficulty	Relax
After Intervention	90%	34%	34%	32%	26%	16%	78%	68%	24%
Before Intervention	80%	70%	66%	60%	56%	52%	50%	48%	24%

Figure 6.13. Comparation of EWB Before and After Considering AI's Impact

Figure 6.14. Difference of Unemployed by AI

6.4. PREPARATION FOR THE FUTURE

To face the threats of AI, 18 participants would try to find a job field that is irreplaceable by AI. Self-learning, open mindedness, self-improvement, and improving skills are among the top five popular ways to prepare for the future. Jobs that need lots of human touches and human interaction are believed to be more irreplaceable.

Accept and adapt to the fact that AI will replace human jobs, be financially prepared, understand AI's potential, and pursue higher education are also popular ways to prepare. Some participants believe that human should control and limit AI's ability and intelligence to protect humans' jobs from being replaced by AI. The result is shown in Figure 6.15.

Figure 6.15. Preparation for The Future

6.5. EXPECTED JOBS/TASKS TO BE DONE BY AI

The medical area is the most popular field for AI integration, followed by heavy work, housework, assistant, laborious work, dangerous work, driver and manufacturing work. Participants believe AI works better at precision tasks and prediction. Risky jobs, simple tasks, and security jobs are also frequently mentioned. The results are shown in Figure 6.16. Generally, all the participants want AI to act as an assistant rather than a colleague or manager.

Figure 6.16. Expected AI Supported Jobs/Tasks

6.6. CONCEPT MAPPING STEPS

In this part, we describe each steps in detail.

6.6.1. Preparation and Data Collection. In the first step, participants need to be selected and focus statements based on the research question should be developed (Shen et al., 2018).

For the questionnaire, cronbach's Alpha is 0.945 and 0.895 for Part I and Part II of the survey, respectively. Details are listed in Table 6.7. Since a reliability coefficient of 0.70 or higher is considered "acceptable" in most social science research situations (Idre, N.A.), the result of the pilot study shows that the questions in the questionnaire are internally consistent.

Table 6.8 shows the distribution of demographic information. To summarize, 29 and 21 subjects are under and above age 24, respectively. Female and male subjects are about half-half distribution. Seventy-eight percentage of the subjects are single. Fifty-eight percentage of the subjects have a bachelor's degree and the other forty-two percentage of the subjects have a master's degree or a Ph.D. degree. Eighty-six percentage of the subjects have majors that are related to IT and Management Systems. 86% of the subjects are students.

Table 6.7. Cronbach's Alpha of Questionnaire

	Psychological Well-Being							Happiness
	Autonomy	Environmental Mastery	Personal Growth	Positive Relations	Purpose in Life	Self-acceptance	0.945	0.895
Cronbach's Alpha	0.826	0.843	0.794	0.839	0.775	0.831		

Table 6.8. Distribution of Demographic Information

Age	18-24	25-34	35-44	45-54			
	29	15	5	1			
Gender	Female	Male					
	24	26					
Marital Status	Single	Married	Windowed, divorced, or separated	Prefer not to answer			
	39	9	1	1			
Highest Degree	Bachelor's Degree	Master's Degree	Doctorate or higher				
	29	15	6				
Currently pursuing major	Information Science and Technology	Business and Management Systems	Material Science and Engineering	Mechanical Engineering	Geology	Education	Civil Engineering
	27	10	2	1	1	1	1
Employment status	Student	Employed Full Time	Self-employed or homemaker	Unemployed and currently looking for a job			
	43	5	1	1			

6.6.2. Generating Statements. After coding the interview data, we finally collect 37 statements for feelings of temporary joblessness induced by AI (statement for the Scenario I) and 39 statements for feelings of permanent joblessness induced by AI (statement for Scenario II).

6.6.3. Structuring Statements. In this step, 10 participants sort each set of the statements individually. The two sets of statements are randomly ordered when passed to the participants. The participants then are asked to sort each statement into piles in a way that made sense to them following three sorting rules: 1) each statement can be placed in only one pile, 2) do not place all statements in one single pile, and 3) each pile needs to have more than one statement (Shen et al., 2018).

6.6.4. Concept-Mapping Analysis. First, we constructed two types of similarity matrices for each scenario: an individual similarity matrix for each participant and an entire similarity matrix for all the 10 participants. To construct the individual similarity matrix, we entered a '1' in the matrix if two statements were sorted in the same pile; otherwise, we entered a '0'. The entire similarity matrix is constructed by summing all the individual similarity matrixes. Any cell in the entire similarity matrix could assume an integer value between 0 and 10. Figure 6.17. and Figure 6.18. show the entire similarity matrix for the Scenario I and Scenario II, respectively.

Second, we conducted the multidimensional scaling (MDS) analysis of the two entire similarity matrixes in SPSS, generating two point-maps as shown in Figure 6.19. and Figure 6.20. In the point map, each point represents one statement. The more times two statements are piled together, the closer the two corresponding points should appear in the map; otherwise, the points should appear further apart.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
Stateme	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1	10	0	0	7	0	3	3	1	2	0	2	3	2	3	0	4	2	2	0	4	0	0	0	0	1	4	5	0	4	0	0	0	0	4	0	0	4
2	0	10	3	0	3	0	0	0	0	1	0	0	0	0	0	0	0	1	6	0	3	4	3	6	0	0	0	0	0	0	2	2	2	0	3	0	0
3	0	3	10	0	1	0	0	0	0	4	0	0	0	0	2	0	0	0	5	0	4	3	3	3	0	0	0	0	0	0	1	2	0	0	3	2	0
4	7	0	0	10	0	5	5	3	2	0	2	3	4	5	0	7	2	4	0	2	0	0	0	0	1	4	5	2	5	1	0	0	0	6	0	0	4
5	0	3	1	0	10	0	0	1	0	0	0	0	0	0	0	0	0	0	3	0	1	5	3	2	0	0	0	0	0	0	0	1	5	0	4	0	0
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7	3	0	0	5	0	7	10	6	1	0	1	1	4	4	0	7	1	4	0	2	0	0	0	0	2	6	5	4	4	3	0	0	0	6	1	0	5
8	1	0	0	3	1	4	6	10	2	0	2	3	2	2	0	4	3	6	0	0	0	0	0	0	4	2	2	7	3	2	0	0	0	2	2	0	2
9	2	0	0	2	0	1	1	2	10	0	10	5	4	5	0	1	7	2	0	4	0	0	0	0	7	1	3	4	2	2	0	0	0	2	0	0	1
10	0	1	4	0	0	0	0	0	0	10	0	0	0	0	0	6	0	0	0	1	0	2	1	2	2	0	0	0	0	0	0	0	0	2	0	1	5	0
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18	2	1	0	4	0	3	4	6	2	0	2	4	3	2	0	3	3	10	0	0	0	0	0	0	5	2	1	7	3	4	1	0	0	4	2	0	3
19	0	6	5	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	10	0	5	3	2	4	0	0	0	0	0	0	1	1	1	0	2	0	0
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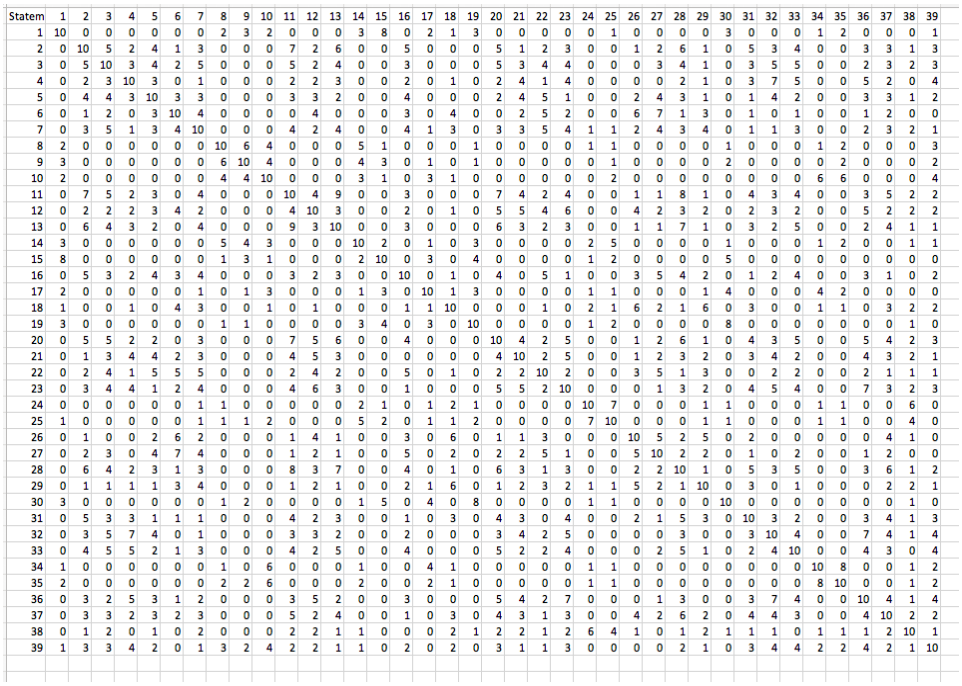
22	0	4	3	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0	3	0	2	10	6	3	0	0	0	0	0	0	0	0	2	2	0	4	1	0
23	0	3	3	0	3	0	0	0	0	2	0	0	0	0	1	0	0	0	2	0	6	6	10	4	0	0	0	0	0	0	0	0	2	4	0	4	2	0
24	0	6	3	0	2	0	0	0	0	2	0	0	0	0	0	1	0	0	0	4	0	4	3	4	10	0	0	0	0	0	1	1	1	3	0	2	1	0
25	1	0	0	1	0	1	2	4	7	0	7	6	3	2	0	2	8	5	0	1	0	0	0	0	0	10	2	2	7	2	3	0	0	0	2	1	0	3
26	4	0	0	4	0	5	6	2	1	0	1	1	3	3	0	6	2	2	0	5	0	0	0	0	0	2	10	6	3	4	3	0	0	0	5	1	0	7
27	5	0	0	5	0	3	5	2	3	0	3	0	5	6	0	3	2	1	0	5	0	0	0	0	2	6	10	2	1	2	0	0	0	5	0	0	7
28	0	0	0	2	0	3	4	7	4	0	4	4	3	2	0	3	5	7	0	1	0	0	0	0	7	3	2	10	2	4	0	0	0	3	2	0	4
29	4	0	0	5	0	4	4	3	2	0	2	2	4	3	0	6	2	3	0	5	0	0	0	0	2	4	1	2	10	2	0	0	0	2	1	0	2
30	0	0	0	1	0	3	3	2	2	0	2	2	4	3	0	3	1	4	0	2	0	0	0	0	1	3	3	2	4	2	10	2	0	0	4	1	0	5
31	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	0	2	0	0	1	0	0	0	0	0	0	2	10	6	0	1	2	0	1
32	0	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	2	2	1	0	0	0	0	0	0	0	6	10	1	0	2	0	0
33	0	2	0	0	5	0	0	0	0	2	0	0	0	0	3	0	0	0	1	0	3	2	4	3	0	0	0	0	0	0	0	0	1	10	0	2	3	0
34	4	0	0	6	0	4	6	2	2	0	2	3	6	5	0	5	1	4	0	3	0	0	0	0	2	5	5	3	2	4	1	0	0	10	0	0	5
35	0	3	3	0	4	1	1	2	0	1	0	0	0	0	1	1	0	2	2	0	4	4	4	2	1	1	0	2	1	1	2	2	2	0	10	1	1
36	0	0	2	0	0	0	0	0	0	5	0	0	0	0	9	0	0	0	0	0	1	1	2	1	0	0	0	0	0	0	0	0	3	0	1	10	0
37	4	0	0	4	0	4	5	2	1	0	1	0	4	4	0	5	1	3	0	4	0	0	0	0	3	7	7	4	2	5	1	0	0	5	1	0	10

Figure 6.17. Entire Similarity Matrix of Scenario I



Statem	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
1	10	0	0	0	0	0	0	2	3	2	0	0	0	3	8	0	2	1	3	0	0	0	0	0	1	0	0	0	0	3	0	0	0	1	2	0	0	0	1
2	0	10	5	2	4	1	3	0	0	0	7	2	6	0	0	5	0	0	0	5	1	2	3	0	0	1	2	6	1	0	5	3	4	0	0	3	3	1	3
3	0	5	10	3	4	2	5	0	0	0	5	2	4	0	0	3	0	0	0	5	3	4	4	0	0	0	3	4	1	0	3	5	5	0	0	2	3	2	3
4	0	2	3	10	3	0	1	0	0	0	2	2	3	0	0	2	0	1	0	2	4	1	4	0	0	0	0	2	1	0	3	7	5	0	0	5	2	0	4
5	0	4	4	3	10	3	3	0	0	0	3	3	2	0	0	4	0	0	0	2	4	5	1	0	0	2	4	3	1	0	1	4	2	0	0	3	3	1	2
6	0	1	2	0	3	10	4	0	0	0	0	4	0	0	0	3	0	4	0	0	2	5	2	0	0	6	7	1	3	0	1	0	1	0	0	1	2	0	0
7	0	3	5	1	3	4	10	0	0	0	4	2	4	0	0	4	1	3	0	3	3	5	4	1	1	2	4	3	4	0	1	1	3	0	0	2	3	2	1
8	2	0	0	0	0	0	0	10	6	4	0	0	0	5	1	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	0	0	0	1	2	0	0	0	3
9	3	0	0	0	0	0	0	6	10	4	0	0	0	4	3	0	1	0	1	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	2	0	0	0	2
10	2	0	0	0	0	0	0	4	4	10	0	0	0	3	1	0	3	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	6	6	0	0	0	4
11	0	7	5	2	3	0	4	0	0	0	10	4	9	0	0	3	0	0	0	7	4	2	4	0	0	1	1	8	1	0	4	3	4	0	0	3	5	2	2
12	0	2	2	2	3	4	2	0	0	0	4	10	3	0	0	2	0	1	0	5	5	4	6	0	0	4	2	3	2	0	2	3	2	0	0	5	2	2	2
13	0	6	4	3	2	0	4	0	0	0	9	3	10	0	0	3	0	0	0	6	3	2	3	0	0	1	1	7	1	0	3	2	5	0	0	2	4	1	1
14	3	0	0	0	0	0	0	5	4	3	0	0	0	10	2	0	1	0	3	0	0	0	0	2	5	0	0	0	0	1	0	0	0	1	2	0	0	1	1
15	8	0	0	0	0	0	0	1	3	1	0	0	0	2	10	0	3	0	4	0	0	0	0	1	2	0	0	0	0	5	0	0	0	0	0	0	0	0	0
16	0	5	3	2	4	3	4	0	0	0	3	2	3	0	0	10	0	1	0	4	0	5	1	0	0	3	5	4	2	0	1	2	4	0	0	3	1	0	2
17	2	0	0	0	0	0	1	0	1	3	0	0	0	1	3	0	10	1	3	0	0	0	0	1	1	0	0	0	1	4	0	0	0	4	2	0	0	0	0
18	1	0	0	1	0	4	3	0	0	1	0	1	0	0	0	1	1	10	0	0	0	1	0	2	1	6	2	1	6	0	3	0	0	1	1	0	3	2	2
19	3	0	0	0	0	0	0	0	1	1	0	0	0	0	3	4	0	3	0	10	0	0	0	0	1	2	0	0	0	0	8	0	0	0	0	0	0	1	0
20	0	5	5	2	2	0	3	0	0	0	7	5	6	0	0	4	0	0	0	10	4	2	5	0	0	1	2	6	1	0	4	3	5	0	0	5	4	2	3
21	0	1	3	4	4	2	3	0	0	0	4	5	3	0	0	0	0	0	0	4	10	2	5	0	0	1	2	3	2	0	3	4	2	0	0	4	3	2	1
22	0	2	4	1	5	5	5	0	0	0	2	4	2	0	0	5	0	1	0	2	2	10	2	0	0	3	5	1	3	0	0	2	2	0	0	2	1	1	1
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24	0	0	0	0	0	0	1	1	0	0	0	0	0	2	1	0	1	2	1	0	0	0	0	10	7	0	0	0	1	1	0	0	0	1	1	0	0	6	0
25	1	0	0	0	0	0	1	1	1	2	0	0	0	5	2	0	1	1	2	0	0	0	0	7	10	0	0	0	1	1	0	0	0	1	1	0	0	4	0
26	0	1	0	0	2	6	2	0	0	0	1	4	1	0	0	3	0	6	0	1	1	3	0	0	0	10	5	2	5	0	2	0	0	0	0	0	4	1	0
27	0	2	3	0	4	7	4	0	0	0	1	2	1	0	0	5	0	2	0	2	2	5	1	0	0	5	10	2	2	0	1	0	2	0	0	1	2	0	0
28	0	6	4	2	3	1	3	0	0	0	8	3	7	0	0	4	0	1	0	6	3	1	3	0	0	2	2	10	1	0	5	3	5	0	0	3	6	1	2
29	0	1	1	1	1	3	4	0	0	0	1	2	1	0	0	2	1	6	0	1	2	3	2	1	1	5	2	1	10	0	3	0	1	0	0	0	2	2	1
30	3	0	0	0	0	0	0	1	2	0	0	0	0	1	5	0	4	0	8	0	0	0	0	1	1	0	0	0	0	10	0	0	0	0	0	0	0	1	0
31	0	5	3	3	1	1	1	0	0	0	4	2	3	0	0	1	0	3	0	4	3	0	4	0	0	2	1	5	3	0	10	3	2	0	0	3	4	1	3
32	0	3	5	7	4	0	1	0	0	0	3	3	2	0	0	2	0	0	0	3	4	2	5	0	0	0	0	3	0	0	3	10	4	0	0	7	4	1	4
33	0	4	5	5	2	1	3	0	0	0	4	2	5	0	0	4	0	0	0	5	2	2	4	0	0	0	2	5	1	0	2	4	10	0	0	4	3	0	4
34	1	0	0	0	0	0	0	1	0	6	0	0	0	1	0	0	4	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	10	8	0	0	1	2
35	2	0	0	0	0	0	0	2	2	6	0	0	0	2	0	0	2	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	8	10	0	0	1	2
36	0	3	2	5	3	1	2	0	0	0	3	5	2	0	0	3	0	0	0	5	4	2	7	0	0	0	1	3	0	0	3	7	4	0	0	10	4	1	4
37	0	3	3	2	3	2	3	0	0	0	5	2	4	0	0	1	0	3	0	4	3	1	3	0	0	4	2	6	2	0	4	4	3	0	0	4	10	2	2
38	0	1	2	0	1	0	2	0	0	0	2	2	1	1	0	0	0	2	1	2	2	1	2	6	4	1	0	1	2	1	1	1	0	1	1	1	2	10	1
39	1	3	3	4	2	0	1	3	2	4	2	2	1	1	0	2	0	2	0	3	1	1	3	0	0	0	0	2	1	0	3	4	4	2	2	4	2	1	10

Figure 6.18. Entire Similarity Matrix of Scenario II

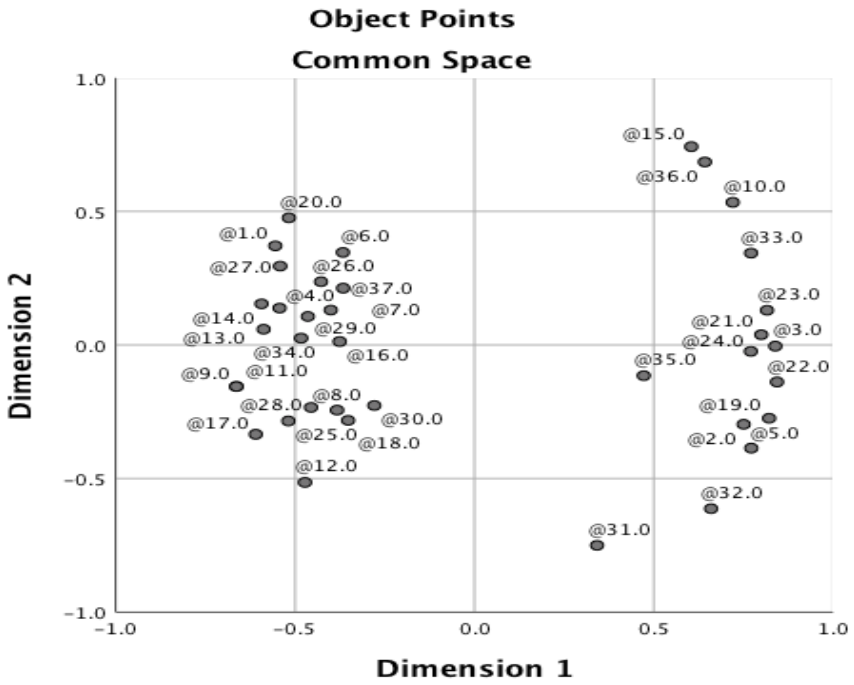

Figure 6.19. Object Points Map of Scenario I

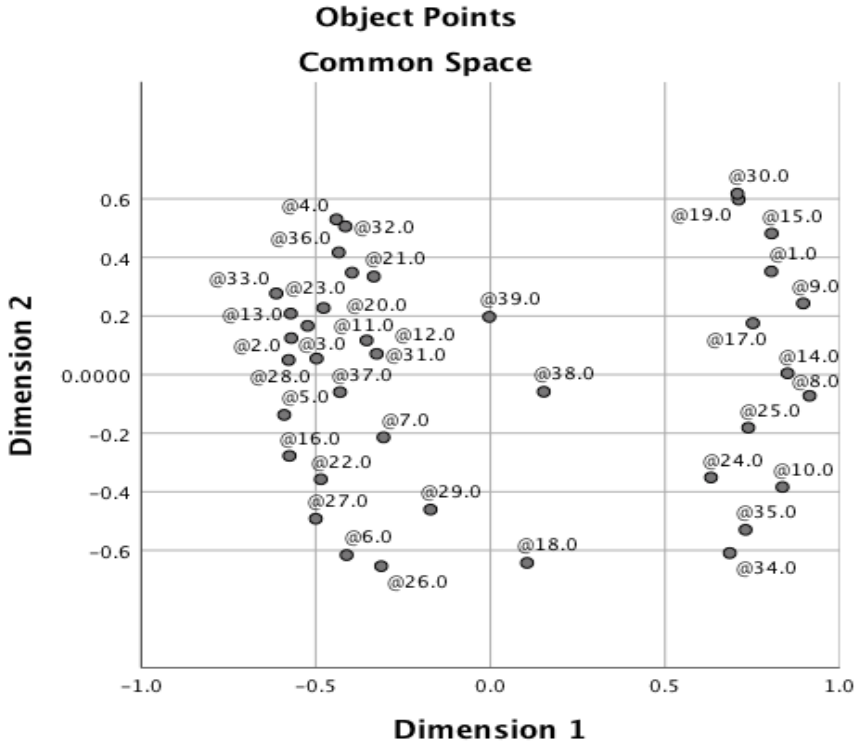

Figure 6.20. Object Points Map of Scenario II

Third, we conducted the hierarchical cluster analysis to group the points on the point map into clusters. Ward's algorithm, which gives more sensible and interpretable solutions (Kane and Trochim, 2007), is used to do the hierarchical cluster analysis. Figure 6.21 A. and B. show the dendrogram graph that was generated by SPSS hierarchical cluster analysis.

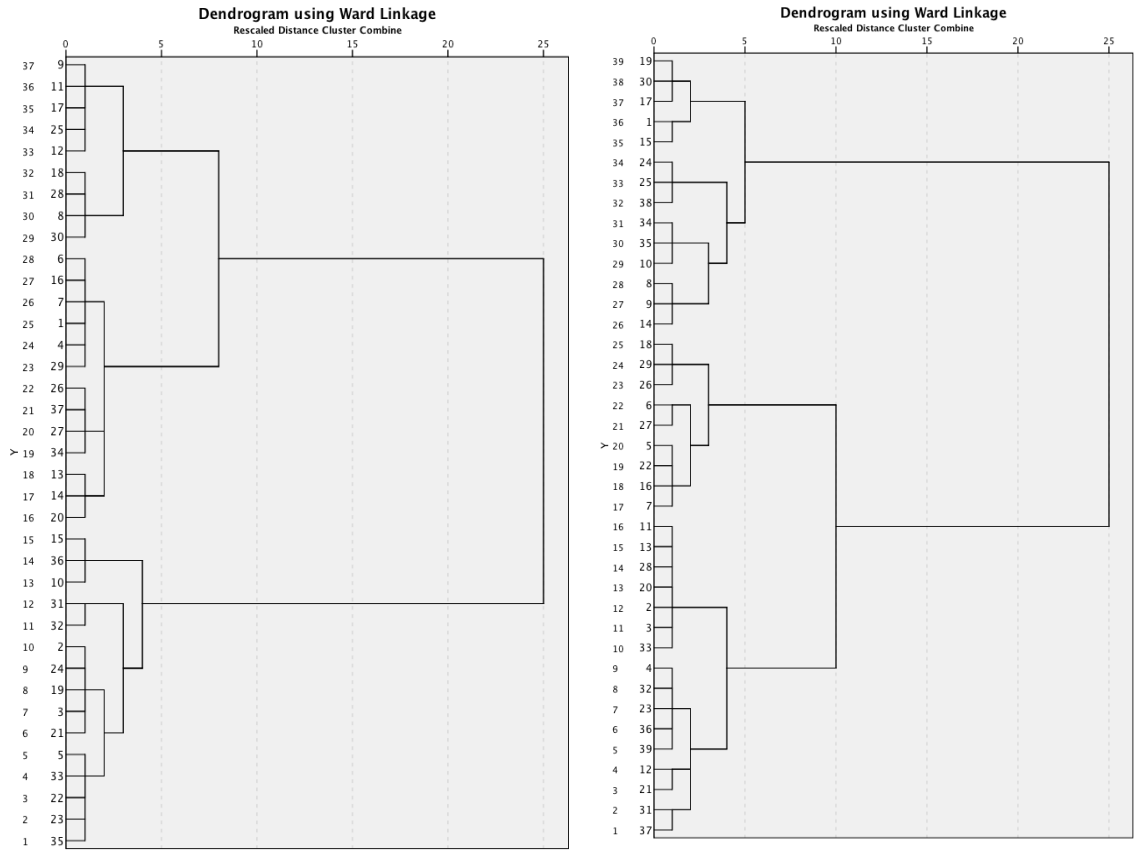

Figure 6.21. A) Dendrogram Graph of Scenario I and B) Dendrogram Graph of Scenario II

Fourth, we decided how many clusters we should have, and which statement should be in which cluster. Basically, the dendrogram graph and the point map are consistent. We combine some of the end sub-clusters in the dendrogram together according to the meanings.

For instance, in Figure 6.17 (2, 3, 19, 21, 23) and (5, 22, 23, 33, 35) are two sub-clusters, but all the statements indicate some way of making changes and being prepared. Thus, we put them in one cluster. In summary, we have 5 clusters for Scenario I and, 5 clusters for Scenario II, respectively, as shown in Table 6.9. and Table 6.10.

Table 6.9. Clusters for Statements of Scenario I

Clusters	**Statements**
1	2, 3, 5, 19, 21, 22, 23, 24, 33, 35
2	31, 32
3	10, 15, 36
4	1, 4, 6, 7, 13, 14, 16, 20, 26, 27, 29, 34, 37
5	8, 9, 11, 17, 18, 28, 25, 30

Table 6.10. Clusters for Statements of Scenario II

Clusters	**Statements**
1	1, 15, 19, 30
2	17, 24, 25, 38
3	8, 9, 10, 14, 34, 35
4	5, 6, 7, 16, 18, 22, 26. 27, 29
5	2, 3, 4, 11, 12, 13, 20, 21, 23, 28, 31, 32, 33, 36, 37, 39

The corresponding cluster graphs of the point map are as shown in Figure 6.22. and 6.23.

6.6.5. Interpreting Concept Maps. According to the meaning of each group's statements, we come up with a name for each cluster. For both scenarios, participants' feelings can be generally divided into two clusters, positive feelings, and negative feelings. The positive feelings include two clusters, positive reaction (can be divided into self-management and environmental change), and acceptance/adoption. The negative feelings

include negative emotions and giving up. We create a hierarchy model for each of the scenarios, as shown in Figure 6.24. and Figure 25.

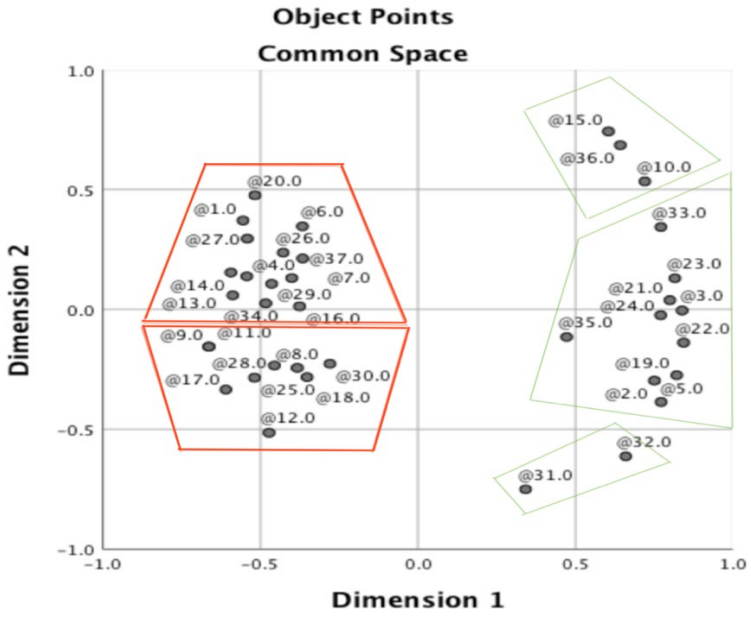

Figure 6.22. Cluster Map of Scenario I

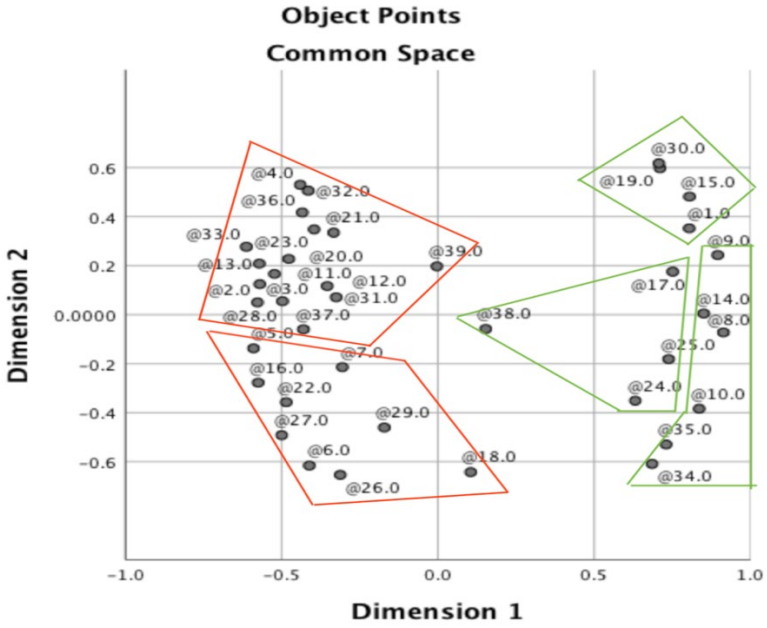

Figure 6.23. Cluster Map of Scenario II

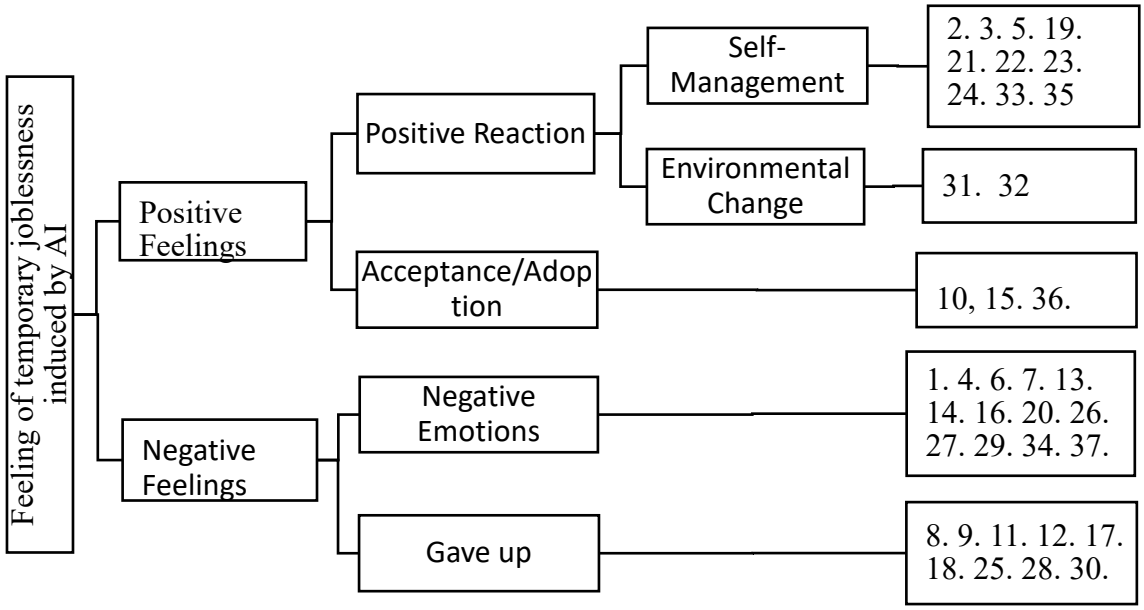

Figure 6.24. Hierarchy Model for Scenario I

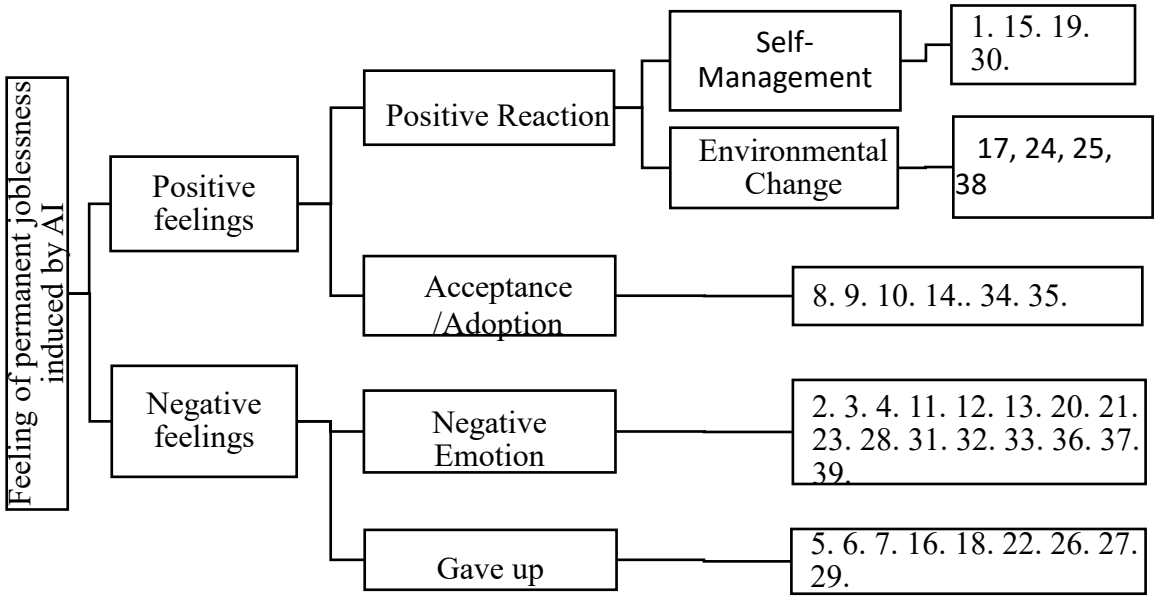

Figure 6.25. Hierarchy Model for Scenario II

6.6.6. Utilizing Concept Maps. In this step, we interpret the concept map, trying to find out the difference between the feeling of temporary joblessness and feeling of permanent joblessness induced by AI.

According to Section 6.6. we finally came up with two models. We compare these two models in Table 6.11. As we can see, no matter whether AI induces temporary or permanent joblessness, peoples' negative responses will have two stages. First, negative emotions will appear; most negative emotions are pretty similar, including frustrated, upset, sad, stressful, nervous, depressed, disappointed, worried, angry, and bad. The difference is that considering permanent joblessness, some participants mentioned feel confused and demoralized about the situation. Second, more extreme emotions of giving up will appear. Helplessness, hopelessness, uselessness, and aimlessness are common emotions for both scenarios. Considering permanent joblessness, some participants mentioned desperation and worry of becoming homeless.

On the contrary, participants with positive feelings have different responses. For Scenario I, some participants will accept and adopt the situation, believing that if AI can replace a human job, it's good for society and it will bring more convenience to human life. Other participants would like to have positive reactions, either relying on themselves by learning new skills and changing careers or believing in government and other organizations. For Scenario II, some participants will accept and adopt to the situation, because there will be no need to work, and since most people would be in the same situation, they believe it's a social problem rather than their own fault. Another response is to take positive reactions. On one hand, participants would like to do something to kill the time and make contributions, such as being a volunteer, developing new hobbies, and visiting friends. On the other hand,

participants could rely on others, either their friends and families, or the government. They believe that financial income is very important. If financial income is satisfied and people can survive, then everything should be ok.

The detailed information of participants' feelings toward temporary joblessness and permanent joblessness induced by AI is discussed in the following two sections.

Table 6.11. Comparison of Hierarchy Models of Scenario I Versus Scenario II

	Scenario I	Scenario II
Positive Feelings	Positive Reaction • Self-Management (actions toward finding a new job) • Environmental Change Acceptance/Adoption	Positive Reaction • Self-Management (actions toward solve the problems and developing hobbies) • Environmental Change Acceptance/Adoption
Negative Feelings	Negative Emotions Gave Up	Negative Emotions Gave Up

6.7. FEELING OF TEMPORARY JOBLESSNESS INDUCED BY AI

Figure 6.26 shows the word cloud of keywords according to the participants' comments about the feeling of temporary joblessness induced by AI. Words such as bad, upset, and sad appeared in high frequencies when participants had a negative attitude. Participants with a positive attitude toward the scenario believed that the situation was not that bad, because AI provides a chance for them to learn new things, improve their knowledge and skills as well as inspire them to work harder. Changing careers and being competitive are popular solutions to the problem. Need of financial income is also

mentioned a lot. They believe that without money, people will starve, be unable to afford their family, and lose their house and insurance, which keep them safe.

Figure 6.26. Feeling of Being Replaced by AI

6.8. FEELING OF PERMANENT JOBLESSNESS INDUCED BY AI

Figure 6.27 shows the word cloud of keywords from the participants' comments about the feeling of permanent joblessness induced by AI. Bad, depressed, helpless, desperate, upset and aimless, and useless are most frequently mentioned. Compared to the feelings showed in Figure 6.26, the negative emotions are even worse. On the one hand, some participants say that the situation has some good aspect. For instance, they can invest more time on other activities and develop new hobbies. Some participants believe that the government will take action and new lifestyles/solutions will be created before the scenario comes true.

Figure 6.27. Feeling of Being Jobless Permanently Because of AI

7. THEORETICAL AND PRACTICAL CONTRIBUTION

The research outcome shows that if temporarily unemployed, participants may feel bad, upset and sad. But they still have a passion to learn new things. Changing careers and being competitive are popular solutions to the scenario. If permanently unemployed, negative feelings such as depressed, helpless, aimless, and desperate emerge. Instead of trying to find a new job, participants will invest more time on developing new hobbies and visiting friends. Participants have beliefs in government behaviors. They believe new lifestyles and solutions to the problem will be created. For both scenarios, financial income is regarded as an essential factor. If financial income is satisfied and people can survive with it, people will have a better life and PWB.

One takeaway from this study is to set up an out-of-bounds marker, policies, and regulations for AI technology, making sure that the positive impact of AI is greater than the negative impact. For instance, the government may set up a ratio of automatic roles in a company.

Another contribution of this research is finding efficient ways to help maintain peoples' positive mental well-being with the onslaught of AI, especially for those who are unemployed and are not able to access higher education or job retraining. For instance, the Universal Basic Income is proposed to reduce poverty and increase equality among citizens.

8. LIMITATION AND FUTURE STUDY

One limitation of this study is that the majority of participants in this study are students who have an information science and technology background. They plan to work in the IT field and believe that they will be those who design, create, and control AI and robotic technology. For future studies, more subjects who are in other majors or fields of study should be recruited. Another limitation is the time and cost. With a longer study period or more interviews, more subjects could be recruited, especially those with work experience and a higher education level. We can obtain a more generalized outcome with more data.

9. CONCLUSION

Based on the results, we found that almost all the participants believe it is inevitable that AI will replace some human jobs, but they also believe that it is very hard for AI to take over jobs with high-level skills, such as an IT programmer, senior manager, and research professor, especially in the short term. Considering the geographic factors, the impact of age on PWB and Personal Growth, the impact of marital status on self-acceptance, and the impact of degree on PWB and Self-Acceptance are statistically significant. More Participants older than 25 tend to have positive PWB and personal growth. Less single participants than other participants have positive self-acceptance. More participants with Master and Ph.D. have positive PWB and self-acceptance. The impact of Gender is not significant.

When given the hypothetical scenario that AI will take over their jobs temporary, most participants feel bad, upset, and sad. Some participants see it as a good thing because it provides motivation and drives them to improve themselves, and they would like to learn new skills to get another job. Considering the permanent joblessness induced by AI, participants feel depressed, helpless, useless, aimless, and desperate. We can see that even though these are hypothetical scenarios, people start to feel bad and lose motivation and confidence.

APPENDIX A.

QUESTIONNAIRE

Part I. To what degree, do you agree or disagree with the following statements?

	Strongly Disagree (1)	Moderately Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Moderately Agree (5)	Strongly Agree (6)
Most people see me as loving and affectionate.	○	○	○	○	○	○
In general, I feel I am in charge of the situation in which I live.	○	○	○	○	○	○
I am not interested in activities that will expand my horizons.	○	○	○	○	○	○
When I look at the story of my life, I am pleased with how things have turned out.	○	○	○	○	○	○
Maintaining close relationships has been difficult and frustrating for me.	○	○	○	○	○	○
I voice my opinions, even when they are in opposition to the opinions of most people.	○	○	○	○	○	○
The demands of everyday life often get me down.	○	○	○	○	○	○
I live life one day at a time and don't really think about the future.	○	○	○	○	○	○
In general, I feel confident and positive about myself.	○	○	○	○	○	○

	Strongly Disagree (1)	Moderately Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Moderately Agree (5)	Strongly Agree (6)
I often feel lonely because I have few close friends with whom to share my concerns.	○	○	○	○	○	○
My decisions are not usually influenced by what everyone else is doing.	○	○	○	○	○	○
I do not fit very well with the people and the community around me.	○	○	○	○	○	○
I tend to focus on the present, because the future nearly always brings me problems.	○	○	○	○	○	○
I feel like many of the people I know have gotten more out of life than I have.	○	○	○	○	○	○
I enjoy personal and mutual conversations with family members or friends.	○	○	○	○	○	○
I tend to worry about what other people think of me.	○	○	○	○	○	○
I am quite good at managing the many responsibilities of my daily life.	○	○	○	○	○	○
I don't want to try new ways of doing things - my life is fine the way it is.	○	○	○	○	○	○

	Strongly Disagree (1)	Moderately Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Moderately Agree (5)	Strongly Agree (6)
Being happy with myself is more important to me than having others approve of me.	○	○	○	○	○	○
I often feel overwhelmed by my responsibilities.	○	○	○	○	○	○
I think it is important to have new experiences that challenge how you think about yourself and the world.	○	○	○	○	○	○
My daily activities often seem trivial and unimportant to me.	○	○	○	○	○	○
I like most aspects of my personality.	○	○	○	○	○	○
I don't have many people who want to listen when I need to talk.	○	○	○	○	○	○
I tend to be influenced by people with strong opinions.	○	○	○	○	○	○
When I think about it, I haven't really improved much as a person over the years.	○	○	○	○	○	○
Please select strongly disagree.	○	○	○	○	○	○
I don't have a good sense of what it is I'm trying to accomplish in life.	○	○	○	○	○	○

	Strongly Disagree (1)	Moderately Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Moderately Agree (5)	Strongly Agree (6)
I made some mistakes in the past, but I feel that all in all everything has worked out for the best.	○	○	○	○	○	○
I generally do a good job of taking care of my personal finances and affairs.	○	○	○	○	○	○
I used to set goals for myself, but that now seems like a waste of time.	○	○	○	○	○	○
In many ways, I feel disappointed about my achievements in life.	○	○	○	○	○	○
It seems to me that most other people have more friends than I do.	○	○	○	○	○	○
I enjoy making plans for the future and working to make them a reality.	○	○	○	○	○	○
People would describe me as a giving person, willing to share my time with others.	○	○	○	○	○	○
I have confidence in my opinions, even if they are contrary to the general consensus.	○	○	○	○	○	○

	Strongly Disagree (1)	Moderately Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Moderately Agree (5)	Strongly Agree (6)
I am good at juggling my time so that I can fit everything in that needs to be done.	○	○	○	○	○	○
I have a sense that I have developed a lot as a person over time.	○	○	○	○	○	○
I am an active person in carrying out the plans I set for myself.	○	○	○	○	○	○
I have not experienced many warm and trusting relationships with others.	○	○	○	○	○	○
It's difficult for me to voice my own opinions on controversial matters.	○	○	○	○	○	○
I enjoy being in new situations that require me to change my old familiar ways of doing things.	○	○	○	○	○	○
Some people wander aimlessly through life, but I am not one of them.	○	○	○	○	○	○
My attitude about myself is probably not as positive as most people feel about themselves.	○	○	○	○	○	○
I often change my mind about decisions if my friends or family disagree.	○	○	○	○	○	○

	Strongly Disagree (1)	Moderately Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Moderately Agree (5)	Strongly Agree (6)
For me, life has been a continuous process of learning, changing, and growth.	○	○	○	○	○	○
I sometimes feel as if I've done all there is to do in life.	○	○	○	○	○	○
Please select strongly agree.	○	○	○	○	○	○
I know that I can trust my friends, and they know they can trust me.	○	○	○	○	○	○
The past had its ups and downs, but in general, I wouldn't want to change it.	○	○	○	○	○	○
I have difficulty arranging my life in a way that is satisfying to me.	○	○	○	○	○	○
I gave up trying to make big improvements or changes in my life a long time ago.	○	○	○	○	○	○
When I compare myself to friends and acquaintances, it makes me feel good about who I am.	○	○	○	○	○	○
I judge myself by what I think is important, not by the values of what others think is important.	○	○	○	○	○	○
I have been able to build a lifestyle for myself that is much to my liking.	○	○	○	○	○	○

	Strongly Disagree (1)	Moderately Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Moderately Agree (5)	Strongly Agree (6)
There is truth to the saying that you can't teach an old dog new tricks.	○	○	○	○	○	○

Part II. Go through the following statements and click the circle that best describes your thoughts and feelings over the last two weeks.

	None of the time (1)	Rarely (2)	Some of the time (3)	Often (4)	All of the time (5)
I've been feeling optimistic about the future	○	○	○	○	○
I've been feeling useful	○	○	○	○	○
I've been feeling relaxed	○	○	○	○	○
I've been feeling interested in other people	○	○	○	○	○
I've had energy to spare	○	○	○	○	○
I've been dealing with problems well	○	○	○	○	○
I've been thinking clearly	○	○	○	○	○
I've been feeling good about myself	○	○	○	○	○
I've been feeling close to other people	○	○	○	○	○
I've been feeling confident	○	○	○	○	○
I've been able to make up my own mind about things	○	○	○	○	○
I've been feeling loved	○	○	○	○	○
I've been interested in new things	○	○	○	○	○
I've been feeling cheerful	○	○	○	○	○

Part III. Demographic questions

Q1 What is your age?
- Under 18
- 19 - 24
- 25 - 34
- 35 - 44
- 45 - 54
- 55 and above

Q2 What best describes your gender?
- Male
- Female
- Prefer not to answer
- Prefer to self-describe

Q3 What is your marital status?
- Single
- Married
- Windowed, divorced, or separated
- Prefer not to answer

Q4 What is the highest degree or level of school you have completed? (if you are currently enrolled in school, please indicate the highest degree you have received)
- Less than a high school diploma
- High school degree or equivalent
- Some college, no degree
- Associate degree
- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate or higher

Q5 What is your current employment status?
- Student
- Employed full time (40 or more hours per week)
- Employed part time (up to 39 hours per week)
- Unemployed and currently looking for a job
- Unemployed and not currently looking for a job
- Retired
- Self-employed or homemaker
- Unable to work

Q6 If you are currently a student, what is the degree you are currently pursuing?
- Less than a high school diploma

- High school degree or equivalent
- Some college, no degree
- Associate degree
- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate or higher
- Not applicable

Q7 If you are currently a student, what is the major you are currently pursuing?

Q8 If you are currently a student, what would likely be your first job after your graduation?

- Professional occupations
- Managerial and Technical occupations
- Skilled non-manual occupations
- Skilled manual occupations
- Partly-skilled occupations
- Unskilled occupations
- Not applicable

Q9 If you are currently employed, what is your industry?

Q10 If you are currently employed, what is your occupation/profession?

Q11 If you are currently employed, what is the skill level of your job?

- Professional occupation
- Managerial and Technical occupation
- Skilled non-manual occupation
- Skilled manual occupation
- Partly-skilled occupation
- Unskilled occupation
- Not applicable

Q12 What is your annual individual income before taxes?

- Less than $24,999
- $25,000-$49,999
- $50,000-$74,999
- $75,000-$99,999
- Over $100,000
- Prefer not to answer

Q13 What is your annual household income before taxes?

- Less than $24,999
- $25,000-$49,999
- $50,000-$74,999
- $75,000-$99,999
- $100,000 - $149,999
- Over $150,000
- Prefer not to answer

APPENDIX B.

INTERVIEW

Q1 What is your understanding of AI?

Q2 What is your perspective of the future capability of AI?

Q3 What is your view of AI taking over some jobs in the future?

Q4 Are you concerned about AI taking over some jobs in the future?

Q5 Are you concerned about AI taking over your job in the future?

Q6 Do you see the possibility that AI may take over your job in the future?

Q7 How would you feel if your job is taken over by AI in the future?

- o Would you still be self-determining and independent, evaluating yourself by personal standards rather than social pressure? Why?
- o Would you still be competent in managing the environment (e.g., everyday affairs)? Why?
- o Would you still be open to new experiences, with the sense of realizing your potentials? Why?
- o Would you keep warm satisfying, trusting relationships with others, being capable of strong empathy and intimacy? Why?
- o Would you have goals in life and a sense of directedness? Why?
- o Would you possess a positive attitude toward yourself, not disappointed with what has occurred in your life? Why?

Q8 How would you feel if you are jobless permanently (can't find job anymore) in the future because of AI?

- o Would you feel optimistic about the future? Why?
- o Would you feel useful? Why?
- o Would you feel relaxed? Why?
- o Would you feel interested in other people? Why??
- o Would you feel good about yourself? Why?
- o Would you feel confident? Why?
- o Would you be interested in new things? Why?
- o Would you feel happy? Why?
- o Would you lose much sleep over worry? Why?
- o Would you feel constantly under stress? Why?
- o Would you be able to overcome difficulties? Why?
- o Would you be able to enjoy day-to-day activities? Why?
- o Would you be able to face problems? Why?
- o Would you feel unhappy and depress? Why?
- o Would you lose confidence? Why?
- o Would you think of yourself as worthless? Why?

Q9. If you are jobless (because of AI), how would it affect your physiological needs (e.g., food, water, warmth, and rest)?

Q10. If you are jobless (because of AI), how would it affect your safety needs(e.g., security and safety)?

Q11. If you are jobless (because of AI), how would it affect your belongingness and love needs (e.g., intimate relationships, friends)?

Q12. If you are jobless (because of AI), how would it affect your esteem needs (e.g., prestige and feeling of accomplishment)?

Q13. If you are jobless (because of AI), how would it affect your self-actualization/self-fulfillment (e.g., achieving one's full potential, including creative activities)?

Q14 How can you prepare yourself for the future where AI is going to take over some jobs?

Q15 Comparing to other unemployment reasons (e.g., bankrupt, global economic crisis), what's the difference of being unemployed because of AI?

Q16 What tasks would you like a future robot to be able to carry out?
What tasks do you prefer a future robot to be able to carry out?

Q17 How controllable, predictable and considerate should a future robot be?

Q18 How human-like should the robot appear, behave and communicate?

Q19 What is your opinion on future work (i.e., the impact of AI on jobs, skills, and wages)?

Q20 What is your opinion on the future of humanity (i.e., will humans be better or worse because of AI)?

Q21 What is your opinion on the future of society (i.e., will society be better or worse because of AI)?

APPENDIX C.

STATEMENT OF SCENARIO I AND II

Table C. Statement of Scenario I and II

Statement of Scenario I	Statement of Scenario II
1. Frustrated	1. Have new hobbies
2. Change career	2. Bad
3. Invest time in other activities	3. Feel terrible
4. Feel terrible	4. Angry
5. Need financial income	5. Desperate
6. Stressful	6. Aimless
7. Nervous	7. Useless
8. In trouble	8. Cool
9. Helpless	9. No need to work
10. Enjoy life	10. Everyone is the same so no need to worry
11. Hopeless	11. Sad
12. Life is meaningless	12. Confused
13. Bad	13. Upset
14. Sad	14. Will get used to it
15. Celebrate AI's advances	15. Invest time in other activities
16. Scary	16. Helpless
17. Useless	17. New way of life and regulations may be implemented by government before AI takes over my job
18. Education and effort wasted	18. I'm incompetent
19. Do something different	19. Do something different
20. Upset	20. Depressed
21. Learn new things	21. Stressful
22. Self-Reflection	22. Homeless
23. Be prepared	23. Worried
24. Be competitive and marketable	24. Rely on family and friends
25. Aimless	25. Need Financial income
26. Anxious	26. Lost the motivation to learn anything
27. Depressed	27. Hopeless
28. Loss confidence	28. Disappointed
29. Angry	29. Loss track of time
30. Not secure	30. Do something to solve the problem
31. University changes direction	31. Not fun
32. Organization provides job retraining	32. It's scary
33. Save money in advance	33. Frustrated
34. Disappointed	34. It's society problem
35. Need time to adapt	35. Not my fault
36. Better for the society	36. Nervous
37. Worried	37. Demoralizing
	38. Affect my independence
	39. It's pretty chilly

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VITA

Weiyu Wang received her Master of Science degree in Information Science and Technology at Missouri University of Science and Technology in July 2019. She was interested in the impact of artificial intelligence (AI) on economy, society, and human mental well-being. She was also interested in the governance, ethical issues, and trust issues that related to AI. In addition to her Master of Science degree in Information Science and Technology, she received a Master of Business Administration degree from the Missouri University of Science and Technology in July 2015.