EXPECTANCY, PERCEIVED BENEFIT AND PERCEIVED COST OF NEW TECHNOLOGY: SCALE DEVELOPMNET IN THE CONTEXT OF CHINESE TEXTILE AND APPAREL FIRM MANAGERS

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APPROVAL PAGE

The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled

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ABSTRACT

The textile and apparel industry have been fundamentally changed due to technology development. However, developing countries are falling behind for adopting new technologies, such as China. To explore factors that may influence motivation to adopt new technology, firm managers' expectancy, perceived benefit and perceived cost of new technology were addressed in this study. However, future literation examination suggested a lack of proper and relevant scales to measure such concepts. Thus, to clearly and effectively understand factors that may influence Chinese T&A firm managers' motivation to adopt new technology, this study was designed to develop scales that measure firm managers' expectancy, perceived benefit and perceived cost of new technology adoption. The psychometric method of item response theory was used as the data collection and analysis paradigm for the research. After item generation, item bank development, and psychometric evaluation by 599 Chinese textile and apparel firm managers, valid and reliable scales of firm managers' expectancy, perceived benefit and perceived cost of new technology were built. The three scales provide a holistic view of firm managers' concerns in the decide-making process of new technology adoption, which would help research Chinese T&A firm managers' motivation to adopt new technology and guide textile and apparel industry upgrades in China.

CHAPTER I. INTRODUCTION

Chapter I includes the following sections: (a) background of the study, (b) gaps in literature, (c) purpose of the study, and (d) significance of the study.

Background of the Study

Development of the Textile and Apparel Industry

The textile and apparel (T&A) industry has been one of the industry sectors that be significantly influenced by technology development. Before the 18^{th} century, clothing manufacturing was performed by individual workers at home for their families' needs (Wilson, 2002). The first Industrial Revolution (or Industry 1.0), which introduced water and steam power in manufacturing during the late 18^{th} century, made mechanized production possible. Factories, instead of individuals, started making yarn, fabrics, and clothing, and the T&A industry was created (Ha-Brookshire, 2017; Wilson, 2002).

The second Industrial Revolution (or Industry 2.0), based on utilizing the power of electricity, oil, and gas during the early 20^{th} century, brought about innovations in communication, transportation, and manufacturing. Electrically-powered tools, such as power looms and ring spinning, replaced manual or animal-forced tools, and dramatically expanded the scale of T&A manufacturing (Mokyr, 1998). This essentially created mass production systems.

The third industrial revolution (or Industry 3.0) started during the mid-20^{th} century and is still occurring. During this era, the rise of computers and digital technology has been highlighted, making automation of production processes popular. Computer-assisted software, automated production systems, and a whole range of

Internet-based services have radically changed the T&A industry (Abnett, 2016). This phenomena also caused T&A supply chains (i.e., sets of companies from a source to a customer linked by flows of products, services, finances, and information) to be fragmented and globalized (Dicken, 2015). The improvements in the speed and relative costs of transportation and communication have continued to drive the geographical shifts of T&A industry activities, and have drawn more developing countries into T&A businesses. The T&A industry has become the pillar industry of the national economy in many countries, such as China and Bangladesh (Dicken, 2015).

Recently, a group of researchers claimed that the fourth Industrial Revolution (or Industry 4.0) is coming (Rüßmann et al., 2015; B. Wang & Ha-Brookshire, 2018). Industry 4.0 focuses on a constellation of new innovations across the physical and digital worlds, from cloud computing and cyber-physical systems to the Internet of Things (IoT) and big data analysis techniques, driving a new wave of smart manufacturing and smart factories in all industries (Hermann, Pentek, & Otto, 2016). Researchers and industrial practitioners believed that the T&A industry, in particular, would benefit from the usage of these advanced technologies in Industry 4.0 (Abnett, 2016; B. Wang & Ha-Brookshire, 2018). Some attempts have already been made in the T&A industry toward employing new techniques and working solutions. For instance, Intelligence Node, a global retail analytic company, provides real-time and insightful information to help forecast fashion trends by utilizing big data analysis techniques to track 1 billion fashion products from more than 130,000 brands globally (Cooper, 2017). Optitex (2017), a fashion software company, also developed Solutions for Product Development (SPD), which uses a digitized-optional module and 3-dimensional (3D) sample suites to create digital samples of T&A products.

However, the rates of acceptance or adoption of these new industrial activities vary. For example, as one of the most significant results of Industry 3.0, greater division has emerged between developed and developing countries in the global T&A industry. The T&A industry in developed countries is more involved in knowledge-intensive, technology-intensive and capital-intensive activities, than in some developing countries where labor-intensive activities, focusing on manual, simple and repetitive tasks, are more prevalent (Stone & Farnan, 2018).

Further, with the development and use of new technologies in developed countries, the T&A business in developing countries could lose its cost advantage and fall even further behind if business in these countries can not adopt new innovations and technologies appropriately and effectively. For example, according to the National Bureau of Statistics of China (2015), China's average labor cost in T&A industry has risen by an average of 14% each year from 2000 to 2014, reaching 2.6 US dollars per hour in 2015. This could create a severe impact on the Chinese T&A industry as buyers from developed countries may shift their orders to other low-wage countries. At the same time, Chinese workers may have to compete against advanced technologies for their jobs. For example, Softwear Automation, an Atlanta-based firm that develops automated tools for apparel factories, said that its new invention—sewbots, would be used in one clothing factory in Arkansas, rather than using manual labors in China, even though the holding company of the factory is from China (Emont, 2018). The sewbots is an automatic sewing robot that can replace all sewing workers in factories, and the cost for production per t-shirt in the United States is even as low as in Bangladesh with human workers (Bain, 2017). The International Labor Organization also warned that robots would replace 64% of textile, clothing, and footwear workers in Indonesia, 86% in Vietnam, and 88% in Cambodia (Chang, Rynhart, & Huynh, 2016). Thus, developing countries must hurry to upgrade their T&A activities to reflect the technological advancement, and to get ready for the technology-intensive future. China, as the largest developing country in the world, is facing the same challenge.

Textile and Apparel Industry in China

China is the world's largest textile and apparel producer and exporter, with the most complete supply chain and for the most complete product categories (Gereffi & Frederick, 2010). After 70 years' development, the T&A industry has been one of the pillar industries of the national economy in China (China National Textile and Apparel Council, 2016; R. Sun, 2017).

Before the reform and opening up of China in 1978, T&A manufacturing was mainly based on the State plans, and the State monopolized the purchase and marketing of T&A products. The domestic T&A market was in short supply, and China was rarely participating in the global T&A business (Lian, 1994). In 1978, China began to implement the reformation and open-economy policy. The T&A industry was prioritized and listed as one of the three pillar industries in need of development. Social capital and oversea investments were introduced and the T&A market began to perk up (Lian, 1994; Zhang & Xu, 2000).

In 1979, there were 7,418 T&A firms in China, producing 740 million pieces of clothing. By 1997, the number of T&A firms increased to 45,000 and the annual output reached 9.7 billion pieces, ranking first in the world. The made-in-China clothing was exported to 130 countries and regions, and the exports reached 31.8 billion US dollars, which ranked first in the world as well (Almanac of China's Textile Industry Council, 1999).

Later, China joined the World Trade Organization in 2001 and the global textile and apparel quota system was ended in 2005, significantly boosting the growth of China's T&A industry. By 2015, there were 975 million T&A enterprises operating above designated size (whose annual income is more than 20 million RMB—around 3 million US dollars), and the T&A exports reached 291.2 billion US dollars, accounting for 38% of the global T&A trade value. As of today, China maintains the first place in global T&A businesses in terms of economic activities (Almanac of China's Textile Industry Council, 2016).

However, as the cost of labor, land, raw materials, and energy continues to rise, and with fluctuating exchange rates, China's T&A industry, which has been based on low cost, has been gradually losing its competitive advantage (Gereffi & Frederick, 2010; R. Sun, 2017). International orders have shifted to Southeast Asia and other countries with cheaper labor and raw materials, and the growth of T&A trade has slowed down. Practitioners point out that low cost-driven development cannot be sustainable for China's T&A industry (R. Sun, 2017).

Therefore, researchers argue that an innovation-driven T&A industry must be planned for the future. Alerted by the coming trends of Industry 4.0, the Chinese government has realized that automatic and smart manufacturing should be the goal of new industrial development (Yue, Cai, Yan, Zou, & Zhou, 2015; Zhong, Xu, Klotz, &

Newman, 2017). In order to guide and speed up such transformation processes, the Chinese government has released a series of policies, such as *Made in China 2025* (State Council of the People's Republic of China, 2015a), *Promote "Internet +" action in China* (State Council of the People's Republic of China, 2015b), the *13th Five-Year Plan for Economic and Social Development of the People's Republic of China* (Central Committee of the Commonist Party of China, 2016), and *Smart Manufacturing Development Plan (2016-2020)* (Ministry of Industry and Information Technology of the People's Republic of China, 2016a).

The T&A industry, working as one of the most important industry sectors in China, also established the goal of digitization and intellectualization by 2025 (R. Sun, 2017). The *Textile Industry Development Plan* (Ministry of Industry and Information Technology of the People's Republic of China, 2016b) noted that China's T&A industry should change the development mind set from being low cost-driven to innovation-driven, and that it should employ the new generation of technologies, such as cloud computing, big data analysis techniques, and IoT. Specifically, the Plan requires smart equipment, smart operation and smart products in the T&A industry. Smart equipment means that the equipment used in the T&A industry should be automatic, digitally controlled, real-time online monitored, and self-adaptive, thus replacing human labor and increasing productivity (R. Sun, 2017).

Smart operation includes smart production and smart management, according to the *Plan*. The former asks for building smart production lines and digital factories in the T&A industry, and the latter refers to the integration of all the supply chain functions with information technologies, such as remote customization, cooperative production, and remote monitoring, to establish the cloud factory and e-commerce, and to meet the consumers' needs in all of the design, production and service processes (R. Sun, 2017).

The *Plan* stipulates that smart products have direct application of information technologies for T&A products, such as combining advanced sensors, communication devices, and artificial intelligence technology with textile technology (R. Sun, 2017). These products can be used in sports, health care, the military, aerospace technology and so on (R. Sun, 2017). To sum up, China has made its plan for T&A industrial upgrading, and a digital, smart and technology-intensive T&A industry is expected.

Challenges for the Chinese Textile and Apparel Industry

However, there are still huge challenges for China's T&A industry to be ready for Industry 4.0. First, the majority of the current T&A industry activities are labor dependent, not technology dependent. The T&A industry in China is mainly located upstream on the global supply chain, still focusing on simple production and assembly. Thus, it is labor-intensive and relies heavily on cheap labor resources. According to the National Bureau of Statistics of China (2017), the T&A industry has the largest employment share in China with about 20 million people working in all kinds of T&A firms as of 2016, accounting for 13% of the whole quantity of employment in all industry sectors. Meanwhile, high-tech usage is at a low level in China's T&A industry. China's T&A industry lacks innovation in products and technologies. There are still a large number of human workers, rather than smart tools and machines, engaging in basic spinning, marking, cutting, sewing, ironing, and packaging processes (Ministry of Industry and Information Technology of the People's Republic of China, 2012).

Second, T&A employees' education level is low, and the new generation of professional and technical personnel are in short supply in China's T&A industry. According to the China National Textile and Apparel Council (2013), 70.7% of workers in T&A factories only have secondary education certificates. Inadequate knowledge reserves would make the employees' competency below the high-tech working environment requirement (B. Wang & Ha-Brookshire, 2018; N. Wang, Sun, & Liu, 2018). Moreover, the existing professional and technical personnel are used to traditional working methods and have limited understanding of the high-tech working environment (Yang, 2010). They rely on their own experience and simple tools, and are slow in adopting new technologies in the workplace, which may force them out of the workplace in Industry 4.0 (B. Wang & Ha-Brookshire, 2018). For example, the future T&A industry would broadly use 3D scanning, digital measuring, digital drawing, and computer-assisted pattern making and marking technologies in the product development and manufacturing process (R. Sun, 2017), asking for the future workforce to not only have an understanding and ability to apply these technologies, but also digital data analysis ability and man-machine interaction ability (B. Wang & Ha-Brookshire, 2018).

Third, T&A employers' motivations toward new technology adoption are also questionable. Today's Chinese T&A firms are used to producing products for the orders that they receive from foreign buyers (Deng & Li, 2015; F. Wang & Guo, 2014). For a long time, Chinese T&A manufacturers were engaged in Owner-Equipment-Manufacturing (OEM) businesses, with limited motivation for innovation or technical upgrades (Deng & Li, 2015; L. Sun, Chen, & Wang, 2010). As the market became more competitive and they faced the loss of cost advantage in the T&A business, some firm owners expanded firm scale without any strategic plans. They tried to increase the quantity of products to make up for the loss of profits in each unit (China Daily, 2016). However, this type of investment caused the waste of resources and created vicious competition (Han, Gao, Wang, Qi, & Wang, 2011; F. Wang & Guo, 2014). Thus, R. Sun (2017) pointed out that China's T&A industry would be unable to develop sustainably if it only depends on production quantity and scale expansion, rather than shifting production mode, making rational use of resources, and improving technical efficiency. The firm owners in an innovation-driven T&A industry should make prudent investment strategies to deal with the fierce competition and low operating profits, and carefully assess the return on investment for new technology and adopt it for their strategic goals (R. Sun, 2017; Yang, 2010). In this light, one might say that China's T&A industry is currently battling between old and new paradigm toward new technology adoption, which is one of the key bottlenecks in the industry's overall new technology adoption rates.

Gaps in Literature

Despite the extensive awareness of and the need for understanding related to new technology adoption in China's T&A industry, research on Chinese T&A firm managers' motivation to adopt new technologies is limited. Most research on new technology adoption in China's T&A industry focuses on: (a) calling for new technology and technology updates (e.g., Y. Cheng (2015) analyzed the problems and challenges existing in China's T&A industry, and pointed out that firms need to update technologies to gain and keep competitiveness); (b) exploring feasibility of implementation of new technology (e.g., Chen, Shi, Chen, Xue, and Bao (2012) introduced the concept and principle of IoT and cloud manufacturing technology, and discussed the possibilities of adopting them in

China’s T&A industry); (c) reviewing technology updating processes in the other countries and areas (e.g., Zhao (2011) reviewed the technology updating process in Japan’s T&A industry and claimed that China’s T&A industry should refer to Japan’s experience); (d) framing the route map of technology updating (e.g., J. Lin and Cui (2013) assessed the current industry technical resources and market demands, and proposed the directions and goals for technology development in China’s T&A industry), and (e) investigating the environmental factors that could influence firms’ technology adoption (e.g., Gao (2011) compared the difference in firms’ innovation capacity in various regions, to study the geographic factors that influence firms’ technology adoption). However, limited research has been conducted to study firm managers’ motivation and its influential factors, even though firm managers would play an important role in the decision-making process of technology adoption.

The lack of such research may be explained by the lack of valid scales to measure motivation factors that may impact T&A firm managers’ motivation or willingness to adopt new technology in their firm. Currently, diffusion of innovation (DOI) (Rogers, 1962, 1995, 2003), technology, organization, and environment framework (TOE) (Tornatzky & Fleischer, 1990), and technology acceptance model (TAM) (Davis, 1989) are the three most addressed technology adoption theories. They seek to explain how and why new ideas and technology spread through social systems (e.g., DOI), or provide a comprehensive look at critical firm contexts that could influence the adoption and implementation of innovations in a firm (e.g., TOE), or illustrate how individual end-users come to accept and use a technology (e.g., TAM). The characteristics, contexts or factors addressed in these theories have provided insightful understanding of technology adoption behavior; however, researchers argued that the explanatory power of these characteristics, contexts or factors are inconsistent when facing various organizational and technological contexts (Baker, 2012; Zmud, 1982), which may make the use of these theories problematic for analyzing the diverse new technology adoption situations in China's T&A industry. In addition, existing characteristics, contexts or factors have been explained by various constructs and tested by inconsistent instruments, suggest a lack of clarity and consensus in the understanding of motivation factors of technology adoption. All of these indicate a lack of valid scales to measure motivation factors, which could be used to study firm managers' motivation to adopt new technology in their firms.

Purpose of the Study

To fill these gaps in the literature, the study was designed to develop scales that are valid and reliable in measuring firm managers' motivation factors (i.e., expectancy, perceived benefit and perceived cost) which may influence their motivation to adopt new technology in their firms.

To meet the purpose of the study, a three-stage approach, namely item generation, item bank development, and psychometric evaluation was used. First, in the item generation stage, the theoretical framework of expectancy-value theory (EVT) was employed for its broad use in human behavior and choice making research. According to EVT, expectancy, perceived benefit and perceived cost were the three concepts that were deemed to influence humans' motivation to do one task, and they were adopted in this research as the motivation factors that may influence firm managers' motivation to adopt new technology in their firms. Instruments used to measure expectancy, perceived benefit and perceived cost in previous EVT research were identified and included in the initial item pools for measuring firm managers' expectancy, perceived benefit and perceived cost of new technology. In addition, factors that may influence humans' technology adoption intentions were also identified by reviewing technology adoption literature. The description of these factors was compared with the concepts of expectancy, perceived benefit and perceived cost, and factors that may have association with expectancy, perceived benefit and perceived cost were filtered. Items used to measure these associated factors were accordingly included into the initial item pool as well. Second, in item bank development stage, items in initial item pools were reviewed, assessed, adopted and adapted by a series of qualitative item bank development process, to ensure they could fully reflect the structure of firm managers' expectancy, perceived benefit and perceived cost of new technology. Finally, in psychometric evaluation stage, the item banks' psychometric properties, reliability and validity were quantitatively assessed by targeted population. After iterative analysis and item elimination, the final scales of firm managers' expectancy, perceived benefit and perceived cost were developed.

Significance of the Study

It is important to understand firm managers' expectancy, perceived benefit and perceived cost of new technology in China's T&A firms, especially when Chinese T&A industry is preparing to shift from Industry 3.0 to Industry 4.0 and numerous new technologies are expected to be adopted in China's T&A firms. Since the firm managers have the dominated power in firms' decision-making processes, understanding their expectancy, perceived benefit and perceived cost of new technology would help clarify their motivation to adopt new technologies, as well as help predict firms' new technology adoption behavior. However, a lack of proper and relevant scales to measure such concepts was observed in the literature. Thus, to clearly and effectively understand factors that may influence firm managers' motivation to adopt new technology, this study was designed to develop reliable and valid scales that measure firm managers' expectancy, perceived benefit and perceived cost of new technology.

The developed scales would first fill the critical gap in the literature to measure firm managers' expectancy, perceived benefit and perceived cost of new technology. The factors or characteristics highlighted in current technology adoption literature were argued to have inconsistent explanatory power in answering humans' technology adoption intention or motivation, when faced with various organizational and technological contexts (Baker, 2012; Zmud, 1982), and they were deemed to lack clear and identical understanding by researchers as well. Thus, the need for reliable and valid scales to measure factors that may impact firm managers' motivation or intention to adopt new technology in their firm was aroused. The three scales generated in this research filled this need and they were completely new. The scales were guided by the framework of EVT, and created and assessed following one psychometric method, namely, item response theory. A qualitative item generation process and a quantitative psychometric evaluation process worked together to ensure the reliability and validity of the three scales. Internal structure of each scale was identified and verified as well. These three scales would provide in-depth understanding of firm managers' concerns in the decision-making process of new technology adoption and would help academics gain insights of the antecedents or factors that may influence firm managers' motivation or intention to adopt new technology.

Second, the three scales would help gauge firm managers' motivation to adopt new technology. Within the framework of EVT, the three scales were found significantly correlated with the firm managers' motivation to adopt new technology in their firm. Particularly, managers' expectancy and perceived benefit of new technology has a positive association with their motivation to adopt new technology, while their perceived cost of new technology has a negative association with their motivation. Thus, firm managers' expectancy, perceived benefit and perceived cost would be worked as three key antecedents to research their motivation to adopt new technology. The items in each scale would also be employed in practice to assess and promote firm managers' motivation to adopt new technology.

Third, the findings in this research provide a clear picture of firm managers' concerns of new technology, which would benefit the T&A firm manager, employee, and technology provider for being prepared in the technology-intensive working environment. With the addressed concerns, T&A firm managers would be aware of the requirements of adopting new technology. They could use scale items as reference to detect if their firm is ready for adopting new technology, and to accordingly adjust their management strategies and improve firms' readiness for potential new technology adoption. As implied in these scales, employees may possess certain knowledge and abilities to work with new technology. This could guide employees to be qualified with new technology requirements. Technology providers could also address firm managers' concerns within new technology development, offering desired technology attributes and functions, to promote the usage and distribution of new technology.

Finally, items in the scales could help government make precise policies or plans to promote new technology adoption in China’s T&A industry. Government could offer pointed services or programs to relieve firm mangers’ concerns of financial and human resources. Educational institutions may also be able to add relevant support courses and training programs in their curriculum, to help qualify the future workforce to smoothly adapt the technology-intensive workplace in their future careers. All of these would also hasten the industrial upgrade process.

CHAPTER II. LITERATURE REVIEW

The literature review section includes the following: (a) theoretical frameworks of the study, and (b) item generation for firm managers' expectancy, perceived benefit and perceived cost of new technology.

Theoretical Frameworks for the Study

Expectancy-value theory is employed as the grand theory that helps develop appropriate scales to measure textile and apparel firm managers' expectancy, perceived benefit and perceived cost of new technology. In addition, diffusion of innovation and technology acceptance model are discussed as they could offer more in-depth insights into factors that may affect technology adoption behavior.

Expectancy-Value Theory

Despite the various constructs posited by psychologists to explain how human behavior is created and motivated, expectancy-value theory (EVT) has been one of the most important, long-standing and vibrant views on explaining humans' attitude, choice, persistence, and performance of behavior (Feather, 1992a; Nagengast et al., 2011; Vansteenkiste, Lens, De Witte, & Feather, 2005; Wigfield & Eccles, 2000). John Atkinson developed EVT in the 1950s and 1960s in an effort to understand the achievement motivation of individuals. He believed that behavior involves motives, expectancy and value. Motives refers to a disposition to strive for a certain success; expectancy refers to individuals' anticipations that a particular consequence (either success or failure) would follow their action, and value refers to the relative attractiveness of succeeding on a task (Atkinson, 1957, 1958, 1964; Atkinson & Feather, 1966). EVT suggested that if an individual's expectancy of doing one action successfully and the perceived value of doing the action are both high, then the individual would have a high motivation to perform that action. That is, when more than one behavior is possible, the behavior chosen would be the one with the largest combination of expected success and perceived value.

Since the 1950s, EVT has been used in many empirical studies. One of the most important works was done by Eccles and her colleagues (Eccles et al., 1983; Eccles & Wigfield, 2002; Wigfield, 1994; Wigfield & Cambria, 2010; Wigfield & Eccles, 2000) who expanded Atkinson's EVT and developed modern expectancy-value model. In their work, Eccles et al. (1983) defined expectancy as an individual's belief about the probability for success at a specific task. Two main components were addressed in the concept of expectancy as (a) ability belief and (b) expectancy for success (Eccles et al., 1983). Ability beliefs are defined as individuals' evaluations of their competence in a given domain, and expectancy for success is defined as individuals' beliefs about how well they would expect to do on upcoming tasks. However, their following empirical work revealed that the two components show very high inter-correlations, and therefore, ability belief and expectancy for success can be collapsed into a single construct (Eccles & Wigfield, 1995; Eccles & Wigfield, 2002). In addition, they admitted that these two components are similar with and measured in a manner analogous to measures in Bandura's (1997) efficacy expectation construct. Here, efficacy expectation refers to individual's perception of his or her current competence at a given activity, or the individual's belief that he or she can accomplish the given activity (Bandura, 1997). Thus, the discussion of efficacy expectancy or ability efficacy has held an important position in the understanding of expectancy in Eccles' framework of EVT.

Next, to explain the concept of value, Eccles et al. (1983) used the term "subjective task values" to describe how important, useful, or enjoyable the individual perceives the task. They identified four components of subjective task value, which are attainment value, intrinsic value, utility value, and cost (Eccles et al., 1983; Eccles & Wigfield, 1992). In their definitions, attainment value refers to the perceived importance of doing well on a given task. For example, an individual would prefer engaging in one activity as it could provide the opportunity to demonstrate the individual's actual or ideal self-schema, and/or competence. Intrinsic value refers to the enjoyment individual gains from doing the task, or the subjective interest the individual has in the subject. It reflects the intrinsic reason, such as interest or enjoyment, to do a certain task. Conversely, utility value refers to how a task fits into an individual's future plans, emphasizing the extrinsic reason, such as doing the activity to reach some desired end state. An example would be that people take jobs they do not particularly enjoy but with good paycheck, where the job has utility value. Finally, cost refers to the loss and effort given due to engagement in a particular activity. It is furtherly constructed by three dimensions: effort cost, opportunity cost, and psychological cost (Eccles et al., 1983; Perez, Cromley, & Kaplan, 2014). Effort cost refers to the amount of effort given for being successful at a task. Opportunity cost refers to the loss that engaging in one activity prevents an individual from participating in other valued activities. Psychological cost refers to the mental suffering related to engaging in one activity, such as anxiety of performing the activity or fear of success and failure of the activity.

The first three positive aspects of subjective task values were broadly researched within the framework of EVT. For example, Eccles and Wigfield (1995) assessed the structure of adolescents' achievement beliefs and values about mathematics within the framework of EVT. More than 1,200 adolescents from grade 5 to 12 in the United States were involved in this study. A total of 29 items, representing two components of expectancy (i.e., ability beliefs and expectancies for success) and three components of subjective task values (i.e., attainment value, intrinsic value, and utility value) were tested. The result of exploratory factor analysis retained 19 items tapping expectancy and subjective task value, and confirmatory factor analysis confirmed the structure of each construct. One factor was generated in expectancy (α = .92) to represent adolescents' perceptions of their math ability and expectancies for success in math. Three factors of subjective task value were found: intrinsic value (α = .76), attainment value (α = .70), and utility value (α = .62). The findings of this study support Eccles and her colleagues' standpoints on the components of expectancy and value.

However, cost, which represents the negative side of value, has been limited researched. Eccles and Wigfield (1992) argued that cost is a critical component in subjective task value; however, they also admitted that "most of our empirical work has focused on the first three of these value constructs" (Wigfield & Eccles, 2000, p. 73). Cost has been "the least studied of the different components of subjective values" (Wigfield & Cambria, 2010, p. 40).

Until recently, the research of cost is emerging. Flake, Barron, Hulleman, McCoach, and Welsh (2015) suggested that as "the forgotten component" (p. 232), cost should be separately measured from expectancy and value within the EVT framework. According to Eccles and Wigfield's (1995) research, task difficulty was independent with expectancy and value. Since the effort component of task difficulty in Eccles and

Wigfield's (1995) research was similar in content to cost (Parsons et al., 1980), McCoach, and Welsh (2015) argued that cost might also be distinct from expectancy and value (or positive value). Empirical research from various domains supported this argument. For example, Chiang, Byrd, and Molin (2011) studied the cost of engaging in physical activity and found that cost was a separate factor from expectancy and other value components. Conley (2012) found that cost was a unique factor rather than combining with other positive values to determine students' motivation to math. By reviewing previous motivation research (Flake et al., 2011; Grays, 2013; Trautwein et al., 2012), Kosovich, Hulleman, Barron, and Getty (2015) also claimed that expectancy, value, and cost components should be separated into three different scales in the study of motivation measurement. Therefore, in this research, cost was separated from the other three positive components of value (i.e., attainment value, intrinsic value and utility value) and treated as the third factor, in the discussion of firm managers' motivation of adopting new technology. To distinguish these value components, attainment value, intrinsic value and utility value were grouped and defined as perceived benefit, demonstrating beliefs about the desirable status of performing one activity; while the component of cost was renamed as perceived cost, demonstrating beliefs about loss, suffering and efforts given of performing one activity.

Besides Eccles and her colleagues, other researchers, such as Feather (1992a) and Bandura (1997), also contributed to the development of EVT, and their works enriched the understanding of expectancy and value. For example, Feather (1992a) defined expectancy as the perceived probability that a behavior will have a particular consequence, and defined value as a set of stable, general beliefs about what is desirable.

It is noteworthy that, different with Eccles et al.'s (1983) explanation of expectancy, Feather (1992a) claimed expectancy encompassed beliefs whether a particular action can be performed up to the required standards. This conceptual explanation is more in line with Bandura's (1997) concept of outcome expectancy, which refers to the belief that a given action will lead to a given outcome.

In fact, Bandura (1997) argued that expectancy in most historical EVT research is explained and measured as outcome expectancy with little attention to efficacy expectancy. Eccles and her colleagues (1983) were the first researchers who raised the notion of efficacy expectancy. For example, Eccles and Wigfield (1995) used items, such as "how good in math are you" and "how good would you be at learning something new in math," to measure the expectancy of adolescents' math achievement, which is clearly self-ability related, while Feather and Davenport (1981) used the item "how confident are you of getting a job in the near future" to measure unemployed youth's expectancy of employment, which is outcome focused.

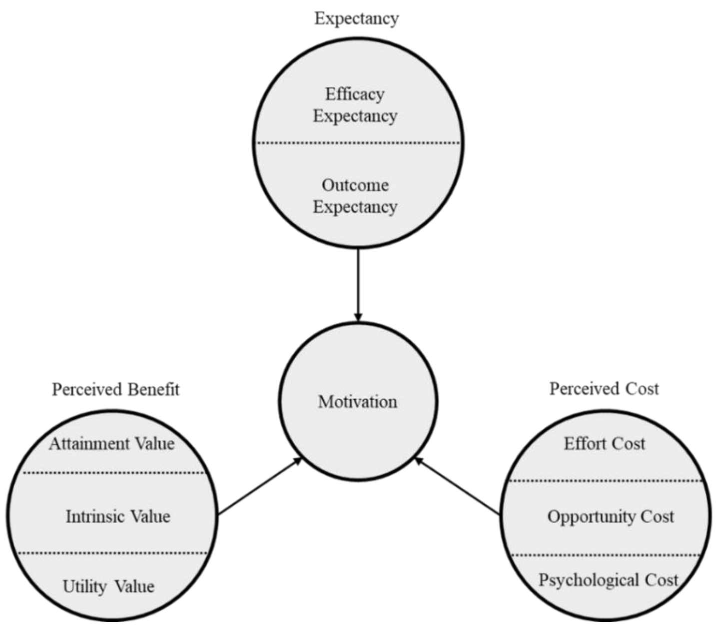
Recent EVT research has concluded that both of two aspects of expectancy should be included in EVT research (Feather, 1992b; Vansteenkiste et al., 2005). For example, if one person is considering doing exercises to lose weight, then exercising is the behavior and losing weight is the expected outcome. However, losing weight is not necessarily followed by exercising. Then, in this case, the person's expectancy of his/her ability to do certain exercises (i.e., efficacy expectancy) and his/her expectancy of losing weight after his/her exercise performance (i.e., outcome expectancy) should both be considered. Similarly, when a firm is considering adopting a new technology, there must be one or more particular outcomes that the firm is expecting, such as increasing profit or working efficiency. However, similar to Maddux, Norton, and Stoltenberg's (1986) case, outcomes would not be fully guaranteed to come following performing one activity (e.g., firm's adoption of new technology). In this light, efficacy expectancy and outcome expectancy should both be included in the discussion of firm managers' expectancy of new technology.

After more than half a century of development and tests, EVT has become a well-established motivational framework, providing good insights into the psychological factors and processes that explain humans' attitude, cognitive belief and behavior (Guo, Marsh, Morin, Parker, & Kaur, 2015; F. Lauermann, Y.-M. Tsai, & J. S. Eccles, 2017; Magidson, Roberts, Collado-Rodriguez, & Lejuez, 2014). Illuminated by Atkinson and Eccles et al.'s framework of EVT, numerous empirical studies were conducted by applying and testing EVT in various domains, including education, employment, economics and marketing. For instance, Eccles and Harold (1991) applied EVT to analyze the amount of free time adolescents spent on sports. Through investigating approximately 3,000 adolescents, the study revealed that self-concept of ability (i.e., expectancy), attainment value and utility value (i.e., perceived benefit) were strong predictors of the amount of free time adolescents spent on sports ($R^2 = .32$). Wiklund, Davidsson, and Delmar (2003) used EVT to investigate how small business managers' beliefs concerning the consequences of firm growth influence their overall firm growth attitude. By analyzing more than 1,200 participants' responses, the study indicated a significant effect of expected consequences (i.e., perceived benefit) of firm growth on managers' attitudes ($R^2 = .24$).

Similarly, Fitzsimmons and Douglas (2011) investigated the relationship between entrepreneurial intentions, perceived desirability, and entrepreneurial self-efficacy. In this study, perceived desirability coincided with perceived benefit and entrepreneurial self-efficacy coincided with expectancy. The result of hierarchical regression analysis indicated that perceived desirability and entrepreneurial self-efficacy have significant impact on entrepreneurial intentions ($R^2 = .19$). Furthermore, Ball, Huang, Cotten, and Rikard (2017) used EVT framework to examine students' science, technology, engineering, and mathematics (STEM) attitudes. The results indicated that changes in students' expectancy, intrinsic value, and utility value had a good predictive power of the changes of students' STEM attitude of science ($R^2 = .42$), math ($R^2 = .32$), and technology ($R^2 = .25$). Though the research of cost was limited, Battle and Wigfield (2003) addressed the influence of cost on college women's intention to attend graduate school by adopting Eccles et al.'s (1983) framework of EVT. A total of 215 female college students were enrolled in this study. The results indicated that cost ($\alpha = .85$) was a significant predictor that negatively impacted college women's intentions to attend graduate school ($p < .01$).

Therefore, given the broad use and successful explanatory power of EVT in behavioral research, EVT was deemed the theoretical framework for studying textile and apparel firm managers' expectancy, perceived benefit and perceived cost of new technology. Applied the concepts into this research, expectancy of new technology refers to the firm managers' belief of the probability for success at adopting the new technology in their firm. It has two aspects: one is efficacy expectancy, which refers to firm managers' belief that their firm is capable to adopt the new technology; the other one is outcome expectancy, which refers to firm managers' beliefs that whether the new technology can bring up desired outcomes. Perceived benefit refers to firm managers' beliefs about the desirable status that brought up by the new technology. It has three aspects. Attainment value refers to the perceived importance of adopting the new technology in firm. Intrinsic value refers to the enjoyment or subjective interest in adopting new technology. Utility value refers to the extrinsic value or usefulness in practice. Finally, perceived cost refers to the loss, suffering and efforts given due to the new technology adoption. It has three aspects. Effort cost refers to the amount of effort given for adopting new technology. Opportunity cost refers to the loss that adopting new technology prevents firm from being able to participate in other valued activities. Psychological cost refers to the mental suffering related to adopting new technology. According to EVT, firm managers' expectancy, perceived benefit and perceived cost of new technology were expected to predict their motivation to adopt such technologies, and therefore, measuring expectancy, perceived benefit and perceived cost of new technology would be an important step to assess firm managers' motivation to adopt new technology. Refer to Figure 2.1 for the conceptual model within EVT framework.

Figure 2.1. Conceptual model generated from the literature of EVT



Diffusion of Innovation

Diffusion of Innovation (DOI) was originally developed to illustrate new technology adoption behavior within individuals and organizations. It indicates five key characteristics that may influence an individual or organization's technology adoption decision making. At the same time, these key characteristics could also offer insights into firm managers' expectancy, perceived benefit and perceived cost of new technology in their decision-making process of new technology adoption.

DOI is a fundamental technology adoption theory which was introduced by Rogers (1962, 1995, 2003). The theory seeks to explain how, why, and at what rate these new ideas and technologies spread through entities (Al-Mamary, Al-nashmi, Hassan, & Shamsuddin, 2016; Oliveira & Martins, 2011; Rogers, 2003). With the wide application in disciplines, such as education, sociology, marketing, and information technology, etc.

(Karahanna, Straub, & Chervany, 1999; Lee, Hsieh, & Hsu, 2011; Lundblad, 2003; Rogers, 1995), DOI research identified a variety of factors that may influence innovation-decision processes and innovation adoption behavior within individuals and organizations.

There are five key characteristics that have been shown in DOI research to influence technology adoption decision making: compatibility, observability, complexity, relative advantage, and trialability (Rogers, 2003). Compatibility refers to the degree to which an innovation is perceived as consistent with users' existing values, beliefs, habits and present and previous experiences (Rogers, 2003). Research has shown that compatibility is a significant factor in determining users' attitude towards new technology adoption (J. M. Cheng, Kao, & Lin, 2004; H.-F. Lin, 2011; Oly Ndubisi & Sinti, 2006), and technologies that are compatible with the intended adopters' values, beliefs, habits, and perceived needs are more readily adopted (Al-Jabri & Sohail, 2012; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004). For example, an innovative firm would have more motivation to adopt a trending technology than a conservative firm because this technology is consistent with the innovative firm's values and beliefs. Linking the concept with the framework of EVT, being compatible with the intended adopters' values, norms, and perceived needs could be the expected outcome of adopting a new technology. Thus, it seems compatibility has the potential to associate with outcome expectancy. In other words, items used to measure compatibility have the potential to measure the new technology adopters' outcome expectancy. For example, Moore and Benbasat (1991) used the item "using a Personal Work Station (one kind of information technology) is compatible with all aspects of my work" to measure compatibility. In this case, being “compatible with all aspects of my work” could be considered as the expected outcome of using the Personal Work Station. Therefore, this research considers compatibility to be associated with the concepts of expectancy.

Observability refers to the extent to which an innovation is visible or exposed to the potential adopters, and the extent to which outcomes of using the innovation can be easily observed and communicated (Rogers, 1962, 2003). Researchers suggested that if the new technology and the benefits of it are visible to intended adopters, then the technology would be adopted more easily (Moore & Benbasat, 1991; Rogers, 2003). Moore and Benbasat (1991) further split the concept of observability into two dimensions: result demonstrability and visibility. Result demonstrability refers to the perceived ability to measure, observe, and communicate the outcomes of using an innovation, while visibility refers to the extent that an innovation is exposed to the users (Moore & Benbasat, 1991). The former item is deemed to have the potential to assess the ability to measure, observe, and communicate the results of using one technology, which is in line with the concept of efficacy expectancy in EVT. However, the latter item does not contribute to measuring one’s belief in expectancy and values. Therefore, observability, especially the component of result demonstrability only, is considered to be associated with the concept of expectancy, and the visibility component of observability was excluded from the study.

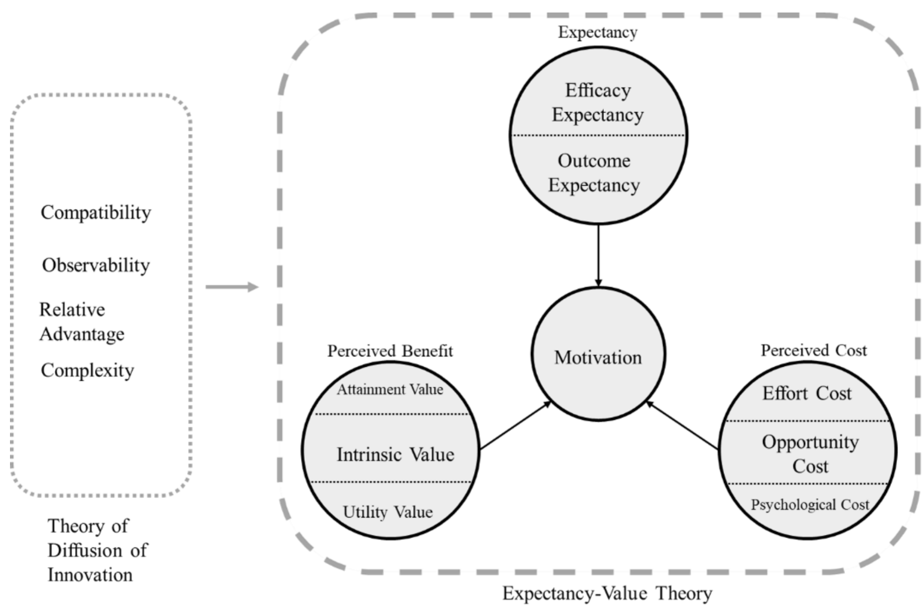
Complexity refers to the extent to which an innovation can be considered relatively difficult to understand and use (Rogers, 2003). A vast body of empirical research suggested that complexity negatively influences new technology adoption (Au & Kauffman, 2008; H.-F. Lin, 2011). Technologies that are perceived by potential users as simple and effortless to use are more easily adopted. In contrast, if the technology has barriers for new users, such as complexity in use, then the intention to adopt the technology is inhibited. Similarly in EVT, Eccles and Wigfield (1995) found that perceptions of task difficulty are negatively correlated to individuals' motivation to take on the task. They suggested that a difficult task would require more physical and emotional effort, which means more cost. In this light, the items used to measure complexity in DOI are deemed to have the potential to measure perceived cost. Therefore, this research considers complexity to be associated with the concepts of perceived cost.

Relative advantage refers to the degree to which an innovation provides more benefits than its precursor (Al-Jabri & Sohail, 2012; Greenhalgh et al., 2004). It is found to be one of the best predictors of innovation adoption (Lee et al., 2011). Researchers suggest that new technologies that have a clear advantage in increasing efficiency, economic benefits, convenience and satisfaction, are more easily adopted and implemented (Al-Jabri & Sohail, 2012; Greenhalgh et al., 2004; Rogers, 2003; Taylor & Todd, 1995). For example, Al-Jabri and Sohail (2012) utilized DOI to investigate factors that may impact bank customers' mobile banking adoption behavior. The result showed that relative advantage of a mobile banking system, such as efficiency, convenience and financial self-control, has positive significant effect ($R^2 = .19$) on customers' mobile banking system adoption. In this case especially, efficiency, convenience and financial self-control are all desired end states created by adoption of a mobile banking system, which could also be considered as utility value of perceived benefit. Therefore, this research considers relative advantage and perceived benefit are associated, and the items used to measure relative advantage could be considered to measure perceived benefit.

Lastly, trialability refers to the degree of opportunity to experiment with new technology before adoption (Rogers, 2003). Researchers argue that potential adopters will feel more comfortable with new technologies when they are allowed to experiment with it before fully adopting and implementing it (Agarwal & Prasad, 1998; Rogers, 2003). Such experimentation could minimize certain unknown fears about the new technology, and motivate potential adopters to use it (Tan & Teo, 2000). For example, Moore and Benbasat (1991) used five items to measure trialability in their overall scale for measuring the various perceptions of using an information technology, such as “I have had a great deal of opportunity to try various PWS applications” and “I know where I can go to satisfactorily try out various uses of a PWS.” They suggested that trialability measures the degree of opportunity the decision makers were exposed to try an innovation before they made the decision to adopt it. In this light, trialability would be a separate antecedent of new technology adoption motivation, rather than a salient component of expectancy or values, both of which refer to individual belief. Therefore, in this study, trialability was not considered to have potential to measure expectancy, perceived benefit and perceived cost.

In sum, working as a fundamental technology adoption theory, DOI offers more insightful understanding of expectancy, perceived benefit and perceived cost that the firm managers may form when considering new technology adoption. Five characteristics—compatibility, complexity, relative advantage, observability and trialability, are addressed in DOI. Compatibility and observability are thought to contribute to the understanding of firm managers' expectancy of new technology, while relative advantage is thought to contribute to the understanding of firm managers' perceived benefit of new technology, and complexity is considered to contribute to the understanding of firm managers' perceived cost of new technology. Refer to Figure 2.2 for the conceptual model generated from the literature of EVT and DOI.

Figure 2.2. Conceptual model generated from the literature of EVT and DOI



Technology Acceptance Model

Technology Acceptance Model (TAM) is another fundamental technology adoption theory illustrating how end-users come to accept and use a technology. Different from DOI, it only focuses on individual end-users' technology adoption behavior and provides insights into determinants that may impact technology adoption behavior of end-users. Though firm managers may not always be the end-user of a new technology, TAM could still work as a supplement and ally with other technology adoption theories (e.g., DOI) to enrich the understanding of firm managers' new technology adoption decision-making processes.

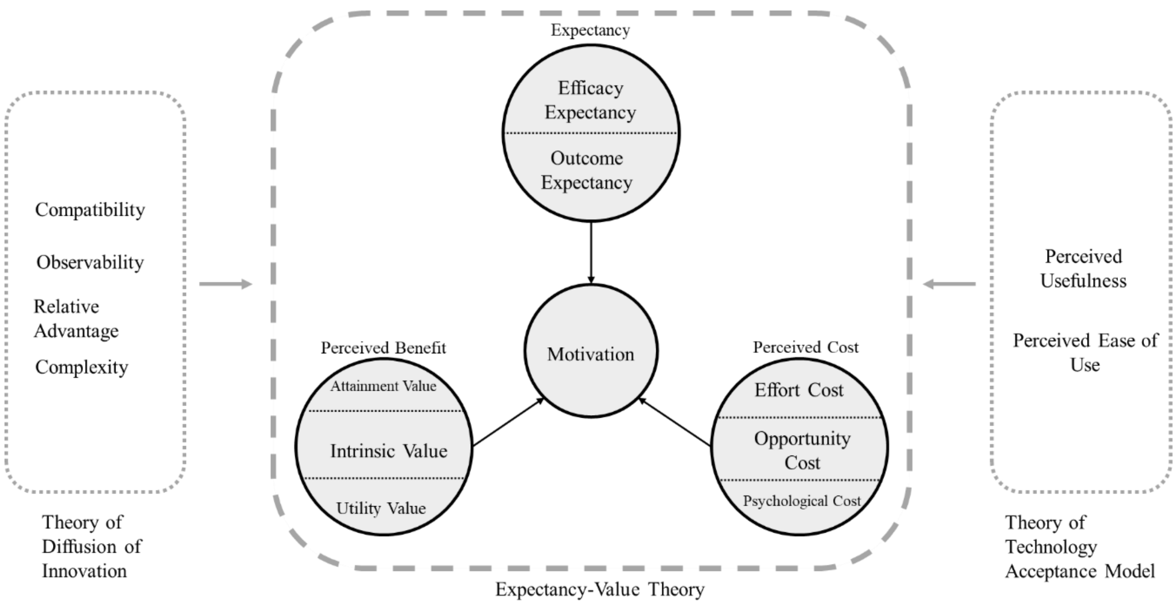
TAM (Davis, 1989) is one of the most widely applied models for studying individual user's technology adoption. It was developed from the theory of reasoned action (Ajzen & Fishbein, 1980) and originally tailored for explaining individual user's acceptance of computer technology. In the model, two fundamental determinants are used in explaining the behavioral intention to use technology: perceived usefulness (PU) and perceived ease of use (PEOU). Davis (1989) claimed that people tend to use or not use an application to the extent they believe it would help them perform their job better, and the difficulty in using this application would negatively impact individuals' willingness to use it. In other words, if the potential technology user would perceive the technology to be useful and easy to use, then the user would have a positive attitude toward accepting this technology and using it in the future. Researchers comment that TAM provides valuable insight into the user acceptance and use of technology (Amoako-Gyampah & Salam, 2004), and much empirical research has shown it to be a useful theoretical model in helping understand and explain individuals' acceptance of technologies, including firm managers' attitude and intention of technology adoption (Legris, Ingham, & Collerette, 2003; Mou, Shin, & Cohen, 2017; Veldeman, Van Praet, & Mechant, 2017). For example, Veldeman et al. (2017) adopted TAM to investigate business-to-business (B2B) companies' perceptions of and attitudes toward social media. By surveying and interviewing the managements from 92 companies, they found that perceived usefulness (e.g., broader communication reach, thought leadership, and networking) and perceived ease of use (e.g., social media use is free of effort) are important to managers' perception and attitude toward social media adoption.

Serving as one of the two fundamental determinants, PU refers to the subjective prospect that specific technology would increase job performance within one organization (Davis, 1989). That is, if the individual has a high expectancy that one technology would help his performance, then he would be more likely to use this technology. This concept is similar to perceived benefit, especially utility value. Items, such as "the technology would enable me accomplish tasks more quickly" and "the technology would increase my productivity", are used to measure PU by Davis (1989). It is not hard to see that all of these items are associated with perceived benefit, specifically utility value, and also similar to or associated with the characteristic of relative advantage in DOI. In this light, PU is considered to be associated with the concept of perceived benefit.

PEOU refers to the extent to which an individual considers that making use of a specific technology would be effortless (Davis, 1989). One technology that is perceived to be easier to use would be generally accepted and utilized by more people (Davis, 1989). Items, such as "I find it easy to get the technology to do what I want it to do" and "easy for me to become skillful at using the technology", are used to assess PEOU by Davis (1989). By reviewing these items, PEOU is found to be similar to the concept of perceived cost. That is, if a technology is perceived as easy to use, then the complexity of the technology would be low. Since complexity is previously assumed to be associated with the concepts of perceived cost, PEOU is also considered to be associated with it.

In sum, TAM provides valuable insights into individual end-users' decision-making process of technology adoption. PU and PEOU are addressed in TAM as two critical determinants that could influence end-users' perception of the technology. Compared with the concept of expectancy, perceived benefit and perceived cost, PU is deemed to associate with firm managers' perceived benefit of new technology, and PEOU is deemed to associate with firm managers' perceived cost of new technology. Refer to Figure 2.3 for final conceptual model.

Figure 2.3. Final conceptual model



Item Generation

In this section, items that will be used to measure firm managers' expectancy, perceived benefit and perceived cost are generated from reviewing previous literature. Specifically, item pools that represent firm managers' expectancy, perceived benefit and perceived cost of new technology are created. Additionally, key characteristics discussed in DOI and TAM are reviewed and sorted into the item pools of expectancy, perceived benefit and perceived cost.

Items from EVT

This section discusses items that used to measure expectancy, perceived benefit and perceived cost in previous EVT research. Items are sorted into relevant item bank. Specifically, efficacy expectancy and outcome expectancy are proposed as the salient constructs for expectancy; attainment value, intrinsic value, and utility value are proposed as the salient constructs for perceived benefit, and effort cost, opportunity cost and psychological cost are proposed as the salient constructs for perceived cost.

Items for expectancy.

Efficacy expectancy.

The most commonly used scales of efficacy expectancy in EVT research are developed by Eccles and her colleagues. Eccles and Harold (1991) conducted research to study the amount of free time adolescents spent on sports by applying EVT. Approximately 3,000 U.S. adolescents were involved in this study and they were asked to rate their ability in sports. The self-concept of ability (i.e., efficacy expectancy) scale was constructed by four 7-point Likert-type items with Cronbach's α greater than .70, such as "how good are you at sports?" (not at all good-very good), "how good are you at sports compared to other subjects?" (not at all good-very good), and "how good are you at sports compared to other children?" (much worse than other children-much better than other children). The results indicated that self-concept of ability is significantly related to the amount of time adolescents spent on sports. All of these items were then included to the study's item pool (see Appendix A). Later, Eccles and Wigfield (1995) assessed the structure of adolescents' achievement beliefs about mathematics by employing EVT. More than 1,200 adolescents from grades 5 to 12 in the United States were involved in this study. Initially, a 10-item ability perception (i.e., efficacy expectancy) scale was created. Exploratory factor analysis was conducted on the item set, and 5 items whose factor loading greater than .70 were retained. The alpha coefficient of the final scale was .92. This five-item efficacy expectancy scale was then broadly adapted and used in EVT research when adopting Eccles' EVT framework, especially in the discussion of academic work engagement (Cox & Whaley, 2004; Gråstén, Watt, Hagger, Jaakkola, & Liukkonen, 2015; F. Lauermann, Y.-M. Tsai, & J. Eccles, 2017). Therefore, these five items were then included into the study's item pool as well (see Appendix A).

Besides Eccles, the other researchers' efficacy expectancy scales have also been widely discussed and adopted in EVT research. For example, Miller, Behrens, Greene, and Newman (1993) investigated the motivational patterns and self-regulatory activities of 119 students in introductory statistics, and they developed nine Likert-type items to measure perceived ability (i.e., efficacy expectancy) regarding statistics (α = .88). This scale was adapted by other EVT researchers, such as DeBacker and Nelson (1999), to measure students' academic performance. In addition, Maddux, Norton, and Stoltenberg (1986) developed a three-item scale to measure humans' efficacy expectancy of communication technique (e.g., broken-record technique) using ($\alpha = .68$). Items, such as "I believe I could learn to use the broken-record technique" and "the broken-record technique would be difficult for me to learn," are used in this scale. The research showed that efficacy expectancy is correlated positively and significantly with humans' behavior intention to use the technology ($r = .40$, $p < .001$). All of these items were included in the item pool (see Appendix A).

It is important to note that all above mentioned efficacy expectancy scales are measured at the individual level, which represent "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391). However, given that firms' technology adoption is not only performed by individuals in the firm, but also performed in groups or by the entire organization as a collective, efficacy expectancy scales should be measured at the group level or organizational level as well (Riggs, Warka, Babasa, Betancourt, & Hooker, 1994). In this light, Riggs et al. (1994) defined group level efficacy expectancy as individuals' assessments of their group's collective ability to perform job related behaviors. They initially generated 25 seven-point Likert-type items to measure group level efficacy expectancy in working conditions. After scrutinized by two experts, piloted tested by 342 individuals and final surveyed by 470 employee respondents, seven items were left in the scale ($\alpha = .88$). Empirical test results revealed that group level efficacy expectancy is positively and significantly corelated to group performance. The scale was later adapted by organizational learning, innovation and performance research (Gardner & Pierce, 1998; Jiménez-Jiménez & Sanz-Valle, 2011; Stajkovic, Lee, & Nyberg, 2009).

Further, Bohn (2010) developed an instrument to assess organizational efficacy based on the work of individual-level and group-level efficacy. Initially, there were 38 six-point Likert-type items generated from previous research and interviews. A total of 142 participants from seven midsized manufacturing companies in the midwestern United States were involved in the study. Items that showed little variability in response and nonsignificant correlations with the whole item pool were dropped, leaving 23 items in scale. Then, a total of 886 participants from 22 organizations were recruited to validate the instrument statistically. The 17 items with the highest factor loadings (above .60) were retained after exploratory factor analysis (a = .94). This scale was later adapted in recent organizational efficacy research (Capone & Petrillo, 2015; Du, Shin, & Choi, 2015). Therefore, both the 7 items from Riggs et al. (1994), as well as the 17 items from Bohn (2010), were used as inspiration items in this study and included in the item pool of efficacy expectancy (see Appendix A). In conclusion, the study proposed the first proposition as follows:

Proposition 1: Efficacy expectancy will be salient to firm managers' expectancy of new technology.

Outcome expectancy.

To measure outcome expectancy, Feather and Davenport (1981) investigated 212 unemployed youth's motivation for job seeking in Australia by adopting EVT. Three items were designed to measure the participants' outcome expectancy of finding a job. They are: (a) "how confident are you of getting a job in the near future? (not at all confident/very confident)"; (b) "what would you say your chances were of getting a job, compared with other people of your age who are unemployed? (much less/much more)";

and (c) "how confident were you of getting a job when you first left school? (not at all confident/very confident)." The results indicated that the changes in confidence level of getting a job (i.e., outcome expectancy) are significantly related to the changes in motivation to seek a job. Though the scale was widely adapted in later research on unemployment (Vansteenkiste et al., 2005; Wanberg, Glomb, Song, & Sorenson, 2005), unfortunately, the reliability of this scale was not reported. However, all above mentioned items were included in the item pool for measuring outcome expectancy in this study (see Appendix A).

Later, Vansteenkiste et al. (2005) conducted another EVT research to analyze unemployed people's job search behavior in Belgium. A total of 446 unemployed people was involved in this study. Outcome expectancy of finding a job was measured by 3 five-point Likert-type items (α = .60). The results showed that outcome expectancy of finding a job is positively and significantly corelated with people's job search motivation (r = .21, $p < .01$). Therefore, all above mentioned items were included in the item pool for measuring outcome expectancy in this study (see Appendix A).

Besides the discussion of employment issues, Maddux et al. (1986) developed a two-item scale to measure human's outcome expectancy of technology use(α = 0.78), concerning the effectiveness of the adopted technology. Items, such as "for those who can use it, the broken-record technique is a very effective way to avoid giving in to other people" and "if I were able to use the broken-record technique, it would be much harder for other people to take advantage of me" were used in their study. The results suggested a main effect for outcome expectancy on the intention of using technology. These two items were also included in the item pool (see Appendix A). In conclusion, the study proposed the second proposition as follows:

Proposition 2: Outcome expectancy will be salient to firm managers' expectancy of new technology.

Items for perceived benefit.

Attainment value.

To measure attainment value, Eccles and Wigfield (1995) developed a three-items scale in researching adolescents' achievement beliefs about mathematics by employing EVT. Initially, a nine-items subjective task value scale was created. After exploratory factor analysis and confirmatory factor analysis, three items were retained in the subscale of attainment value, with all the factor loadings above .50. The items are (a) "is the amount of effort it will take to do well in advanced high school math courses worthwhile to you? (not very worthwhile, very worthwhile);" (b) "I feel that, to me, being good at solving problems which involve math or reasoning mathematically is (not at all important, very important)," and "how important is it to you to get good grades in math? (not at all important, very important)." The Cronbach's α is .70. This attainment value scale was further broadly adapted in other EVT studies (Cox & Whaley, 2004; DeBacker & Nelson, 1999; Gråstén et al., 2015). Therefore, these three items were then included in the study's item pool (see Appendix A).

Later, Battle and Wigfield (2003) created the Valuing of Education (VOE) Scale based on Eccles et al.'s (1983) definition of subjective task value. This scale examined college women's valuing of graduate education. It contains 51 items covering attainment value, intrinsic value, utility value, and cost components. Initially, 10 five-point Likert-type items were designed to measure the extent to which college women perceived personal importance or meaningfulness with the pursuit of graduate school (i.e., attainment value). After principal components analysis, five items with factor loading greater than .40 were retained in the scale, such as “I feel that attending graduate school is a necessary part of what will make me feel good about myself in the future” and “I feel that I have something to prove to myself by going to graduate school.” The Cronbach’s α is .88. The result of this research indicated that attainment value is a significant predictor of intentions to attend graduate school. Therefore, these five items were then included in the study’s item pool as well (see Appendix A).

Similarly, Trautwein et al. (2012) developed a twelve-item scale to measure students’ value beliefs (i.e., perceived benefit) on academic courses based on Eccles et al.’s (1983) research. A total of 2,508 students from 156 randomly selected academic-track secondary schools in Germany were involved in their research. Cronbach’s α was greater than .75 for the whole scale; however, they did not report the Cronbach’s α for each subscale (e.g., attainment value). Within the value belief scale, three items were used to measure students’ attainment value, such as “I’m really keen to learn a lot in Mathematics/English” and “Mathematics/English is important to me personally.” The result of this study showed that attainment value has significant impact on students’ academic course achievement. These three items were included in the item pool of subjective task value for measuring attainment value as well (see Appendix A).

The other EVT researchers also addressed and measured attainment value in their studies, though they may name it differently or integrate it into a general value scale. For example, Maddux et al. (1986) developed a 3-items scale to measure humans’ outcome value of using one communication technique (α = .78), and one of the items—"getting my way with people and not being taken advantage of by other people is very important to me"—was specifically designed to measure received importance (i.e., attainment value) for using the technique. Likewise, Lynd-Stevenson (1999) used one seven-point Likert-type item to measure humans' perceived job importance in the research of human employment motivation. This item was "getting a job is more important to some than others. How important is getting a job to you," which is adapted from Feather and Barber's (1983) research on unemployment. Since there are no Cronbach's *α* reported for the above items and they are all similar to Battle and Wigfield's (2003) and Trautwein et al.'s (2012) work, they were not included into the item pool. In conclusion, the study proposed the third proposition as follows:

Proposition 3: Attainment value will be salient to firm managers' perceived benefit of new technology.

Intrinsic value.

Eccles and Wigfield (1995) developed a two-items scale to measure intrinsic value in the research on adolescents' achievement beliefs about mathematics. Stemming from exploratory factor analysis and confirmatory factor analysis, two items out of nine were retained in the subscale of intrinsic value, with all the factor loadings above .70. The items are "in general, I find working on math assignments (very boring, very interesting)" and "how much do you like doing math? (not very much, very much)." The Cronbach's *α* is .76. This intrinsic value scale was further broadly adapted in other EVT studies (Ball et al., 2017; Cox & Whaley, 2004; Gråstén et al., 2015). Therefore, these two items were included in the item pool for measuring intrinsic value (see Appendix A).

Later, in the VOE scale which was created by Battle and Wigfield (2003), eight items were designed as a subscale to measure the degree to which college women perceived enjoyment of the pursuit of graduate school (i.e., intrinsic value). Items, such as “I find the idea of being a graduate student to be very appealing” and “I look forward to advancing my knowledge by exploring new and challenging ideas in graduate school,” were used. The Cronbach’s α is .96. The result of this research indicated that intrinsic value significantly predicts college women’s intentions to attend graduate school. Therefore, these eight items were included in the study’s item pool as well (see Appendix A).

Further, Trautwein et al. (2012) developed 12 items to measure students’ value beliefs (i.e., benefit value) of academic courses, and five of them were designed for the measurement of intrinsic value. Items, such as “I would like to have more mathematics/English lessons” and “when I am working on a mathematics/English problem, I sometimes do not notice time passing,” were included in it. Unfortunately, they did not report the Cronbach’s α of it. However, the result of this study showed that intrinsic value is a significant predictor of students’ academic course achievement. Therefore, these five items were also included into the item pool of perceived benefit for measuring intrinsic value (see Appendix A).

Besides Eccles and her followers, other researchers also addressed and measured the concept of intrinsic value in their studies. Feather and Davenport (1981) designed a three-items scale to measure the perceived attractiveness of employment (i.e., intrinsic value) in the investigation of 212 unemployed youths’ motivation for job seeking. The three items were selected on the basis of factor analysis, with factor loading all above .50.

They are (a) “should a job mean more to a person than just money? (not at all/yes, definitely),” (b) “does most of the satisfaction in a person's life come from his work? (definitely not/yes, definitely),” and (c) “how much should people be interested in their work? (no need to be interested/people should be very interested).” Unfortunately, the reliability of this scale was not reported. The results indicated that intrinsic value is significantly related to humans’ motivation to work.

Miller et al. (1993) examined students’ motivational patterns of self-regulatory activities in introductory statistics and developed a four-item scale to measure intrinsic value. They are (a) “working with statistics was personally satisfying;” (b) “I found working with statistics enjoyable;” (c) “I found learning statistics interesting,” and (d) “learning statistics does not hold my interest.” The Cronbach’s α is .86. The findings of the research indicated that intrinsic value is significantly and positively correlated with students’ persistence in self-regulatory activities ($r = .36$, $p < .01$). In this light, both the three items from Feather and Davenport (1981), as well as the four items from Miller et al. (1993), were included in the item pool (see Appendix A). In conclusion, the study proposed the fourth proposition as follows:

Proposition 4: Intrinsic value will be salient to firm managers’ perceived benefit of new technology.

Utility value.

To measure utility value, Eccles and Wigfield (1995) developed a two-item scale in the research on adolescents’ achievement beliefs about mathematics. The two items were generated from 9 subjective task value items by exploratory factor analysis and confirmatory factor analysis, with all the factor loading above .60. They are “how useful is learning advanced high school math for what you want to do after you graduate and go to work? (not very useful, very useful)" and "how useful is what you learn in advanced high school math for your daily life outside school? (not at all useful, very useful)." The Cronbach's α is .62. These two items were further adapted in other EVT research for measuring utility value (Ball et al., 2017; Cox & Whaley, 2004; DeBacker & Nelson, 1999; Gråstén et al., 2015). Therefore, both of them were included to the study's item pool (see Appendix A).

Based on Eccles et al.'s (1983) work on subjective task value, Battle and Wigfield (2003) initially created a nine-item scale to measure college women's perceived usefulness of pursuing graduate study (i.e., utility value). Three items with factor loading greater than .40 were retained after principal components analysis, such as "I do not think a graduate degree will be very useful for what I want to do in the future" and "I want to get a graduate degree so that I can support myself." The Cronbach's α is .76. The result of this research indicated that the college women's perceived utility value significantly predicts their intentions to attend graduate school. Moreover, they also created a supplementary value questionnaire to assess the reason why college women pursue a graduate education, and utility issues (e.g., money, status, and career) appear to be the most selected ones. Each statement of utility issues, such as "the reason for attending graduate school is that I will make more money," was chosen by more than 44% of participants. Thus, statements used to describe utility value in the supplementary value questionnaire, as well as the three items in the utility value scale, were all included in the study's item pool for measuring utility value (see Appendix A).

Miller et al. (1993) designed a four-items scale to measure extrinsic value (i.e., utility value) in their research on students' motivational patterns in self-regulatory activities in introductory statistics. The items are (a) "being able to use statistics will help me professionally," (b) "being knowledgeable about statistics is of little value to me professionally," (c) "statistics has little relevance to my future work," and (d) "I will need knowledge of statistics for my future work." The Cronbach's α was .93. The finding of the research indicated that extrinsic value is significantly and positively correlated with students' persistence in self-regulatory activities (r = .30, p < .01). In this light, these four items were included in the study's item pool as well (see Appendix A).

Beyond the domain of education, researchers also measured utility value in working conditions. Wiklund et al. (2003) investigated small business managers' beliefs of the consequences of firm growth (i.e., subjective task values) to study their motivation to expand firms. Eight items were derived from the literature review to represent the perceived value of firm growth, such as "would the small business manager have to work more or less hours" and "would his or her ability to survey and control operations increase or decrease." The Cronbach's α is .72. Even though they did not explicate that the measurement of the items is for utility value, this study considered it to be in line with it after comparing the items with Eccles et al.'s (1983) explanation of utility value. The results showed that all items are positive corelated with firm managers' motivation to expand firms. Therefore, all eight items were included in the study's item pool (see Appendix A). In conclusion, the study proposed the fifth proposition as follows:

Proposition 5: Utility value will be salient to firm managers' perceived benefit of new technology.

Items for perceived cost.

Effort cost.

Battle and Wigfield (2003) addressed and tested cost in their research on college women's valuing of attending graduate school within the framework of EVT. They used 11 items to measure college women's anticipated cost, or the personal sacrifice associated with pursuing graduate study. Among them, three items were developed to measure personal effort, such as "when I think about all the work required to get through graduate school, I am not sure that getting a graduate degree is going to be worth it in the end" and "I am not sure if I have got the energy to work (either outside the university or as graduate assistant) and go to graduate school at the same time." The Cronbach's α of overall cost scale was .85; however, no Cronbach's α was reported for the subscale of effort cost. The result of this research indicated that college women's perceived cost significantly and negatively predicts their intentions to attend graduate school. Battle and Wigfield's (2003) cost scale worked as guidelines for later cost research (Perez et al., 2014). Thus, the 3 items were included to the study's item pool (see Appendix A).

More recently, Flake et al. (2015) conducted a literature review of existing measurement of cost and a focus group study with 123 students in U.S. public universities, to create the item pool of college students' perceived cost for taking classes. After being reviewed by 8 content experts who had expertise in measurement and motivation theory, a total of 24 items were left in the item pool, representing four dimensions: task effort cost, outside effort cost, loss of valued alternatives cost, and emotional cost. In their study, effort cost was split as task effort cost (i.e., negative appraisals of time, effort, or amount of work put forth to engage in the task) and outside effort cost (i.e., negative appraisals of time, effort, or amount of work put forth for task other than the task of interest). Five items were used to measure task effort cost (α = .95), such as "this class demands too much of my time" and "I have to put too much energy into this class." Four items were used to measure outside effort cost (α = .93), such as "because of all the other demands on my time, I do not have enough time for this class" and "because of other things that I do, I do not have time to put into this class." A further empirical test showed that both of the effort cost scales were significantly corelated with students' motivation for taking classes. Therefore, all 9 items were included in the study's item pool for measuring effort cost (see Appendix A). In conclusion, the study proposed the sixth proposition as follows:

Proposition 6: Effort cost will be salient to firm managers' perceived cost of new technology.

Opportunity cost.

Battle and Wigfield (2003) described opportunity cost as the perceptions of lost time for alternative activities in their study of college women's motivation to attend graduate school. Two items were developed to measure the loss of time for alternative activities, such as "I worry that spending all the time in graduate school will take time away from other activities I want to pursue while I am still young." These two items were included to the item pool of perceived cost for measuring opportunity cost (see Appendix A).

Flake et al. (2015) described opportunity cost as loss of valued alternatives in their comprehensive cost scale. Four items were used to measure loss of valued alternatives (α = .89), such as "I have to sacrifice too much to be in this class" and "this class requires me to give up too many other activities I value." A further empirical test of students' motivation of class taking showed that loss of valued alternatives was significantly corelated with students' motivation. Therefore, these four items were included in the study's item pool for measuring opportunity cost (see Appendix A). In conclusion, the study proposed the seventh proposition as follows:

Proposition 7: Opportunity cost will be salient to firm managers' perceived cost of new technology.

Psychological cost.

Battle and Wigfield (2003) developed six items to measure college women's psychological cost for attending graduate school, such as "I worry that I will waste a lot of time and money before I find out that I do not want to continue in graduate school" and "I would be embarrassed if I started graduate school and found out that my work was inferior to that of my peers." The result of their research indicated that college women's psychological cost significantly and negatively predicts their intentions to attend graduate school. These 6 items were included to the study's item pool (see Appendix A).

Flake et al. (2015) also measured psychological cost, which they named it as emotional cost, by six items (α = .94), such as "I worry too much about this class" and "this class is too stressful." Empirical test showed that the six-item psychological cost scale was significantly corelated with students' motivation for taking classes. Therefore, all 6 items were included in the study's item pool for measuring psychological cost (see Appendix A). In conclusion, the study proposed the eighth proposition as follows:

Proposition 8: Psychological cost will be salient to firm managers' perceived cost of new technology.

Overall, a total of 53 items were generated for expectancy construct, 58 items for perceived benefit construct, and 30 items for perceived cost construct from the theoretical framework of EVT.

Items from DOI

In addition to the items generated from EVT, DOI offers additional insights to measure expectancy, perceived benefit and perceived cost of new technology adoption. This section discusses items used to measure the five characteristics in the framework of DOI. Each item is reviewed and compared with the definitions and explanations of the eight salient components (2 for expectancy, 3 for perceived benefit and 3 for perceived cost), and then sorted into relevant item pools.

Items from compatibility for expectancy.

Based on Rogers's (1983) explanation of the five characteristics of innovations, Moore and Benbasat (1991) developed an overall scale to measure the various perceptions of using an information technology (e.g., Personal Work Stations). Initially, by reviewing existing measurement scales, a total of 94 items used to measure all five characteristics were included in the item pool. Then, all the items were sorted into groups by four judges (e.g., industrial workers, professor and student) based on their own understanding of each item. Four rounds of sorting were conducted, and different judges were involved in each round. Items that could not be sorted into any groups or were labeled as ambiguous were dropped, leaving 75 items in the item pool. Next, a total of 540 participants coming from a variety of industries were involved in the final field test.

Principal component analysis was conducted on the collected data and 34 items with factor loading above .40 remained in the item pool. This 34-item scale was broadly adapted by other researchers (Chin & Gopal, 1995; Hardgrave, Davis, & Riemenschneider, 2003; Karahanna et al., 1999). Within it, four items remained in the item pool to measure compatibility, and the Cronbach's α was .84. They are: (a) "using a Personal Work Station (PWS) is compatible with all aspects of my work;" (b) "using a PWS is completely compatible with my current situation;" (c) "I think that using a PWS fits well with the way I like to work," and (d) "using a PWS fits into my work style." All four items were deemed to have potential to describe firm managers' outcome expectancy, as such the expectancy that adopting one new technology (i.e., the behavior) would fit well with the firm's current situation and workstyle (i.e., the expected outcome). Therefore, all four items were included in the item pool of expectancy for measuring outcome expectancy (See Appendix A).

Items from observability for expectancy.

Moore and Benbasat (1991) split observability into two dimensions, result demonstrability and visibility, in their widely adapted scale of perceptions of using an information technology. The former dimension refers to the ability to measure, observe, and communicate the results of using an innovation, and the latter dimension refers to the extent that an innovation is exposed to the users (Moore & Benbasat, 1991). Four items were used to measure result demonstrability, which are: (a) "I would have no difficulty telling others about the results of using a PWS;" (b) "I believe I could communicate to others the consequences of using a PWS;" (c) "the results of using a PWS are apparent to me," and (d) "I would have difficulty explaining why using a PWS may or may not be beneficial." The Cronbach's α was .77. Since all the items describe the perceived ability to measure, observe and communicate the result of using an innovation, they are deemed to be in line with efficacy expectancy in EVT. Therefore, all four items were included in the item pool of expectancy for measuring efficacy expectancy (See Appendix A).

Items from complexity for perceived cost.

In Moore and Benbasat's (1991) broadly adapted scale of the perception of adopting information technology innovations, six items were generated by integrating the concept of ease of use in TAM, to assess the perceived complexity of an innovation. The Cronbach's α was .80. They are: (a) "I believe that a PWS is cumbersome to use;" (b) "my using a PWS requires a lot of mental effort;" (c) "using a PWS is often frustrating;" (d) "I believe that it is easy to get a PWS to do what I want it to do;" (e) "overall, I believe that a PWS is easy to use," and (f) "learning to operate a PWS is easy for me." All six items were deemed to have the potential to measure psychological cost (e.g., item b and c) or effort cost (e.g., item a, d, e, and f) that may be required to adopt the technology; therefore, these three items were included in the item pool of perceived cost (See Appendix A).

Al-Jabri and Sohail (2012) created a three-item scale to measure customers' perceived complexity of mobile banking in their research of customers' mobile banking adoption behavior (α = .83). The first two items are similar to Moore and Benbasat's (1991) scale of complexity, such as "mobile banking requires a lot of mental effort" and "mobile banking can be frustrating." These two items were deemed to be in line with the concept of psychological cost. The third item is "mobile banking requires technical skills." This item implies that extra effort may be required to use mobile banking; thus, it was considered to be in line with the concept of cost and included in the item pool of perceived cost for measuring effort cost. (See Appendix A).

Items from relative advantage for perceived benefit.

Moore and Benbasat (1991) developed eight items to measure relative advantage in their overall scale of perceptions of using an information technology. They are: (a) "using a PWS enables me to accomplish tasks more quickly;" (b) "using a PWS improves the quality of work I do;" (c) "using a PWS makes it easier to do my job;" (d) "using a PWS improves my job performance;" (e) "overall, I find using a PWS to be advantageous in my job;" (f) "using a PWS enhances my effectiveness on the job;" (g) "using a PWS gives me greater control over my work," and (h) "using a PWS increases my productivity." The Cronbach's α was .93. Comparing these items with Eccles et al.'s (1983) definition of utility value, this study considered all the items represent the extrinsic desired end states offered by adopting the technology, which is what utility value emphasizes. Therefore, these eight items were included in the item pool of perceived benefit for measuring utility value (See Appendix A).

Moreover, another four items were generated by Moore and Benbasat (1991) to measure image, which is defined as the degree to which using an innovation is perceived to enhance one's image or status. It is also considered as part of relative advantage (Rogers, 1995). The four items are: (a) "using a PWS improves my image within the organization;" (b) "people in my organization who use a PWS have more prestige than those who do not;" (c) "people in my organization who use a PWS have a high profile," and (d) "having a PWS is a status symbol in my organization." The Cronbach's α was .80. The concept of image was deemed in line with the salient construct of attainment value in EVT, describing the personal importance of adopting the new technology. Therefore, these four items were also included in the item pool of perceived benefit (See Appendix A).

Recently, Hsu, Kraemer, and Dunkle (2006) conducted a study to investigate the determinants of e-business use among a sample of 294 U.S. firms. Building from DOI, a three-item scale was used to measure perceived benefits (i.e., relative advantage) of e-business. The three-item perceive benefit scales were: (a) “to expand market for existing product/services;” (b) “to enter new businesses or markets,” and (c) “to catch up with major competitors that are on-line.” The Cronbach’s α was .77. All three items were also deemed to have the potential to measure perceived utility value of new technology, and then, were included in the item pool of perceived benefit (See Appendix A).

Overall, a total of 8 items were generated for expectancy construct, 15 items for perceived benefit construct, and 7 items for perceived cost construct from the theoretical framework of DOI.

Items from TAM

Items from perceived ease of use for perceived cost.

Davis (1989) initially generated 14 candidate items for the measurement of users’ perceived ease of use (PEOU) for computer technology, from reviewing previous research that deals with user reactions to interactive systems. Next, a pretest interview was conducted to assess the semantic content of the items. A sample of 15 experienced computer users participated, and they were asked to identify the fitness between each item and the definition of PEOU. A total of 10 items that best fit the definition were retained. Finally, two field studies were conducted to assess the reliability and construct validity of the resulting scale. A total of 112 computer users were involved in the first field study and they were asked to rate the PEOU of designated computer systems. The result of convergent validity and discriminant validity suggested that six items would be adequate to achieve reliability levels above .90 while maintaining adequate validity levels. The six items are: (a) “learning to operate the technology would be easy for me;” (b) “I find it easy to get the technology to do what I want it to do;” (c) “my interaction with the technology would be clear and understandable;” (d) “the technology is flexible to interact with;” (e) “easy for me to become skillful at using the technology,” and (f) “the technology would be easy to use.” The second field study empirically tested this six-item scale of PEOU on 40 participants, and the Cronbach’s α is .95. These 6 items were then commonly used in following TAM research to measure PEOU (Yan & Liu, 2012). Similar to the characteristic of complexity in DOI, all of the items more or less describe the efforts taken in adopting technologies, therefore, all of them were considered as having the potential to measure the salient construct of effort cost and were included in the item pool of perceived cost (See Appendix A).

Items from perceived usefulness for perceived benefit.

Davis’s (1989) scale of perceived usefulness (PU) was broadly adapted in TAM research. He initially generated 14 candidate items for the measurement of PU for computer technology. After a pretest interview and two field studies, a total of six items remained in the scale with the Cronbach’s α at .98. The items are: (a) “the technology would enable me to accomplish tasks more quickly;” (b) “the technology would improve my job performance;” (c) “the technology would increase my productivity;” (d) “the technology would enhance my effectiveness on the job;” (e) “the technology would make it easier to do my job," and (f) "the technology would be useful in my job." All of the items were deemed to have the potential to measure utility value, representing the extrinsic desired end states offering by adopting the technology. Therefore, these six items were included in the item pool of perceived benefit for measuring utility value (See Appendix A).

Overall, a total of 6 items were generated for perceived benefit construct and 6 items were generated for perceived cost construct from the framework of TAM. As a result, a total of 61 items were initially included in the item pool for expectancy, 79 items for perceived benefit and 43 items for perceived cost, generating from the framework of EVT, DOI and TAM.

Next, considering the items were generated with scales and questions across various research domains, all of the items were reviewed again by the author and adapted to reflect a consistent format that fits into the research domain of new technology adoption in firms. For example, the item "I believe I could learn how to use the broken-record technique" was adapted as "I believe people in my firm could learn how to use the new technology," to measure firm managers' efficacy expectancy of new technology, and the item "Using a PWS improves my image within the organization" was adapted as "Using the new technology will improve my firm's image within the industry," to measure the firm manager perceived attainment value of new technology. Likewise, the items "Using a PWS requires a lot of mental effort" was adapted as "Using new technology will require a lot of mental effort," to measure the firm managers' psychological cost of new technology (See Appendices A for more information). Some items, such as "This company will double in size in the next 10 years" and "I would be surprised if this organization exists in 5 years," which have less connection with or are hard to fit into the research domain, were dropped from the item pool (See Appendices A for more information). Finally, a total of 55 items were included in the item pool for expectancy, 65 items for perceived benefit and 41 items for perceived cost (See Table 2.1). In order to be understood and tested by Chinese T&A firm managers, all the items were then translated into Chinese from English by the author. Back translation from Chinese to English by another Chinese-English speaking person was conducted and no major changes were necessary (See the final Chinese version items in Appendices A).

Table 2.1.
Construction of Item Pool

		EVT	**DOI**	**TAM**	**Total**	
Expectancy	Efficacy Expectancy	39	4		43	
	Outcome Expectancy	8	4		12	55
Perceived Benefit	Attainment Value	11	4		15	
	Intrinsic Value	18			18	
	Utility Value	15	11	6	32	65
Perceived Cost	Effort Cost	11	5	6	22	
	Opportunity Cost	5			5	
	Psychological Cost	12	2		14	41

Note. EVT = Expectancy-Value Theory; DOI = Diffusion of Innovation; TAM = Technology Acceptance Model

CHAPTER III. RESEARCH METHODOLOGY

The research methodology section includes the following: (a) item bank development, and (b) psychometric evaluation.

Following the item generation, item bank development and psychometric evaluation are the next two suggested stages for the development of measures (Cella, Gershon, Lai, & Choi, 2007; Hinkin, Tracey, & Enz, 1997; Revicki, Chen, & Tucker, 2014). In the item bank development stage, a qualitative research approach was taken to review, assess and examine the potential set of items and their constructs, to ensure the content validity of the item bank for expectancy and perceived value (Revicki, Chen, & Tucker, 2014; Hinkin, 1995).

In the psychometric evaluation stages, an Item Response Theory (IRT) approach was taken to empirically test and evaluate the psychometric properties of the developed scale of expectancy and perceived value. IRT is a research design and analysis paradigm that attempts to capture the relationship between an individual's response to an item and his or her level of the latent trait being measured by the scale (Reeve & Fayers, 2005). It provides a clear picture of the performance of each item in the scale and how the scale functions overall for measuring the latent trait, helping model latent traits based on a set of relevant items within a scale and determine the scale's adequacy as an instrument to measure the latent trait (Edelen & Reeve, 2007). In this study, quantitative data were collected from relevant target samples and analyzed for their item and scale properties. Thus, after the two stages of item bank development and psychometric evaluation, the study plans a reliable and valid scale developed to measure firm managers' expectancy and perceived value of new technology.

Item Bank Development

Given that items in the item pool of expectancy, perceived benefit and perceived cost come from various domains, a series of qualitative sub-phases were conducted to organize and evaluate the items in the item bank development stage. These qualitative sub-phases were binning, winnowing, content expert validation, item revisions, and cognitive interviews (DeWalt, Rothrock, Yount, & Stone, 2007; Revicki et al., 2014).

Binning

Binning refers to a systematic process for grouping items according to the similarity of their contents and the specific latent construct (DeWalt et al., 2007; Revicki et al., 2014). Thus, in this step, items were systematically grouped, and each such group was referred to as a bin. The purpose of binning is to identify items to capture the meaning of a bin, and then to identify redundancy among different content-relevant items in a bin and further identify the best potential items based on qualitative characteristics.

Additionally, during the binning process, items that seemed to not fit an existing bin very closely were set aside for further review. For example, the item "current technologies used in my firm are useless" was initially set aside because it seemed that it did not exactly matches the designed bin called "utility value". This was done to explore if any new bins could be created to reflect the content and characteristics of those filtered items (or those set aside). However, no such additional bins were formed at the end of the binning process. All the filtered items were added back to the existing designed bins that seemed the most closely relevant content bins. These binned items were then reviewed by content experts in the following qualitative sub-phase. To ensure every item was relevant to each assigned bin, the final set of items in each bin was then reviewed again by the author. Eventually, a total of two bins were created in the item pool of expectancy (55 items): (a) efficacy expectancy and (b) outcome expectancy. Three bins were created in the item pool of perceived benefit (65 items): (a) attainment value, (b) intrinsic value and (c) utility value. Three bins were created in the item pool of perceived cost (41 items): (a) effort cost, (b) opportunity cost and (c) psychological cost.

Winnowing

Winnowing refers to the process of reducing the large item pool to a smaller representative set of items that are consistent with the construct characteristics definitions (Revicki et al., 2014). After carefully analyzing each item and comparing them to other items within a given bin, items that met the specific criteria of item removal suggested by Revicki et al. (2014) (i.e., inconsistent with construct definitions, redundant in nature, confusing to understand, had narrow generalizability, and had contexts too specific), were removed from the item pool.

For example, in the efficacy expectancy bin, the item “my firm performs well at using new technology compared to other firms” was deemed to be redundant with “my firm is better than the other firms in using new technology.” The latter item was considered simpler and easier to understand than the former, and hence the former item was removed from the item pool. Similarly, in the outcome expectancy bin, the item “my firm had failed to adopt new technologies, so I do not expect new technology would work well” was deemed to be too context specific (because it showed the specific past activity) and was deleted from the item pool. Likewise, in the bin of effort cost, the items “because of other activities, my firm does not have enough time for adopting new technology” was deemed to be context specific (i.e., “because of other activities.”) and redundant with the item “adopting new technology would demand too much of time.” Thus, the former item was deleted from the item pool. As a result, a total of 18 items were deleted from the item pool of expectancy; 17 items were deleted from the item pool of perceived benefit, and 12 items were deleted from the item pool of perceived cost, generating a smaller pool of 37 items in expectancy, 48 items in perceived benefit and 29 items in perceived cost (See Appendices B).

Content Expert Validation

Content validity is a critical measurement property that assesses whether items in the scale are comprehensive and adequately reflect a desired domain of content, and content expert validation is the recommended method for ensuring content validity (Grant & Davis, 1997; Revicki et al., 2014). In this approach, the item bank was reviewed by experts in the areas of interests, and the feedback from experts can help the scale developer to understand and confirm if the item bank captures the content domain properly (Brod, Tesler, & Christensen, 2009). Specifically, content expert validation can help the researcher discover the vocabularies and the thinking patterns of the target group for describing the domain content (DeWalt et al., 2007). This can assist in confirming the domain definitions, identify the common vocabulary related to domain content, and identify theoretically coherent and incoherent items, and, thus, ensure that the items in a scale are understandable and acceptable to the target population. At the same time, content expert validation can detect any important gaps yet to be covered by the item bank (DeWalt et al., 2007). This can help confirm that the target population's relevant experiences related to the domain content being measured are adequately captured and addressed in the item bank.

The most appropriate way to do content expert validation is by conducting qualitative research entailing direct communication with experts in the areas of interest (Brod et al., 2009). Focus groups and individual interviews are the two methods that are suggested and conducted by previous research (Grant & Davis, 1997; Revicki et al., 2014), because both of them can help ensure that the collection and analysis of the information is systematic, documentable and qualitatively accurate (Brod et al., 2009; Revicki et al., 2014). In this research, the individual interview was adopted due to the research condition.

To ensure that the items are fair to every individual of the target population, strategically selecting participants as content experts is important (Revicki et al., 2014). Content experts should come from different demographic groups as well as represent the various kinds of firm in China's T&A industry in this study. However, there are many different firms depending on different taxonomies, such as textile firms and apparel firms, small-size firms and big-size firms, and private owned firms and state-owned firms. To adequately cover firm managers with different demographic characteristics working at different kinds of firms, a large number of sample populations would be required. However, it is not practical in nature (Revicki et al., 2014). In addition, the *Standards for Educational and Psychological Testing* emphasizes the necessity of relevant training, experience, and qualifications as the criterions of content experts selection (American Educational Research Association, 1985). Therefore, a purposive sampling technique was used to recruit content experts so that participants represent firm managers with age, gender and firm type diversity, and meet the three addressed content experts selection criterions.

Participants were required to work at the position of department manager or program manager and at even higher levels, such as Director (or Manager) of Design Department, Director (or Manager) of Marketing, Director of Human Resources, Business Partner, and Firm Owner, and they needed to have the authority in the decision-making process of new technology adoption. Participants were required to have at least a year of working experience in the T&A industry, which was deemed necessary to ensure that participants had spent considerable time within the industry.

All the participants were recruited from the researcher's own network and connections. Recruitment emails were sent to them, with a description of the research and an invitation to participate in the study. Each participant was compensated with 200 RMB (around $28) gift cards. After the agreements were obtained, online interviews were set up and then conducted at the appointed time through Skype or WeChat. Questions were asked about: (a) their opinions regarding each construct and its connection with new technology adoption; (b) the extent to which the constructs represented their real-life experiences; (c) perceptions and thoughts regarding all the items; (d) the wording and vocabulary of the items; (e) if they found any conceptually repetitive items, and (f) if they recommended adding any unexplored construct to explain expectancy and perceived value of new technology (refer to Appendix C). Each interview last 20 to 40 minutes. The audio of interviews was recorded, and a simultaneous transcription and analysis of the interviews were conducted.

A total of 9 participants were interviewed until the information saturation was reached (Spiggle, 1994). Participants included 2 females and 7 males, with an age range from 31 to 60 years. The participants were deemed to represent the varying demographic groups of firm managers as well as the various kinds of firm in China's T&A industry. See Table 3.1 for the characteristics of the content experts.

Table 3.1.

Characteristics of Content Experts

ID	Age	Sex	Position	Product Category	Ownership	Firm Size
1	31-40	M	Owner	Apparel	Private	Micro-Size Firm
2	31-40	M	Department Manager of Product Development	Apparel	Private	Small-Size Firm
3	31-40	F	Sourcing Department Manager	Apparel	Private	Middle-Size Firm
4	31-40	M	Department Manager of Product Development	Apparel	Private	Middle-Size Firm
5	41-50	M	Production Director	Textile	Private	Middle-Size Firm
6	51-60	M	Vice President	Apparel	State-Owned	Big-Size Firm
7	41-50	F	Product Management Manager	Apparel	Private	Small-Size Firm
8	51-60	M	Marketing Director	Textile	State-Owned	Big-Size Firm
9	31-40	M	Sourcing Department Manager	Apparel	Private	Small-Size Firm

Note: micro-sized firm has less than 20 employees or 3 million RMB annual revenue; small-sized firm has 20-300 employees and annual revenue of 3-20 million RMB; middle-sized firm has 300-1000 employees and annual revenue of 20-400 million RMB, and big-sized firm has more than 1000 employees and annual revenue of more than 400 million RMB.

The results of expert validation suggested several modifications to the items generated from binning and windowing. First, items deleted or revised from the item banks due to redundancy. Redundancy was the most mentioned issue in the three item banks. For example, "My firm is good at using new technology" and "My firm is good at using new technology compared to other firms" were both included in the item bank of expectancy of new technology, representing efficacy expectancy. However, experts reported difficulties when distinguishing these two items. Most of them (5 out of 9) noted that "comparing with other firms" was rarely addressed with nor related to the firm's ability to adopt new technology. In their real experiences, ability was assessed with intra-firm rather than comparison with others. Thus, the comparison result would not help on decision making, and then, these two items had no significant difference in experts' view. Following their suggestion, the latter item was deleted from the item bank. Similarly, "Adopting the new technology would make my firm to be prestigious" was marked to be repetitive with "Firms adopt the new technology have more prestige than those who do not." The latter item was also deleted from the item bank as suggested. Likewise, in the item bank of perceived cost, the items "Adopting new technology makes me feel too anxious" and "I worry too much about adopting new technology" were reported having similar meaning by content experts, which could be represented by another single item "Adopting new technology is emotionally draining." Thus, the third item was kept in the item bank and the other two were removed. See Appendix C for more information about reported redundancy and modification.

Second, items deleted from the item banks due to limited association with the construct being measured. For example, experts pointed out that the item "My firm can beat our competitors to adopt the new technology" had less connection with its measured construct of efficacy expectancy. None of the experts had mentioned competitions with competitors in their firms' technology adoption experience and the adoption behavior was more likely to be an individual act. Whether or not their firm can beat the competitors was not a necessary representation for firm's ability to adopt new technology. Therefore, this item was deleted from the item bank. Likewise, the item "I would welcome the challenge of doing the work to successfully adopt new technology in my firm" was deleted due to limited association with measured intrinsic value. None experts reported that they would "welcome the challenges" in new technology adoption process and the item was then removed from the item bank. See Appendix C for more information about limited-associated items and modification.

Third, Items deleted from the item banks due to confusion in understanding. For example, for the item "My firm is good at using new technology compared to the other technologies," some experts (4 out of 9) reported that "other technologies" was confusing to understand. They were not sure what the "other technologies" stood for. One participant interpreted the "other technologies" as the new technologies that were available for the firm to choose along with the one his firm finally adopted, while another participant took the phrase as the technologies that were currently existing and using in his firm. The varying interpretations would lead to totally different scenarios, which may harm the item's reliability and validity. This item was deleted from item bank following experts' suggestion. Another example is the item "Adopting new technology means more than just money to my firm." Participants were unclear about the term of "more than just money". Thus, this item was removed from the item bank. See Appendix C for more information about confusing items and modification.

Finally, Items added based on experts' suggestions. In the item bank of perceived benefit of new technology (i.e., attainment value), two experts noted that if the new technology adoption action complied with government's suggestion or guidance, then the firm may get potential benefits. Thus, it could be an importance of adopting the new technology (or attainment value), if it fits with the government's suggestion or guidance. In this light, a new item "Adopting new technology would fit with the government's suggestion or guidance" was added into the item bank. Similarly, experts reported a lack of items representing financial loss in the item bank of perceived cost. Following their suggestion, two new items, respectively, "Adopting new technology would demand too much of money" and "It is hard to see the return in a short time when adopt new technology" were added into the item bank. See Appendix C for more added items.

After content expert validation, a total of 19 items resulted in the item bank of expectancy of new technology, 37 items resulted in the item bank of perceived benefit, and 18 items resulted in the item bank of perceived cost of new technology, for further assessments.

Item Revisions

After the binning and winnowing process and the content expert validation, item revisions followed. Since all the items under each construct were generated from various domains, they included a variety of response options (e.g., five-point or seven-point Likert scale). Thus, the item bank was revised to provide a consistent set of response options within each item in the item revision process.

Some researchers suggested that four-point or six-point Likert scales allow for a range of responses and work well for IRT analyses (Dalal, Carter, & Lake, 2014; Silvia, Wigert, Reiter-Palmon, & Kaufman, 2012). In these types of scales, no central point is included, which can help researchers get their participants to avoid taking a neutral stand and help the IRT model avoid misestimating the measured latent trait (Dalal et al., 2014).

Therefore, a four-point Likert scale was chosen in this research. Response choices of "strongly disagree" to "strongly agree" were designed.

Cognitive Interviews

Cognitive interviews are the last step of the item bank development of the study. It was conducted to make sure that respondents understand the items and their meanings, and that they know how to reply to the item bank (Revicki et al., 2014). It is essential for ensuring the content validity of instrument or item bank. Retrospective verbal probing is one of the commonly suggested methods of conducting a cognitive review, in which participants are asked to read and complete the item, and then interviews are followed to ask the participant questions about their understanding of the item content and response scale (Revicki et al., 2014; Willis, 2004). The qualitative data from the cognitive interviews are content analyzed to detect issues related to misunderstandings, absence of comprehension, and other problems with the items and response scales. Generally, a small sample of respondents (N = 10-30) is suggested, depending on the number of items and the complexity of the measures (Revicki et al., 2014).

In this research, potential participants from the researcher's network and connections were emailed by the researcher with a description of the research and an invitation to participate in the study. Similar with content expert validation, the participants were required to work at the position of department manager or higher-level position and have at least a year of working experience in the T&A industry. In addition, in order to ensure the results of cognitive interview being independent with the interviews of content expert validation, a new group of interviewees were recruited.

As result, a total of 10 participants were recruited in the cognitive interviews. Participants included 5 females and 5 males, with an age range from 31 to 50 years. All of them had worked in high level management in Chinese T&A firms. The participants were deemed to represent the varying demographic groups of firm managers as well as the various kinds of firm in China's T&A industry. Participants were compensated with 200 RMB (around $28) gift cards. See Table 3.2 for the characteristics of the participants.

Table 3.2.

Characteristics of Participants of Cognitive Interviews

ID	Age	Sex	Position	Product Category	Ownership	Firm Size
1	31-40	M	Department Manager of Marketing	Apparel	Private	Middle-Size Firm
2	31-40	F	Director of Human Resources	Apparel	Private	Big-Size Firm
3	41-50	M	Department Manager of Production	Textile	Private	Middle-Size Firm
4	41-50	M	Department Manager of Design	Apparel	Private	Big-Size Firm
5	31-40	F	Owner	Apparel	Private	Small Firm
6	31-40	F	Department Manager of Human Resources	Apparel	Private	Big-Size Firm
7	41-50	M	Owner	Apparel	Private	Middle-Size Firm
8	41-50	F	Department Manager of Planning	Apparel	Private	Middle-Size Firm
9	41-50	F	Department Manager of Retailing	Apparel	Private	Big-Size Firm
10	31-40	M	Department Manager of Human Resources	Apparel	Private	Middle-Size Firm

Note: micro-sized firm has less than 20 employees or 3 million RMB annual revenue; small-sized firm has 20-300 employees and annual revenue of 3-20 million RMB; middle-sized firm has 300-1000 employees and annual revenue of 20-400 million RMB, and big-sized firm has more than 1000 employees and annual revenue of more than 400 million RMB.

To conduct the cognitive interviews, first, each participant was emailed the questionnaire that was constructed by items of expectancy, perceived benefit and perceived cost, as well as the survey instruction and interview questions. Similar to content expert interviews, survey instruction included the purpose of this research, the description of each constructs and the definition of new technology.

Next, each participant was asked to complete the survey. Participants needed to rate each item statement on a 4-point Likert scale, from “Strongly Disagree” to “Strongly Agree.” After that, a structured interview was conducted to enquire about the reflection on each item and the whole survey. Questions, such as “What do you think about the survey instructions?”, “Which item do you think is hard to response?”, and “Which item do you think can be revised to be more concise?” were asked. See Appendix D for more information about survey design and interview questions in cognitive interview.

Feedback from participants suggested that the overall survey instruction was clear and easy to understand. No vague item was identified, and all items were deemed to be understandable. Two participants pointed out that several items (in Chinese) did not deliver their meanings smoothly in the way Chinese speaker be used to, even though they understood the meaning what the items tried to represent. Following their suggestions, minor revision was made on the wording of these Chinese items.

After cognitive interview, a total of 19 items resulted in the item bank of expectancy, 37 items resulted in the item bank of perceived benefit and 18 items resulted in the item bank of perceived cost of new technology, waiting for psychometric evaluation.

Psychometric Evaluation

This section discusses the item bank evaluation using IRT approach. A self-reported survey was conducted to empirically test and evaluate the psychometric properties of the developed scale of expectancy, perceived benefit and perceived cost of new technology.

Measures

In this research, the item banks formed after the series of qualitative sub-phases of item bank development were used to measure firm managers' expectancy, perceived benefit and perceived cost of new technology. In addition, in order to give the survey participants a clear conception of new technology, the definition of new technology was given in the survey instruction. According to Oxford dictionary (Oxford.com, 2018), technology is the application of scientific knowledge for practical purposes, and it could be machinery and equipment, as well as a branch of knowledge dealing with engineering or applied sciences. Thus, in this research, new technology was defined as the new application of scientific knowledge that can work for practical purposes and has not been used in the firm before, including hardware (i.e., machinery and equipment) and software. For example, a new type of sewing machine, or new software of inventory management system, that will be adopted for the first time in firm is considered as new technology for the firm, no matter whether or not they have been adopted by the other firms.

Sample Selection

Considering that the study aims to explore the Chinese T&A firm managers' expectancy, perceived benefit and perceived cost of new technology, a nationwide data collection was conducted to recruit firm managers with Chinese T&A industry experience. To ensure that the data adequately represents the diversity of China's T&A industry, survey participants come from different kinds of firms, such as textile firms and apparel firms, and small-size firms and big-size firms. Similar to the qualitative part of the study, participants were required to work at the position of department manager or even higher levels, such as Director (or Manager) of Design Department, Director (or Manager) of Marketing, Director of Human Resources, Business Partner, and Firm Owner, to ensure that they have a role in the decision-making process of new technology adoption. At least a year of working experience in China's T&A industry was deemed necessary for the participants being sophisticated.

Data Collection

Quantitative data for this study was collected from December 2018 to January 2019 via Wenjuanxing, a market research firm. Wenjuanxing has its own panel of survey respondents representing a general sample of the Chinese population, and it also offers sample service that allows researchers to assign a certain type of sample, helping connect a research survey with qualifying respondents precisely. In addition, Wenjuanxing can help monitor the data collection procedure and control for issues such as disqualification due to inattentiveness, high incompletion rates, or unreasonably quick completion times, to increase the validity of collected data. Thus, Wenjuanxing was used for this research and the Chinese T&A firm managers were assigned as the target sample. Three screening questions, such as the position in the firm, years of work experience in the T&A industry and whether or not the participant has a role in the decision-making process of one new technology adoption, were set to help recruit survey participants. Only those who indicated working as department manager or at a higher-level position, having more than a year of work experience in the T&A industry, and having the role in decision-making process, were selected for this study.

According to Revicki et al. (2014), the recommended sample size for psychometric tests like IRT depends on the complexity of the constructs and the total number of items within an item bank. A sample size of 10 participants for every item is considered a general rule of thumb to determine the overall sample size (Revicki et al., 2014). Reeves and Fayers (2005) also recommend using around 500 respondents to achieve accurate parameter estimates in IRT when using polychromous response format items like a Likert-scale format. In this research, a total of 2,147 Chinese T&A firm managers from various firm types were invited to finish the online research survey, and 599 participants eventually met all the requirements of the screening questions and completed the survey. Since each item bank had no more than 40 items, a total of 599 participants seemed to be acceptable for this study. In total, 12,500 RMB was paid to Wenjuanxing to receive these 599 responses.

In the self-reported survey, instructions were firstly provided, giving the information such as the description of the survey and the definition of new technology. In addition to the core-content survey measures, demographic information, such as age and gender, were enquired to understand the general characteristics of the study sample group. Background information of firm, such as product category (e.g., textile or apparel), ownership (e.g., private firm or state-owned firm) and firm size (e.g., micro firm, small-size firm, middle-size firm, big-size firm), were asked as well, to gain a holistic picture of the study sample's firms. The identification of firm size was based on the standard of firm classification given by the National Bureau of Statistics of China (2011), in which micro firm has less than 20 employees or 3 million RMB annual revenue; small size firm has 20-300 employees and annual revenue of 3-20 million RMB; middle-size firm has 300-1,000 employees and annual revenue of 20-400 million RMB, and big-size firm has more than 1,000 employees and annual revenue of more than 400 million RMB.

To ensure the validity of answers, the length of time and the Internet Protocol (IP) address used for answering the survey were monitored. The average length of the survey was observed to be 11 minutes for the initial 50 responses, and this timeframe was later added as a speed check for the rest of the survey. Participants taking about one-third of the average time were deemed as not responding thoughtfully and were automatically screened out. In addition, multiple responses from the same IP address were screened out due to the potential of intentionally repeating answers.

Data Analysis

All statistical analyses were conducted using R-Studio, a free software for statistical computing and graphics. Statistical analysis packages, such as Multidimensional Item Response Theory (MIRT) and Procedures for Psychological, Psychometric, and Personality Research (psych), were used to conduct the analysis in R-Studio.

The collected data was analyzed to examine the psychometric properties of the scales of expectancy, perceived benefit and perceived cost, to test how well each item performed in the scale and how well the scale functions overall for measuring the latent trait (Revicki et al., 2014). Generally, the process of data analysis in IRT consists of evaluating assumptions, selecting and fitting a model, determining the fit, and confirming test fairness, reliability, and validity (Revicki et al., 2014).

IRT assumption.

IRT model has three critical assumptions. They are monotonicity, unidimensionality and local independence (De Ayala, 2009).

Monotonicity.

According to the assumption of monotonicity, the probability of endorsing an item measuring a particular latent trait should increase as the underlying level of the dominant factor increases (Revicki et al., 2014). That is, the trace line, which represents the relationships between a latent trait and its item responses, should increase its height as the latent trait increases, showing as a S-shaped curve (De Ayala, 2009). Applied to this study, if the probability of getting a high response on an item from the expectancy scale or perceived value scale increases with an increase in participants' higher level of expectancy or perceived value of the new technology, then monotonicity is met. This assumption can be assessed by reviewing the plots generated with a nonparametric item response modeling process called Mokken Scaling (Mokken, 1971).

Unidimensionality.

According to the assumption of unidimensionality items in the item bank should represent a single underlying construct, or latent trait (De Ayala, 2009). Applied to this research, it means that all the items in each item bank have to co-vary only due to the presence of expectancy or perceived value and no other factors. This assumption does not exclude the situation that a number of minor dimensions (subscales) may exist in the item bank, but does assume that one dominant dimension suffices to explain the underlying structure (Reeve & Fayers, 2005). However, researchers argued that no item bank can strictly follow the assumption and will most likely have some multidimensionality (Reise, Scheines, Widaman, & Haviland, 2013). Thus, to assess if the unidimensionality is sufficient, checking the potential change or improvement that occur in the robustness of item parameters (item discrimination or factor loading) after removal of items representing other dimensions beyond the single underlying factor is suggested (Harrison, 1986). If there are any significant changes in the item parameters, then the data represents multidimensions and the assumption of unidimensionality is violated. If there are no significant changes, then the unidimensionality is deemed to be sufficient.

Unidimensionality is often determined using principal component analysis (PCA) (Revicki et al., 2014). In PCA, considerations, such as (a) variance accounted for in the largest dimension is greater than 20%, (b) the ratio of the eigenvalues between the largest and second dimensions is considerably large, and (c) a total of eigenvalues of all dimensions other than the largest dimension is less than 1, are commonly used to explore and determine unidimensionality (Hattie, 1985). The factor loadings and the scree-test are also reviewed to determine the underlying dimensions (Reeve & Fayers, 2005; Revicki et al., 2014).

Local independence.

Local independence is the third assumption in IRT. This assumption requires that all the item responses are uncorrelated after controlling for the latent trait (De Ayala, 2009). In other words, the item response should be independent given the respondent's ability. If there are supererogatory associations found among the items other than the measured latent trait, the assumption is violated, and this situation is described as a presence of local dependence (Wainer & Thissen, 1996). Edelen and Reeve (2007) pointed out that local dependence can be possibly detected among subsets of items that have similar content or stem. The existence of local dependence may result in a biased parameter estimation, making an item appear to be more informative and then leading to erroneous decisions of selecting items for scale construction (Reeve & Fayers, 2005; Revicki et al., 2014). Therefore, the locally dependent items may need to be stepwise dropped, or be merged as one item for each pair of them, or be combined into testlets for measuring secondary dimensions (Wainer, Bradlow, & Wang, 2007; Zenisky, Hambleton, & Sired, 2002).

A commonly used index for testing local independence is LD X^2 index (Chen & Thissen, 1997). To obtain the LD X^2 statistics for pairs of items, first, a relevant IRT model was fitted into the data, and item parameters and latent trait estimates were computed. Second, expected frequencies of response of item pair were calculated using the estimated parameters, and compared with the observed frequencies of response through bivariate contingency tables, to compute the LD X^2 indexes. In this process, Phi correlations were computed for both the expected and observed bivariate tables. If the expected Phi correlation is lower than the observed correlation for a given item pair, the LD X^2 index is positive. If the expected Phi correlation is higher, then a negative LD X^2 index is obtained. The absolute value of LD X^2 index can be tested against critical value to determine whether the violation of local independence is ignorable. However, there was no one consistently used critical value among IRT research. Houts and Cai (2013) suggested that if the LD X^2 index above 3.0, then the item pairs need to be examined further for possible local dependence, while Choi, Schalet, Cook and Cella (2014) considered values of 10 or greater should be used.

IRT model and item parameters.

IRT presents various types of models to describe the relationship between a person's response to an item and the person's level of the latent trait that the scale intends to measure (De Ayala, 2009). Among all the models, the graded response model (GRM), which was introduced by Samejima (1969), was reported to be appropriate to use for polytomous data, or for the item response options that can be conceptualized as ordered categories (e.g., with Likert-type scales) (Fraley, Waller, & Brennan, 2000; Revicki et al., 2014). In addition, because the GRM allows discrimination to vary item by item, the GRM is capable of offering a flexible framework for modeling the participants' responses, calibrating the items of the item bank, and scoring individual response patterns (Revicki et al., 2014). Thus, the GRM was used in this research to calibrate items within the four-point Likert scale of expectancy and four-point Likert scale of perceived value.

Within the GRM framework, polytomous scores are turned into a series of cumulative comparisons (i.e., below a category versus at or above this category), resulting in m-1 response dichotomies, where m represents the number of response options for a given item (De Ayala, 2009). The GRM was formulated as:

$$P_i(x_i = k|\theta, b_i,a_i) = (1/(1+\exp[-a_i(\theta - b_{i,\,k-1})]) - (1/(1+\exp[-a_i(\theta - b_{i,\,k})]). \qquad (1)$$

where $P_i(x_i = k|\theta, b_i,a_i)$ indicates the probability of choosing response option of k. The range of k is from 1 to 4, since all the items of expectancy and perceived value are measured in four-point Likert scales. a_i represents the item discriminatory parameter of item i, and b_i represents the item location points on the latent trait axis (X-axis) where the probability exceeds 50% that the response is in the associated category or higher category. θ represents person location or the latent trait measured by the scale, describing an individual's ability or level of an unobserved characteristic. In this research, θ denoted the participants' expectancy, perceived benefit or perceived cost of new technology.

To analyze psychometric properties of the item i in IRT, item characteristic curve (ICC) and item parameters of the GRM model were reviewed (Reeve & Fayers, 2005). ICC describes the relation between an individual's level of a trait and the probability of correct response to an item (De Ayala, 2009). In this research, ICC for each item was generated and reviewed to understand how participants' expectancy, perceived benefit and perceived cost of new technology were related to the responses chosen of the polytomous items of each scale.

As one of the item parameters, person location or the latent trait (θ) describes the level of unobserved characteristic, which was expectancy or perceived value of new technology in this research. Theoretically, it can range from –infinity to +infinity; however, a range of -6 to 6 is assigned as default in the MIRT package. Though De Ayala (2009) argued that a range of -3 to 3 would be sufficient in IRT analysis, the default range of value was used in this research in order to gain a more holistic view of item performance on various latent trait. The higher place θ locates, the higher level of latent trait it represents.

Item discriminatory parameter (a) characterizes how well an item can differentiate among individual located at different points along the θ continuum (De Ayala, 2009). Similar to θ, it can also theoretically range from –infinity to +infinity. Items with larger discriminatory parameter performance discriminating better among respondents located at different points along the θ continuum than do items with smaller discriminatory parameter. However, a positive discriminatory parameter between approximately 0.8 and 2.5 is suggested and considered as having good discrimination (De Ayala, 2009). Thus, in this research, items with discriminatory parameter ranging from 0.8 to 2.5 were considered capable of well discriminating firm managers between low and high expectancy, perceived benefit and perceived cost of new technology. Items with discriminatory parameter below or beyond the range were flagged and reviewed for possible deletion.

Threshold parameter is another parameter needs to review. It represents the location point on the latent trait axis (X-axis) where the ICC changes its direction (De Ayala, 2009). For one k response categories item, there are k-1 threshold parameters (represented by b in MIRT package), following the constraints that $b_{k-1} < b_k < b_{k+1}$ (Samejima, 1969). The threshold parameter of k^{th} response category indicates that at this point it becomes more likely that category k+1 is endorsed rather than category k. Thus, knowledge of threshold parameters of every response category for an item enables researchers to estimate which response category will be chosen by a participant for that item. In this research, item from the scales of expectancy, perceived benefit and perceived cost should have 3 threshold parameters ideally, varying from negative infinity to positive infinity. Since IRT hypothesizes that individual with high latent trait should have higher possibility to choose high score category, the threshold parameters of one item should arrange in order from smallest to highest. Therefore, the items with threshold parameters not arrange in order were flagged and reviewed for possible deletion.

Model fit.

Model fit describes how well an IRT model reflects observation (De Ayala, 2009). To assess the model fit, indices at the individual item level and at the overall scale level need to be reviewed.

At the item-level, the common statistic of S-X^2 is used to assess the fit of each individual item to the observed proportions of response. It is based on the observed and expected proportions of correct and incorrect response, indicating the degree to which a trace line is under- or overestimating the proportion of correct response. More simply, it indicates how well the responses follow the pattern predicted by the model (Orlando & Thissen, 2000, 2003). S-X^2 is considered having adequate power to detect misfit (Orlando & Thissen, 2000, 2003), and statistically significant differences indicate poor fit of the item. In this research, items with poor item fit were flagged and reviewed for possible deletion.

At the scale-level, M_2 statistics is recommended to assess IRT model fit (Albert Maydeu-Olivares & Joe, 2005). The M_2 statistics is based on the contingency tables represented by moments instead of probabilities (Alberto Maydeu-Olivares & Joe, 2014). It is asymptotically chi-square equal to the number of univariate and bivariate moments minus the number of estimated parameters (Alberto Maydeu-Olivares, 2013). If M_2 statistics is statistically significant, it indicates that the assigned model does not replicate the observed reality well and there exists a lack of fit between the two. In addition, a root means square error of approximation (RMSEA) fit index can also be generated from the M_2 statistics. Alberto Maydeu-Olivares (2013) suggested using $RMSEA_2$ to distinguish it from traditional RMSEA, as the $RMSEA_2$ obtained from M_2 statistics is a variation of

RMSEA. A cutoff of $RMSEA_2$ equal or below 0.05 was suggested and indicates adequate fit (Alberto Maydeu-Olivares, 2013).

Reliability.

In IRT, the concept of reliability refers to the degree to which the items and scales can differ across the levels of latent trait (De Ayala, 2009). It is described as information available or standard error of estimate (SEE) in an item and in the entire test (Revicki et al., 2014). Higher information or low SEE denotes more precision (or reliability) that items and scales have in discriminating individuals among the latent trait.

The amount of information available from a single item can be derived from the Item Information Function (IIF) of that item (De Ayala, 2009). IIF is indicative of the range of latent trait where an item is best at discriminating among individuals and is defined by the item discrimination parameters and threshold parameters. Items with high discrimination parameters have the most peaked information function (i.e., a high height shown on the curve) when used to test a certain range of latent trait determined by threshold parameters (De Ayala, 2009). That is, if an item has more information at a certain range of latent trait, then the item is considered as more informative and reliable to test the latent trait at the certain range. In this research, items with relatively low information were flagged and considered for potential issues, such as the items (a) not measuring the proposed latent trait, and (b) being poorly worded or vague in meaning or too complex for the respondents to understand (Reeve & Fayers, 2005), and thus left for possible deletion from the item bank.

The reliability of the scale, or the information available in the scale, can be obtained by summing up all individual items' information functions in the scale. Similar to item reliability, the scale is considered to be reliable at the range of latent trait where the information function curve is high. In this research, the information function curve of expectancy and perceived value of new technology were reviewed for reliability testing.

Test-fairness.

Test fairness means that a scale should generate the same or similar results while measuring individuals with similar levels of the latent trait, for example, regardless of individuals' demographic difference (Revicki et al., 2014). If items have different response functions for one group respondents than for another, then the items are considered biased. To identify biased items in the scale, differential item functioning (DIF) is used as a common practice in IRT (De Ayala, 2009).

DIF refers to the situation in which items display different statistical properties for different groups of individuals who have the same or similar level of latent trait (Revicki et al., 2014). It is considered as a threat to the validity of scales. Graphically, DIF is represented as the difference between two trace lines (from one focal group and one reference group). If an item is not exhibiting DIF, then the two trace lines would be superimposed on one another, and if the trace lines are meaningfully different, then DIF may be present for that item (De Ayala, 2009).

In IRT, TSW likelihood ratio test are commonly used to detect DIF (De Ayala, 2009). TSW likelihood ratio test is based on a comparison of the fit of two IRT models using the likelihood ratio statistic (Thissen, Steinberg, & Wainer, 1988). It is used to find whether there is a significant difference in model fit when an item is constrained to have the same location across groups versus when the item is free to have different locations across groups.

To run a likelihood ratio test, first, an IRT model is fit to both groups, restricting the item parameters to be equal across groups for all but one item. Then the one free item can generate different parameter estimates across both groups. Second, the same IRT model is fit to both groups again but with all items' parameter estimates equal across both groups, which presents no DIF situation. Finally, a comparison of the likelihood ratios of both models is conducted. A statistically significant difference between the two models indicates presence of DIF for the item. Conversely, an insignificant difference indicates the item is not exhibiting DIF.

In this research, TSW likelihood ratio test was conducted to detect differential item functioning within items, in terms of firm managers' gender, age, and firm type (i.e., firm size, ownership). Since only two groups/categories could be compared and analyzed at a time for DIF conditions, variables, such as age and firm type, which have more than two categories, were separately analyzed by pairs across all categories. For the scale items identified with presence of DIF conditions, the impact of DIF is analyzed. If the DIF impact is not negligible, then the text of DIF item should be subjected to further review to determine if differential performance is due to the wording of the item. If no error is observed in the item design, the item might need to be deleted from the scale to remove bias possibilities.

Convergent validity.

To establish convergent validity of a scale, empirical evidence that demonstrates the scale is measuring what it is intended to measure is required. Unidimensionality and reliability were addressed by O'Leary-Kelly and Vokurka (1998) as two important components required to establish convergent validity of a new scale. The satisfaction of unidimensionality ensures that the existence of a single trait underlies a set of measures (Gerbing & Anderson, 1988), and the satisfaction of reliability ensures the consistency or stability of a measure (Bollen, 1989). In this research, empirical evidences that show these two components were met on the scale of expectancy, perceived benefit and perceived cost, were generated from the IRT assumption test and reliability test.

As suggested by EVT, if individual possesses a high expectancy of doing one task successfully, and a high perceived benefit and low perceived cost of doing the task, then the individual would have a high motivation to perform that task. Thus, a positive correlation is suggested among expectancy and motivation as well as perceived benefit and motivation. A negative correlation is suggested among perceived cost and motivation. In this light, convergent validity of the new scale of expectancy and perceived benefit of new technology would be confirmed when positive correlation is identified by empirical data between expectancy/perceived benefit of new technology and motivation to adopt new technology, and convergent validity of the perceived cost of new technology would be confirmed when negative correlation is identified by empirical data between perceived cost of new technology and motivation to adopt new technology. Since motivation is manifested by intension, effort and persistence (Reeve, 2014), the instruments of individual intension was broadly used in EVT research for assessing human's motivation of behavior choices. Thus, three four-point Likert items (α = .89) that used to measure human's behavioral intension to adopt mobile banking by Gu, Lee and Suh (2009) were adopted and adapted in this research, for assessing Chinese T&A firm managers' motivation to new technology adoption. The three items are "I intend to support adopting new technology in my firm," "I will recommend other managers to support adopting new technology in my firm," and "I will continually support adopting new technology in my firm."

CHAPTER IV. RESULTS

The results section includes the following: (a) sample description, (b) initial item bank analysis, (c) item reduction, and (d) final item bank analysis.

Sample Description

A total of 2,147 Chinese T&A firm managers were contacted and asked to finish the online research survey distributed by Wenjuanxing in January, and 599 participants completed the survey within one month. The answer rate was 27.9%. A descriptive analysis of the data was conducted to understand the demographic characteristics of the participants. Ages of the participants ranged from 21 to 60. There were 215 participants (35.9%) aged from 21-30 years; 318 participants (53.1%) aged from 31-40 years; 54 participants (9%) aged from 41-50 years, and 12 participants (2%) aged from 51-60 years. No participants were aged below 21 or above 61. The age distribution was expected and consistent with Hu's (2014) research of the motivation mechanism of firm managers in Chinese T&A industry. Thus, it was deemed to reflect the age structure of firm managers in Chinese T&A industry.

The sample included 311 males (51.9%) and 275 females (45.9%), and thirteen participants refused to answer the query. All the participants had at least one year working experience in the T&A industry. Almost half of them (47.1%) had 1-5 years' experience, following by 6-10 years (39.7%) and more than 10 years (13.2%). All of them acknowledged that they had a role in the decision-making process if their firms or departments considered adopting new technologies.

Background information of the participants' firms were also analyzed. A total of 277 (46.2%) participants reported their firms as textile firms and 322 (53.8%) as apparel firms. Based on ownership, 71.4% of firms were private owned, 11.4% were owned by the state (i.e., business enterprise where the government or state has significant control through full, majority, or significant minority ownership) and 17.2% were jointly owned with foreign investment. The majority of firms were middle-sized (45.3%) and small-sized firms (40.9%), while 8.3% of firms were big-sized firms and 5.5% were micro-sized firms. Table 4.1 shows the sample information in detail.

Table 4.1.

Sample Description

Variable	**Categories**	**Frequency**	**Percentage**
Age	20 and below	0	0
	21-30	215	35.9
	31-40	318	53.1
	41-50	54	9
	51-60	12	2
	61 and above	0	0
Gender	Male	311	51.9
	Female	275	45.9
	Prefer not to disclose	13	2.2
Working History	1-5 years	282	47.1
	6-10 years	239	39.7
	more than 10 years	79	13.2
Firm Type I (Product Category)	Textile Firm	277	46.2
	Apparel Firm	322	53.8
Firm Type II (Ownership)	Private Owned	428	71.4
	State Owned	68	11.4
	Foreign Joint Business	103	17.2
Firm Type III (firm size)	Micro-Sized Firm	33	5.5
	Small-Sized Firm	245	40.9
	Middle-Sized Firm	271	45.3
	Big-Sized Firm	50	8.3

Note: micro-sized firm has less than 20 employees or 3 million RMB annual revenue; small-sized firm has 20-300 employees and annual revenue of 3-20 million RMB; middle-sized firm has 300-1000 employees and annual revenue of 20-400 million RMB, and big-sized firm has more than 1000 employees and annual revenue of more than 400 million RMB.

Initial Item Bank Analysis

In this section, the results of initial item bank analysis, including the assessment of response frequency, IRT assumptions, item parameters and model fit, and reliability, were conducted on expectancy, perceived benefit and perceived cost, respectively.

Expectancy

The item bank of expectancy consisted of a total of 19 items, represented by 14 items for efficacy expectancy and 5 items for outcome expectancy. All response categories of the 19 items were endorsed by participants, showing reasonable variability in the item endorsements (De Ayala, 2009). Category 3 was the most endorsed category for 17 items, with the highest 63.3% in item E1 and the lowest 41.1% in item E10. No missing data occurred in the data. Descriptive statistics of the initial item bank of expectancy was shown in Table 4.2. Full description of items was shown in appendix D.

Table 4.2.

Descriptive Statistics of the Initial Item Bank of Expectancy

Item	**N**	**Mean**	**Std. Dev.**	**Proportion of participants (%) with each response category**			
				1	2	3	4
E1	599	3.12	0.611	0.7	11.4	63.3	24.7
E2	599	3.25	0.700	1.5	10.7	49.6	38.2
E3	599	3.21	0.687	1.5	10.9	53.1	34.6
E4	599	3.26	0.667	0.8	10	51.1	38.1
E5	599	3.19	0.704	1.2	13.5	50.4	34.9
E6	599	3.07	0.762	2.7	17.9	49.6	29.9
E7	599	3.13	0.731	1.8	15.5	50.4	32.2
E8	599	3.27	0.749	2	12.2	42.9	42.9
E9	599	3.16	0.749	2.3	14.2	48.4	35.1
E10	599	3.31	0.742	1.8	11.4	41.1	45.7
E11	599	3.11	0.802	3	18.2	43.6	35.2
E12	599	3.04	0.808	5.3	14.7	50.8	29.2
E13	599	3.10	0.787	3.7	15.5	48.2	32.6
E14	599	3.07	0.823	5	15.7	46.9	32.4
E15	599	3.14	0.686	2	11.5	57.1	29.4

Table 4.2. (Continued)

Item	N	Mean	Std. Dev.	Proportion of participants (%) with each response category			
				1	2	3	4
E16	599	3.23	0.702	1.8	10.4	51.3	36.6
E17	599	3.14	0.732	2.3	13.7	51.6	32.4
E18	599	3.12	0.728	1.8	15.9	51.3	31.1
E19	599	3.11	0.812	4.3	15	45.9	34.7

IRT assumptions.

The first IRT assumption, which is monotonicity, was met, as the probability of getting a high response on an item from the item bank of expectancy increases with participants' expectancy of new technology increasing. It was assessed by checking the plots generated with a nonparametric item response modeling process called Mokken Scaling (Mokken, 1971). Two plots were generated for each item.

The first plot represented three item-step-response functions, which were reflected by three curves illustrating the difference of probability of endorsing response categories between responses of 0 and 1, 1 and 2, and 2 and 3. The x-axis of plot represented rest score, which referred to the total score received by a participant on all items except the selected one from item bank. With those three item-step-response functions increasing monotonically along with the rest score, the assumption of monotonicity was confirmed for each of the 19 items, indicating that participants with high expectancy tend to choose high score response (Van der Ark, 2007). For example, for item E11, the three curves showed an increased tendency with the participants' rest scores increasing. Particularly, participants' probability of endorsing the last response category rather than the third response category for item E11 increased from approximately .2 to .5, as the participants' rest score increased from under 35 to above 50.

The second plot represented participants' response on the selected item along with rest score. An increasing curve indicates participants tend to choose high-value response category when their expectancy of new technology increase. Each of the 19 items' second plot showed an increasing curve, thus the data was considered to satisfy the assumption of monotonicity in IRT (Van der Ark, 2007). For example, for item E11, participants with rest score 44-52 tend to choose a higher response category than the participants with rest score 16-31. Refer to Appendix F for overall plots.

The second assumption, unidimensionality, was assessed by reviewing the underlying structure of the item bank generated with a principal component analysis (PCA) extraction method (Revicki et al., 2014). Using the criterion of eigenvalue greater than 1 (Kaiser, 1960), PCA yielded six principal dimensions for the item bank of expectancy, accounting for 49.31% of the total variance. Specifically, the first dimension accounted for 19.04% of the variance, the second dimension explained 7.62% of the variance. Refer to Table 4.3 for detailed PCA results.

Table 4.3.

Results of PCA Test for the Initial Item Bank of Expectancy

% of variance explained by first PC	19.04%
% of variance explained by second PC	7.62%
% of variance explained by third PC	5.87%
% of variance explained by fourth PC	5.78%
% of variance explained by fifth PC	5.59%
% of variance explained by sixth PC	5.39%
Ratio of first PC to second PC	2.5

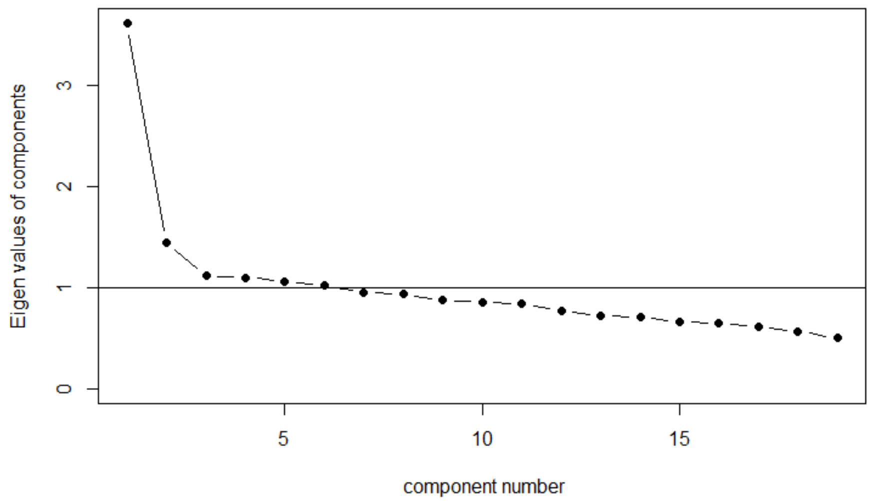
Compared with Hattie's (1985) suggested threshold of a minimum of 20% variance explained by the first dimension, the first principal dimension extracted from the data explained less than 20% variance (i.e. 19.04%), which indicated a violation of unidimensionality in the data. In addition, a total of 7 items loaded on more than one dimension (with factor loading above .3), and a scree test found that more than one dimensions lay above the point of inflexion, suggesting the data was observed to have multidimensionality and violate the assumption of unidimensionality. Refer to Table 4.4 for the results of factor loadings of the 19 items and Figure 4.1 for the screen test result.

Table 4.4.

Factor Loadings for the Initial Item Bank of Expectancy

	Loading on Dimension					
Items	**1**	**2**	**3**	**4**	**5**	**6**
E1	0.298	0.655	0.265	0.211	0.045	0.153
E2	0.487	0.049	0.413	0.005	-0.062	-0.009
E3	0.430	0.199	0.150	-0.145	-0.512	0.269
E4	0.339	-0.314	0.628	-0.052	-0.012	-0.035
E5	0.362	0.522	0.033	0.294	0.314	-0.153
E6	0.445	-0.087	0.067	-0.020	0.417	0.384
E7	0.474	-0.060	0.106	-0.243	-0.183	0.279
E8	0.427	-0.204	0.055	0.347	-0.099	-0.022
E9	0.359	0.488	-0.047	-0.090	-0.082	-0.123
E10	0.473	-0.311	-0.085	0.134	0.093	-0.091
E11	0.511	-0.098	-0.073	0.074	-0.043	-0.263
E12	0.472	-0.183	-0.112	0.019	0.376	0.192
E13	0.491	0.050	-0.369	-0.104	-0.463	-0.112
E14	0.396	-0.002	-0.377	-0.085	0.066	0.448
E15	0.476	-0.216	0.091	-0.367	0.062	-0.076
E16	0.440	-0.005	0.049	-0.198	0.121	-0.551
E17	0.472	0.021	-0.220	0.378	-0.066	-0.018
E18	0.432	-0.304	-0.116	0.419	-0.134	-0.054
E19	0.438	0.180	-0.243	-0.471	0.247	-0.147

Figure 4.1. Scree plot of the initial item bank of expectancy

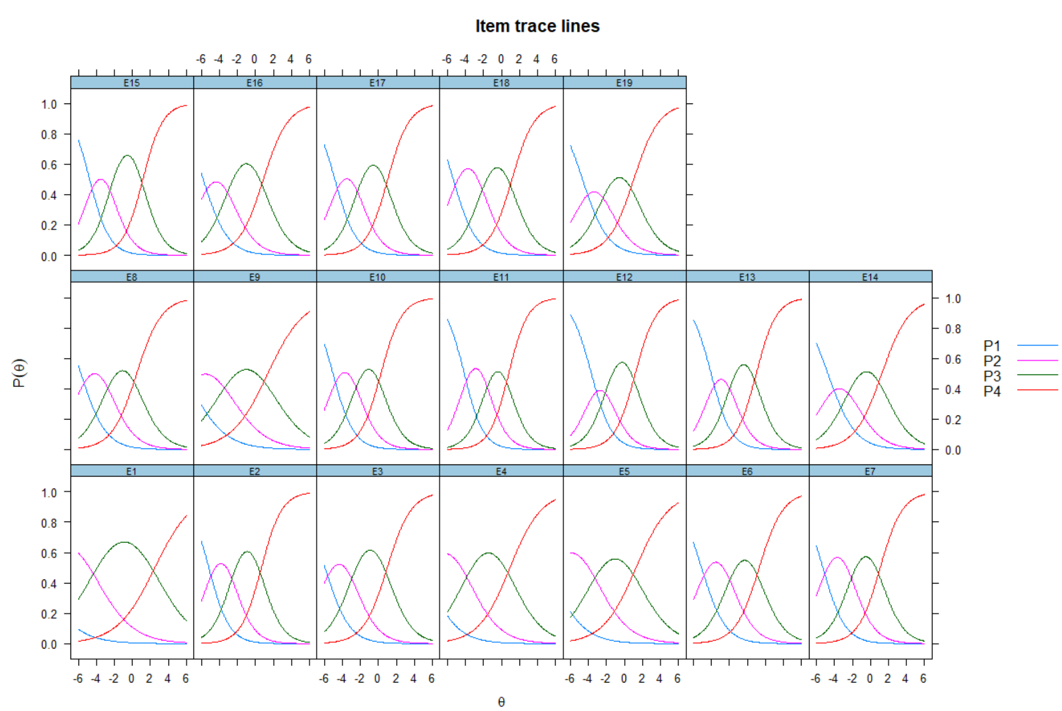


The third assumption, local independence, was assessed by checking LD X^2 index for each item pair in the item bank of expectancy. Out of 190 item pairs, only 18 pairs LD X^2 index (9.47%) were less than 10, and no item pair LD X^2 index was below than 3, indicating the existence of local dependence among items in the item bank of expectancy. Edelen and Reeve (2007) argued that the assumption of local independence was technically subsumed under unidimensionality assumption, and local dependence could potentially arise when data represents multidimensionality, as a result of item pairs having similar stem or content. Given the previous PCA and scree test indicated multiple dimensions as the underlying scale structure, existence of local dependence was expected. Refer to Appendix I for the LD X^2 index matrix.

Item parameters and model fit.

The GRM was used to calibrate items within the item bank of expectancy. The latent trait, participants' expectancy of new technology, was mapped to a scale of -6 to 6 standard deviation below and above the average level of expectancy on the x-axis. Zero on the x-axis was plotted to represent average level of expectancy. Participants with lower than average level of expectancy were mapped on the negative range and participants with higher than average level of expectancy were mapped on the positive range on x-axis. To graphically demonstrate the relation between an individual's level of expectancy and the probability of endorsing response categories of an item, ICC of each item was generated. A higher score on x-axis meant a higher level of expectancy, and a higher score on y-axis meant a higher possibility of endorsing one response category. The ICCs showed that response category 3 and 4 had higher possibility being endorsed by participants with average and above average level of expectancy than category 1 and 2 in all the items. See Figure 4.2 for detailed information of ICCs.

Figure 4.2. Item characteristic curve of the initial item bank of expectancy



The item's discrimination parameter 'a' was reviewed to identify how well an item can distinguish participants with different levels of expectancy. For the 19 items, discrimination parameter ranged from 0.48 to 0.94. Considering that the suggested value for well discrimination was from .8 to 2.5, only 9 items out of 19 (47.37%) showed an acceptable ability to differentiate participants with various level of expectancy. The item E11, "My firm has money to adopt new technology," had the highest discrimination parameter, indicating the highest discrimination ability. That is, participants with high levels of expectancy were likely to endorse high score response categories, and participants with low levels of expectancy were likely to endorse low score response categories. Item E1, "People in my firm would be good at using new technology," had the lowest discrimination parameter, indicating the lowest discrimination ability. Reflected on the ICC in figure 4.2, the first, second and fourth response category of item E1 were overlapped by category three at the expectancy level from -3 to 3. It represented that participants tend to choose the third response category on item E1, no matter their level of expectancy. Refer to Table 4.5 for each item's discrimination parameter.

Table 4.5.

Item Parameter Estimates and Item Fit Statistics

Items	**a**	**b1**	**b2**	**b3**	**S-X^2**	**df**	**p**
E1	0.48	-10.74	-4.31	2.49	68.22	42	0.01
E2	0.88	-5.17	-2.51	0.68	63.95	41	0.01
E3	0.75	-5.91	-2.83	0.99	46.15	42	0.30
E4	0.57	-8.61	-3.86	0.95	60.40	42	0.03
E5	0.54	-8.44	-3.37	1.29	72.48	42	0.00
E6	0.76	-5.09	-1.94	1.31	45.55	40	0.25
E7	0.81	-5.28	-2.11	1.09	55.95	40	0.05
E8	0.72	-5.71	-2.68	0.49	60.49	39	0.02
E9	0.49	-7.77	-3.36	1.38	65.62	41	0.01
E10	0.86	-5.04	-2.45	0.29	56.07	39	0.04

Table 4.5. (Continued)

Items	a	b1	b2	b3	S-X2	df	p
E11	0.94	-4.12	-1.60	0.81	56.41	41	0.06
E12	0.87	-3.67	-1.78	1.22	41.92	48	0.72
E13	0.90	-4.04	-1.82	0.99	62.71	42	0.02
E14	0.66	-4.73	-2.16	1.27	56.76	55	0.41
E15	0.91	-4.74	-2.31	1.17	40.05	37	0.34
E16	0.73	-5.80	-2.91	0.90	65.90	42	0.01
E17	0.84	-4.84	-2.20	1.05	42.30	39	0.33
E18	0.80	-5.34	-2.10	1.18	73.56	40	0.00
E19	0.71	-4.65	-2.15	1.04	88.87	49	0.00

The threshold parameter was reviewed to assess participants' response on each item. Since all the items had four response categories, there were three threshold parameters observed. They ranged from -10.74 to 2.49. Especially, item E1 had both the lowest (i.e. -10.74) and the highest (i.e., 2.49) threshold parameters. Considering it had the lowest discrimination parameter and more than half participants (63.3%) chose the third response category in this item, it was not surprised. Besides item E1, all the other items had a range of -8.61 to -3.67 for the first threshold parameters, a range of -3.86 to -1.60 for the second threshold parameters, and a range of 0.49 to 1.38 for the third threshold parameters. This indicated that participants with lower and average levels of expectancy were prone to answer higher score response options in items. In other words, all the items in the item bank could well capture lower and average levels of expectancy. Refer to table 4.5 for each item's threshold parameters.

The IRT model fit was assessed by using M2 statistic. The M2 statistics for the initial item bank was computed as M2 (114) = 225.55, $p < .001$, indicating that the model didn't well replicate the observed reality. $RMSEA_2$ fit assessment was .04, which was below the general cut-off value of .05 (Alberto Maydeu-Olivares, 2013); however, the fit indices of CFI was .87 and TLI was .85, which were both under the cut-off value of .95. Therefore, a poor model fit was detected by the M2 statistic.

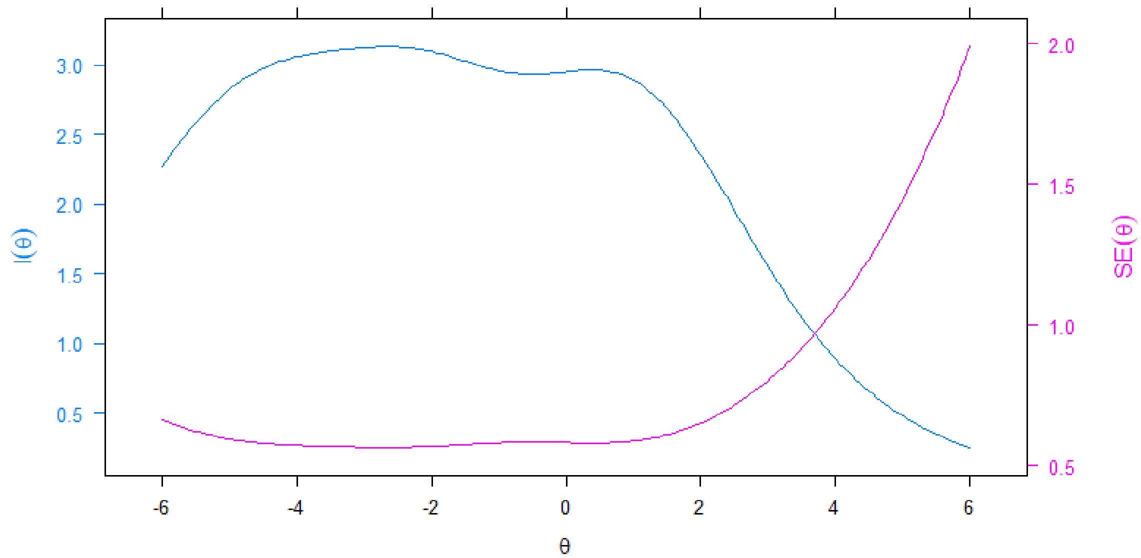
At the item-level, S-X^2 was used to assess the fit of each individual item. Out of 19, only 7 items had a good fit with $p > .05$. Item E5 (i.e., “People in my firm have skills of using new technology”), E18 (i.e., “I am confident that new technology would be compatible with the existing technologies in my firm”), and E19 (i.e., “I am sure about the results of using new technology in my firm”), were found having the significant poor fit. These items were flagged for potential elimination from the item bank. Refer to table 4.5 for detailed S-X^2 statistic.

Reliability.

Reliability was assessed by checking the amount of information available from a single item and the overall item bank derived from the IIF. High information or low SEE denotes more precision (or reliability) that items and scales have in discriminating individuals among the latent trait. In the item bank of expectancy, item E1 had comparatively lower information, suggesting less value it contributed to the precision of the overall test. Refer to appendix F for IIF of each item.

The overall item bank IIF illustrated a higher curve at the latent trait range of -4 to 2. It indicated that the initial item bank of expectancy generated more information, or was more reliable, to test the expectancy level of -4 to 2. Considering the general range of ability was -3 to 3, the initial item bank was deemed to be more precise to test participants with average, lower than average, and slightly higher than average level of expectancy. Refer to Figure 4.3 for IIF of the initial item bank. From the classical test theory perspective, the initial item bank was analyzed to have a reliability of .86 Cronbach's alpha.

Figure 4.3. Item information function of the initial item bank of expectancy



To summarize, the initial item bank of expectancy violated the two assumption of unidimensionality and local independence. More than one component was draw from reality observation, and interrelated items existed among the 19 items in the item bank. Some items were poor replications of the reality and could not precisely measure expectancy. The overall item bank had a poor model fit. All of these called for an item bank refining process. Since the existence of local dependent items may result in a biased parameter estimation and multidimensionality, items with local dependence may need to be stepwise dropped. Therefore, the initial item bank of 19 items was subjected to iterative item reduction process to eliminate local independence.

Perceived Benefit

The item bank of perceived benefit consisted of a total of 37 items, represented by 6 items for attainment value, 10 items for intrinsic value, and 21 items for utility value. All response categories of the 37 items were endorsed by participants. Category 3 was the most endorsed categories for 31 items, with the highest 64.9% in item B18 and the lowest 35.9% in item B20. No missing data occurred in the data. Descriptive statistics of the initial item bank of perceived benefit was shown in Table 4.6. Full description of items was shown in appendix D.

Table 4.6.

Descriptive Statistics of the Initial Item Bank of Perceived Benefit

Item	N	Mean	Std. Dev.	Proportion of participants (%) with each response category			
				1	2	3	4
B1	599	3.23	0.611	0.5	8.3	59.1	32.1
B2	599	3.14	0.779	2.7	16.2	45.4	35.7
B3	599	3.44	0.664	1	6.7	39.9	52.4
B4	599	3.3	0.699	2.2	7.3	48.7	41.7
B5	599	3.08	0.761	3.3	15.2	51.6	29.9
B6	599	3.21	0.743	3	10.2	49.4	37.4
B7	599	2.82	0.842	7	24.9	47.1	21
B8	599	3.06	0.754	2.7	17.5	50.9	28.9
B9	599	3.04	0.839	5	18	44.6	32.4
B10	599	3.24	0.693	1.8	9.3	51.9	36.9
B11	599	3.14	0.692	2	11.9	56.3	29.9
B12	599	2.95	0.792	4.2	21.5	49.6	24.7
B13	599	3.07	0.743	2.8	16	52.9	28.2
B14	599	3.1	0.764	2.8	16	49.2	31.9
B15	599	3.15	0.736	2	14.9	49.7	33.4
B16	599	3.14	0.704	1.8	13.2	54.1	30.9
B17	599	2.89	0.764	4.2	22.5	53.1	20.2
B18	599	3.11	0.611	1.2	10.2	64.9	23.7
B19	599	3.46	0.648	0.8	6	39.6	53.6
B20	599	3.51	0.649	1.2	5	35.9	57.9
B21	599	3.36	0.674	1.8	5.7	47.2	45.2
B22	599	3.07	0.785	3.7	16.4	48.9	31.1
B23	599	3.07	0.763	3	17	50.4	29.5

Table 4.6. (Continued)

Item	N	Mean	Std. Dev.	Proportion of participants (%) with each response category			
				1	2	3	4
B24	599	3.23	0.724	1.7	12.4	47.4	38.6
B25	599	3.3	0.763	3.2	9	42.4	45.4
B26	599	3.32	0.703	1.3	9.8	44.7	44.1
B27	599	3.2	0.758	2.3	13.7	45.7	38.2
B28	599	3.3	0.702	1.7	9.2	47.1	42.1
B29	599	3.33	0.679	1.5	7.5	47.9	43.1
B30	599	3.13	0.763	2.7	15.4	48.2	33.7
B31	599	3.04	0.747	2.8	17.4	52.6	27.2
B32	599	3.39	0.653	0.8	6.8	44.4	47.9
B33	599	3.08	0.725	2.5	15	54.4	28
B34	599	3.4	0.639	1	5.3	46.2	47.4
B35	599	3.24	0.765	2.7	12.2	43.9	41.2
B36	599	3.15	0.841	4.8	14.4	41.7	39.1
B37	599	2.65	0.84	9.3	30.6	45.6	14.5

IRT assumptions.

Similar with expectancy, the assumption of monotonicity was assessed by checking the plots generated from Mokken Scaling (Mokken, 1971). All plots of items in the item bank of perceived benefit represented increased item-step-response functions, indicating that participants with high perceived benefit tend to choose high score response categories. The assumption of monotonicity was confirmed for each of the 37 items. For example, for item B16, the three curves showed an increased tendency with the participants' rest scores increasing. Particularly, participants' probability of endorsing the last response category rather than the third response category for item B16 increased from approximately .1 to .5, as the participants' rest score increased from under 60 to above 90. In addition, for item B16, participants with rest score above 90 tend to choose a higher response category than the participants with rest score under 60. Refer to Appendix F for overall plots.

Unidimensionality was assessed by reviewing the underlying structure of the item bank generated with PCA (Revicki et al., 2014). Using the criterion of eigenvalue greater than 1 (Kaiser, 1960), PCA yielded ten principal dimensions for the item bank of perceived benefit, accounting for 52.77% of the total variance. Specifically, the first dimension accounted for 20.89% of the variance, the second dimension explained 6.18% of the variance. Refer to Table 4.7 for detailed PCA results.

Table 4.7.

Results of PCA Test for the Initial Item Bank of Perceived Benefit

% of variance explained by first PC	20.89%
% of variance explained by second PC	6.18%
% of variance explained by third PC	3.99%
% of variance explained by fourth PC	3.64%
% of variance explained by fifth PC	3.44%
% of variance explained by sixth PC	3.14%
% of variance explained by seventh PC	3.01%
% of variance explained by eighth PC	2.90%
% of variance explained by ninth PC	2.86%
% of variance explained by tenth PC	2.71%
Ratio of first PC to second PC	3.4

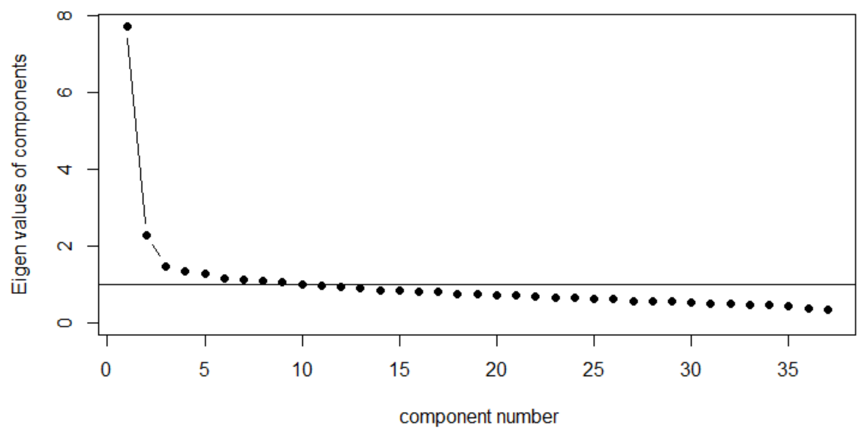
The first principal dimension extracted from the data explained slightly more than 20% variance. However, a total of 10 items loaded on more than one dimension (with factor loading above .3), and a scree test found that more than one dimensions lay above the point of inflexion, which all suggested the data was observed to have multidimensionality and violate the assumption of unidimensionality. Refer to Table 4.8 for the results of factor loadings of the 37 items and Figure 4.4 for the screen test result.

Table 4.8.

Factor Loadings for the Initial Item Bank of Perceived Benefit

Item	Loading on Dimension									
	1	2	3	4	5	6	7	8	9	10
B1	0.354	0.286	-0.027	0.125	0.207	0.375	-0.364	0.09	-0.057	-0.178
B2	0.414	-0.135	-0.095	0.355	0.222	-0.336	-0.284	0.069	0.264	0.078
B3	0.378	0.203	0.176	-0.044	-0.454	0.129	0.394	0.118	-0.193	-0.129
B4	0.368	0.136	0.046	-0.422	0.240	-0.043	-0.1	0.371	-0.057	0.305
B5	0.438	-0.241	-0.020	0.302	0.070	0.047	0.127	-0.148	0.102	-0.168
B6	0.430	-0.007	0.183	-0.031	0.009	-0.338	0.11	0.34	0.271	0.127
B7	0.476	-0.539	0.027	0.096	0.052	0.145	0.03	-0.117	-0.078	0.211
B8	0.476	-0.354	0.392	0.070	-0.112	0.110	-0.075	-0.015	0.018	0.046
B9	0.497	-0.368	0.126	-0.003	-0.137	-0.045	-0.014	0.114	-0.074	-0.098
B10	0.442	-0.252	0.386	0.310	0.035	0.081	-0.01	-0.093	-0.041	-0.206
B11	0.457	-0.324	0.273	0.038	-0.216	-0.026	-0.015	0.078	0.109	0.175
B12	0.474	-0.308	-0.141	-0.184	-0.058	0.034	-0.091	-0.201	-0.346	0.151
B13	0.554	-0.061	-0.028	-0.367	0.126	-0.058	-0.096	-0.168	-0.011	-0.159
B14	0.469	-0.298	-0.035	-0.150	-0.284	-0.166	-0.171	-0.069	0.041	-0.031
B15	0.565	-0.058	0.092	-0.204	-0.012	0.133	-0.085	0.045	0.141	-0.202
B16	0.461	-0.303	0.059	-0.417	0.028	0.036	-0.007	-0.072	-0.134	-0.054
B17	0.522	-0.196	-0.329	0.070	0.037	0.034	0.033	-0.045	-0.143	-0.045
B18	0.444	0.146	-0.205	0.151	0.000	0.420	-0.258	-0.049	-0.023	0.196
B19	0.441	0.340	0.044	-0.048	-0.272	-0.210	-0.162	0.012	0.173	-0.293
B20	0.417	0.268	0.108	0.125	0.125	-0.063	0.113	0.215	-0.435	-0.126
B21	0.431	0.304	0.297	0.021	-0.034	0.145	0.147	-0.036	0.198	0.335
B22	0.535	-0.032	-0.190	-0.267	0.204	0.017	-0.005	0.089	0.14	-0.16
B23	0.456	0.076	-0.279	0.118	-0.012	-0.451	0.13	-0.177	-0.077	0.113
B24	0.450	-0.028	-0.114	-0.127	0.197	-0.042	0.061	0.134	0.111	-0.142
B25	0.450	0.240	0.103	0.302	-0.119	0.002	-0.172	0.224	-0.078	-0.11
B26	0.451	0.354	-0.003	0.020	-0.120	0.037	-0.066	-0.352	0.078	0.272
B27	0.530	0.185	-0.352	-0.056	-0.247	-0.126	0.01	-0.116	-0.122	0.094
B28	0.386	0.118	0.224	-0.029	0.310	-0.079	0.368	-0.183	-0.067	-0.208
B29	0.513	0.249	0.010	0.084	-0.203	0.030	-0.145	0.168	-0.201	0.126
B30	0.469	-0.065	-0.061	0.011	0.254	0.208	0.082	-0.123	0.315	-0.027
B31	0.465	-0.060	-0.154	0.316	0.059	-0.067	0.26	-0.022	0.029	0.153
B32	0.398	0.266	0.346	-0.138	0.251	-0.023	0.082	-0.056	-0.046	0.268
B33	0.538	0.023	-0.277	-0.040	-0.322	0.057	-0.008	0.156	0.234	-0.078
B34	0.421	0.404	0.152	-0.029	0.054	-0.027	-0.143	-0.178	0.039	-0.062
B35	0.523	0.115	-0.070	0.178	0.288	-0.206	-0.061	0.032	-0.3	-0.05
B36	0.409	0.374	-0.152	-0.060	-0.063	0.156	0.296	-0.208	0.193	-0.082
B37	0.264	-0.174	-0.365	0.079	0.075	0.291	0.341	0.415	0.039	0.075

Figure 4.4. Scree plot of the initial item bank of perceived benefit

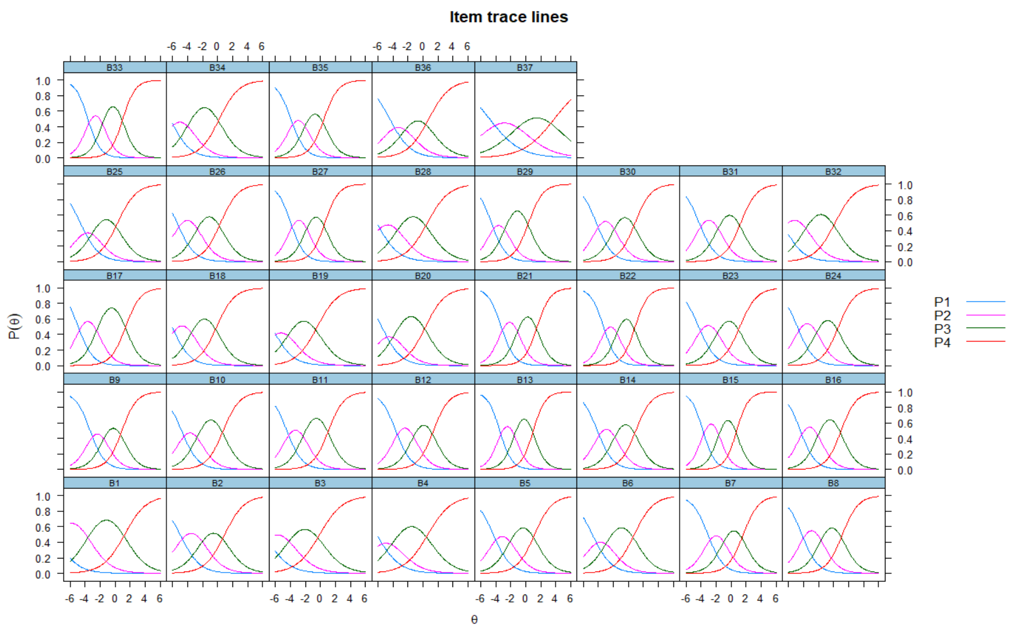


Local independence was assessed by checking LD X^2 index for each item pair in the item bank of perceived benefit. Out of 703 item pairs, only 57 pairs LD X^2 index (8.11%) were less than 10, and only 1 item pair LD X^2 index was below than 3, indicating the existence of local dependence among items in the item bank of perceived benefit. Given that the previous PCA and scree test indicated multiple dimensions as the underlying scale structure, existence of local dependence was expected. Refer to Appendix F for the LD X^2 index matrix.

Item parameters and model fit.

The GRM was used to calibrate items within the item bank of perceived benefit, mapped on a scale of -6 to 6 standard deviation below and above the average level of perceived benefit. Zero on the x-axis represented average level of perceived benefit. Similar with the analysis of expectancy, ICC of each item was generated to graphically demonstrate the relation between an individual's level of perceived benefit and the probability of endorsing response categories of an item. A higher score on x-axis meant a higher level of perceived benefit, and a higher score on y-axis meant a higher possibility of endorsing one response category. The ICCs showed that response category 3 and 4 had higher possibility being endorsed by participants with average and above average level of perceived benefit than category 1 and 2 in most of the items. See Figure 4.5 for detailed information of ICCs.

Figure 4.5. ICC of the initial item bank of perceived benefit



The items' discrimination parameter 'a' ranged from 0.49 to 1.26 in the entire item bank. Out of 37, 25 items' discrimination parameter located at the range .8 to 2.5, showing an acceptable ability to differentiate participants with various level of perceived benefit. The item B15, "People in my firm are look forward that the firm can use new technology," had the highest discrimination parameter; while, item B37, "The other firm have used the same new technology successfully," had the lowest discrimination parameter. Refer to Table 4.9 for each item's discrimination parameter.

Table 4.9.

Item Parameter Estimates and Item Fit Statistics

Items	a	b1	b2	b3	S-X2	df	p
B1	0.69	-8.03	-3.59	1.26	81.33	60	0.03
B2	0.77	-5.02	-2.05	0.92	86.88	75	0.16
B3	0.65	-7.40	-4.05	-0.10	67.64	57	0.16
B4	0.65	-6.21	-3.67	0.64	94.94	69	0.02
B5	0.86	-4.32	-1.92	1.19	66.60	73	0.69
B6	0.79	-4.79	-2.63	0.80	93.16	76	0.09
B7	0.97	-3.07	-0.90	1.64	83.35	73	0.19
B8	0.95	-4.23	-1.64	1.17	99.94	73	0.02
B9	1.03	-3.31	-1.39	0.91	77.71	71	0.27
B10	0.91	-4.82	-2.57	0.74	112.43	67	0.00
B11	0.97	-4.47	-2.17	1.08	98.30	68	0.01
B12	0.99	-3.62	-1.22	1.40	82.87	70	0.14
B13	1.24	-3.45	-1.45	1.02	70.82	67	0.35
B14	0.96	-4.12	-1.74	0.99	119.12	72	0.00
B15	1.26	-3.72	-1.60	0.77	75.95	66	0.19
B16	1.01	-4.42	-2.01	1.00	77.60	69	0.22
B17	1.14	-3.24	-1.04	1.54	88.80	69	0.05
B18	1.01	-4.90	-2.35	1.42	70.08	62	0.22
B19	0.85	-6.07	-3.41	-0.14	80.17	55	0.02
B20	0.72	-6.50	-4.02	-0.43	58.69	50	0.19
B21	0.78	-5.50	-3.50	0.34	77.23	55	0.03
B22	1.17	-3.31	-1.44	0.91	95.51	70	0.02
B23	0.89	-4.30	-1.74	1.18	107.45	73	0.01
B24	0.92	-4.84	-2.23	0.64	78.94	71	0.24
B25	0.80	-4.63	-2.69	0.33	76.35	74	0.40
B26	0.86	-5.41	-2.67	0.39	93.58	72	0.04
B27	1.10	-3.94	-1.77	0.61	91.69	69	0.04
B28	0.70	-6.17	-3.22	0.57	105.07	73	0.01
B29	1.04	-4.57	-2.62	0.38	74.62	57	0.06
B30	0.94	-4.26	-1.83	0.90	76.33	73	0.37
B31	0.93	-4.24	-1.67	1.29	73.19	72	0.44
B32	0.74	-6.84	-3.62	0.18	79.79	55	0.02
B33	1.20	-3.61	-1.60	1.04	50.47	69	0.95
B34	0.78	-6.32	-3.76	0.21	63.84	50	0.09
B35	1.05	-3.93	-1.94	0.48	77.01	69	0.24
B36	0.72	-4.44	-2.13	0.75	36.94	46	0.83
B37	0.49	-4.81	-0.86	3.79	88.48	47	0.00

The threshold parameter ranged from -8.02 to 3.80. Especially, the first threshold parameters ranged from -8.02 to -3.07, the second threshold parameters ranged from -4.05 to -0.86, and the third threshold parameters ranged from -0.43 to 3.80. Notably, item B37 had the largest threshold parameter b3, and all the other items' b3 were less than 2. This indicated that participants with lower and average levels of perceived value were prone to answer higher score response options in items. Refer to table 4.9 for each item's threshold parameters.

The IRT model fit was assessed by using M2 statistic. The M2 statistics for the initial item bank was computed as M2 (555) = 1463.33, $p < .001$, indicating that the model didn't well replicate the observed reality. $RMSEA_2$ fit assessment was .05 which was just at the edge of suggested cut-off value. The fit indices of CFI was .87 and TLI was .86, which were both under the cut-off value of .95. Therefore, a poor model fit was detected by the M2 statistic.

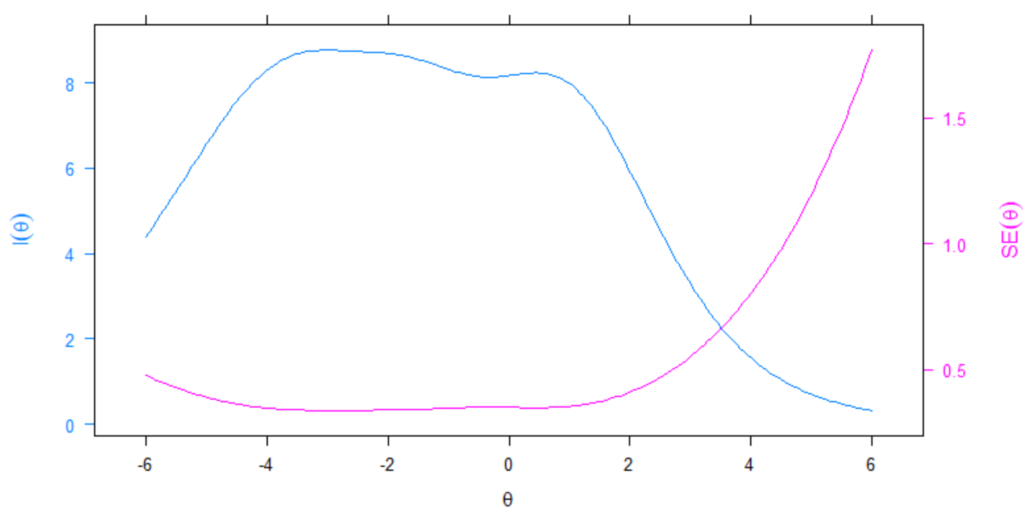
At the item-level, $S\text{-}X^2$ was used to assess the fit of each individual item. Out of 37, 22 items had a good fit with $p > .05$. Item B10 (i.e., "I am look forward that my firm can use new technology"), B14 (i.e., "People in my firm think the idea of being new technology users to be appealing"), and B37 (i.e., "The other firms have used the same new technology successfully"), were found having the significant poor fit. These items were flagged for potential elimination from the item bank. Refer to table 4.9 for detailed $S\text{-}X^2$ statistic.

Reliability.

Reliability was assessed by checking the amount of information available from each single item and the overall item bank derived from the IIF. In the item bank of perceived benefit, item B28 and B37 had comparatively lower information, suggesting less value it contributed to the precision of the overall test. Refer to appendix F for IIF of each item.

The overall item bank IIF illustrated a higher curve at the latent trait range of -4 to 2. It indicated that the initial item bank of perceived benefit generated more information, or was more reliable, to test perceived benefit at the level of -4 to 2. The initial item bank was deemed to be more precise to test participants with average, lower than average, and slightly higher than average level of perceived benefit. Refer to Figure 4.6 for IIF of the initial item bank. From the classical test theory perspective, the initial item bank was analyzed to have a reliability of .89 Cronbach's alpha.

Figure 4.6. IIF of the initial item bank of perceived benefit.



To summarize, the initial item bank of perceived benefit violated the two assumption of unidimensionality and local independence. More than one component was draw from reality observation, and interrelated items existed among the 37 items in the item bank. Some items were poor replications of the reality and could not precisely measure perceived benefit. The overall item bank had a poor model fit. All of these called for an item bank refining process to eliminate local dependence.

Perceived Cost

The item bank of perceived cost consisted of a total of 18 items. All response categories of the 18 items were endorsed by participants. To keep the consistency of category score with previous item banks, the response to the items of perceived cost were reversely coded. For example, “Strongly Disagree” was coded as 3 instead of 0 and “Strongly Agree” was coded as 0 instead of 3. The category of “Disagree” was the most endorsed for all items, with the highest 53.1% in item C5 and the lowest 11% in item C18. No missing data occurred in the data. Descriptive statistics of the initial item bank of perceived cost was shown in Table 4.10. Full description of items was shown in appendix D.

Table 4.10.

Descriptive Statistics of the Initial Item Bank of Perceived Cost

Item	N	Mean	Std. Dev.	Proportion of participants (%) with each response category			
				1	2	3	4
C1	599	2.18	0.815	19.9	47.9	26.4	5.8
C2	599	2.62	0.872	10.9	31.4	42.4	15.4
C3	599	2.35	0.891	17.7	40.1	31.7	10.5
C4	599	2.56	0.914	13	34.1	36.6	16.4
C5	599	3.01	0.806	6	14	53.1	26.9
C6	599	2.16	0.728	15	59.3	20.9	4.8
C7	599	2.76	0.873	10.4	21.9	49.2	18.5

Table 4.10. (Continued)

Item	N	Mean	Std. Dev.	Proportion of participants (%) with each response category			
				1	2	3	4
C8	599	2.63	0.894	12.4	28.2	43.6	15.9
C9	599	2.91	0.887	7.5	21.9	43.1	27.5
C10	599	2.21	0.898	22.9	42.1	26	9
C11	599	2.21	0.858	20.9	45.2	26.2	7.7
C12	599	2.24	0.92	21.5	45.1	21.7	11.7
C13	599	2.21	0.921	25	38.1	27.9	9
C14	599	2.07	0.895	28.7	44.1	19	8.2
C15	599	2.19	0.872	22.4	44.1	25.7	7.8
C16	599	2.31	0.929	20.5	39.9	27.7	11.9
C17	599	2.03	0.864	29.2	45.4	18.7	6.7
C18	599	1.76	0.804	43.4	41.6	11	4

IRT assumptions.

By reviewing plots generated from Mokken Scaling, each item of perceived cost represented increased item-step-response functions, indicating that participants with high perceived cost tend to choose high score response categories. The assumption of monotonicity was confirmed for each of the 18 items. For example, for item C14, the three curves showed an increased tendency with the participant's rest scores increasing. Particularly, participants' probability of endorsing the last response category rather than the third response category for item C14 increased from approximately 0 to .5, as the participants' rest score increased from under 15 to above 40. In addition, for item C14, participants with rest score above 40 tend to choose a higher response category than the participants with rest score under 15. Refer to Appendix F for each item's plots.

Unidimensionality was assessed by reviewing the underlying structure of the item bank generated with PCA (Revicki et al., 2014). Using the criterion of eigenvalue greater than 1 (Kaiser, 1960), PCA yielded three principal dimensions for the item bank of perceived cost, accounting for 52.93% of the total variance. Specifically, the first dimension accounted for 36.60% of the variance, the second dimension explained 10.73% of the variance. Refer to Table 4.11 for detailed PCA results.

Table 4.11

Results of PCA Test for the Initial Item Bank of Perceived Cost

% of variance explained by first PC	36.60%
% of variance explained by second PC	10.73%
% of variance explained by third PC	5.59%
Ratio of first PC to second PC	3.4

The first principal dimension extracted from the data explained more than 20% variance. However, a total of 11 items loaded on more than one dimensions (with factor loading above .3), and a scree test found that more than one dimensions lay above the point of inflexion, which all suggested the data was observed to have multidimensionality and violate the assumption of unidimensionality. Refer to Figure 4.7 for the screen test result and Table 4.12 for the results of factor loadings.

Figure 4.7. Scree plot of the initial item bank of perceived cost

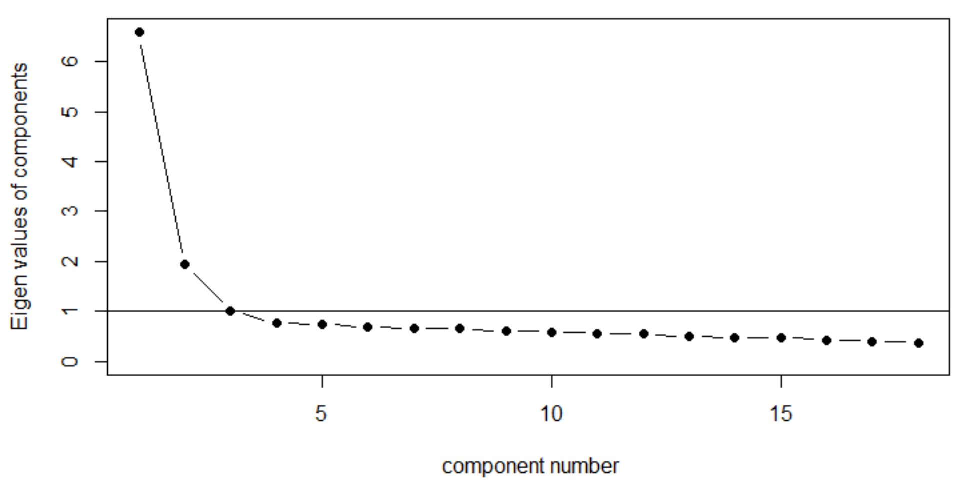


Table 4.12.

Results of Factor Loadings for the Initial Item Bank of Perceived Cost

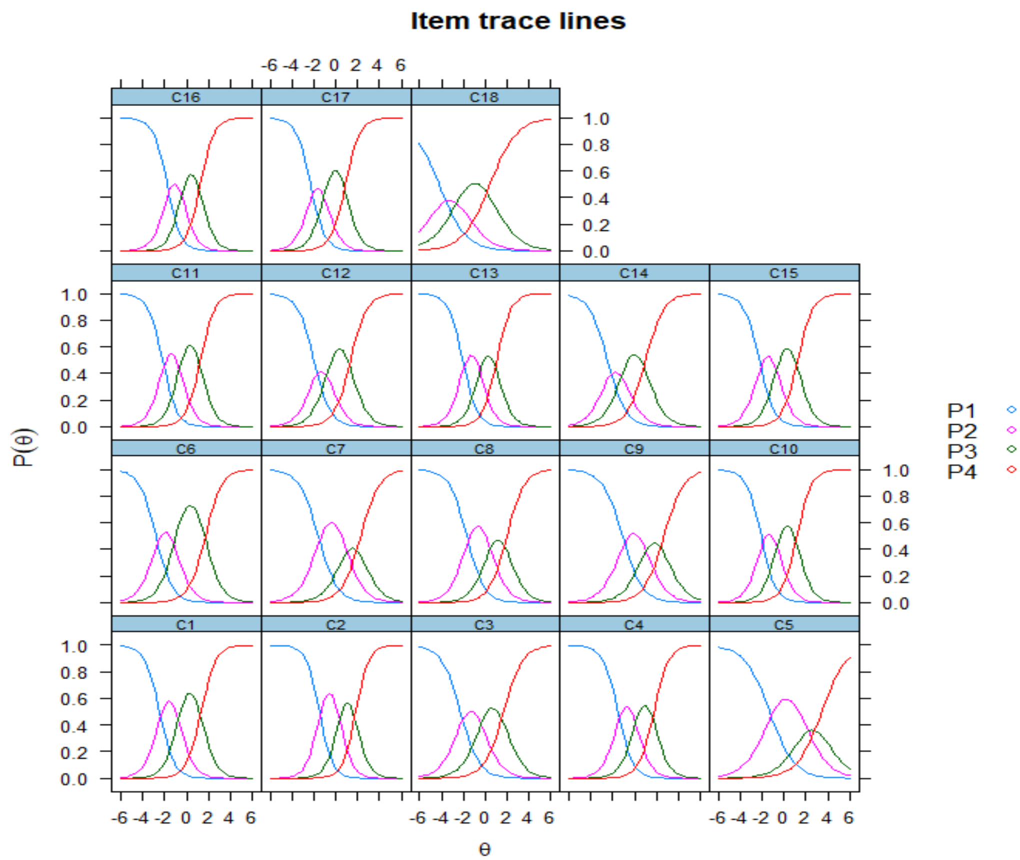
Item	**Loading on Dimension**		
	1	**2**	**3**
C1	0.634	-0.229	-0.130
C2	0.680	0.290	0.062
C3	0.566	0.281	0.463
C4	0.648	0.306	0.295
C5	0.455	0.491	-0.252
C6	0.575	-0.224	0.305
C7	0.552	0.524	-0.083
C8	0.582	0.362	-0.011
C9	0.544	0.513	-0.019
C10	0.645	-0.205	-0.126
C11	0.659	-0.187	-0.264
C12	0.628	-0.249	-0.341
C13	0.662	-0.102	-0.233
C14	0.581	-0.327	-0.018
C15	0.638	-0.241	-0.084
C16	0.675	-0.131	-0.151
C17	0.644	-0.189	0.352
C18	0.458	-0.544	0.334

Local independence was assessed by checking LD X^2 index for each item pair in the item bank of perceived cost. Out of 171 item pairs, only 8 pairs LD X^2 index (4.68%) were less than 10, and none item pair LD X^2 index was below than 3, indicating the existence of local dependence among items in the item bank of perceived cost. Given that the previous PCA and scree test indicated multiple dimensions as the underlying scale structure, existence of local dependence was expected. Refer to Appendix F for the LD X^2 index matrix.

Item parameters and model fit.

The GRM was used to calibrate items, mapped on a scale of -6 to 6 standard deviation below and above the average level of perceived cost. ICC of each item was generated to graphically demonstrate the relation between an individual's level of perceived cost and the probability of endorsing response categories of an item. The ICCs showed that response category 3 and 4 had higher possibility being endorsed by participants with average and above average level of perceived cost than category 1 and 2 in most of the items. See Figure 4.8 for detailed information of ICCs.

Figure 4.8. ICC of the initial item bank of perceived cost.



The items' discrimination parameter 'a' ranged from 0.82 to 1.69 in the entire item bank. All of the items' discrimination parameter located at the range .8 to 2.5, showing an acceptable ability to differentiate participants with various level of perceived cost. The item C2, "Adopting new technology would demand too much of time," had the highest discrimination parameter, indicating the highest discrimination ability. Refer to Table 4.13 for each item's discrimination parameter.

Table 4.13.

Item Parameter Estimates and Item Fit Statistics

Items	a	b1	b2	b3	S-X2	df	p
C1	1.50	-2.47	-0.70	1.33	107.42	58	0.00
C2	1.69	-1.50	0.29	1.81	86.75	58	0.01
C3	1.15	-2.27	-0.35	1.68	84.70	73	0.16
C4	1.49	-1.53	0.09	1.75	90.70	68	0.03
C5	0.90	-1.32	1.75	3.44	79.21	74	0.32
C6	1.34	-2.79	-1.05	1.72	81.79	55	0.01
C7	1.16	-1.60	0.78	2.27	87.51	72	0.10
C8	1.27	-1.69	0.37	1.97	92.36	72	0.05
C9	1.11	-1.12	0.94	2.68	116.58	72	0.00
C10	1.49	-2.10	-0.58	1.17	84.97	64	0.04
C11	1.53	-2.20	-0.60	1.26	83.22	62	0.04
C12	1.34	-1.99	-0.66	1.34	111.59	71	0.00
C13	1.54	-2.05	-0.50	1.05	73.41	65	0.22
C14	1.20	-2.48	-1.02	1.00	98.91	72	0.02
C15	1.44	-2.27	-0.64	1.23	91.01	65	0.02
C16	1.60	-1.77	-0.38	1.25	94.99	66	0.01
C17	1.52	-2.31	-0.98	0.86	87.01	64	0.03
C18	0.82	-4.24	-2.30	0.43	112.33	65	0.00

The threshold parameter ranged from -4.24 to 3.44. Especially, the first threshold parameters ranged from -4.24 to -1.11, the second threshold parameters ranged from -2.30 to 1.75, and the third threshold parameters ranged from 0.43 to 3.44. Refer to table 4.13 for each item's threshold parameters.

The IRT model fit was assessed by using M2 statistic. The M2 statistics for the initial item bank was computed as M2 (99) = 210.69, $p < .001$, indicating that the model didn't well replicate the observed reality. $RMSEA_2$ fit assessment was .04 which was below the suggested cut-off value .05. The fit indices of CFI (i.e., .94) was slightly below the cut-value of .95, and TLI was just at the edge of the cut-value of .95. All of these indicated a moderate model fit of the initial item bank.

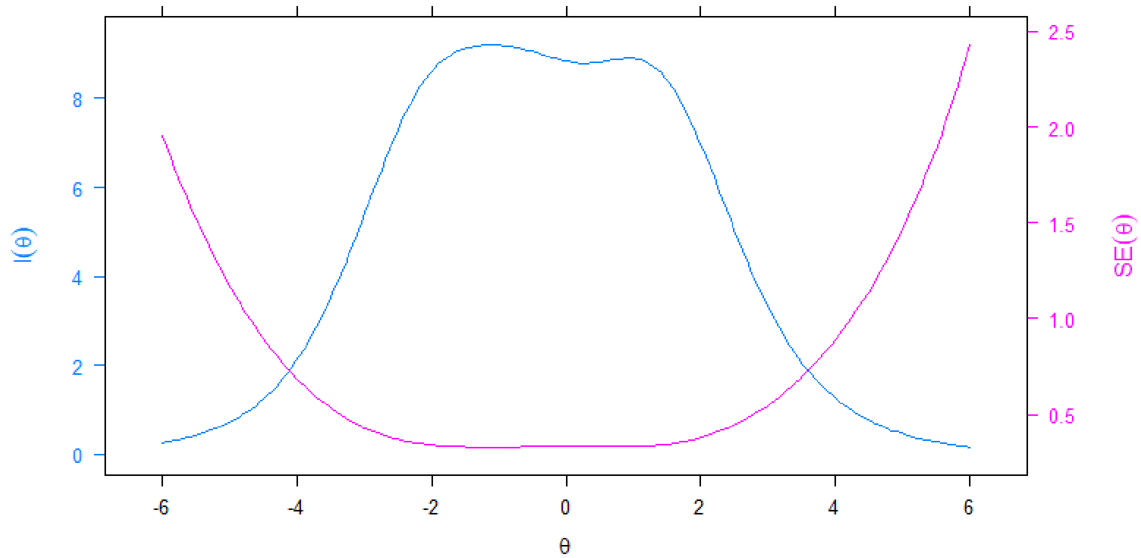
At the item-level, S-X^2 was used to assess the fit of each individual item. Out of 18, only 5 items had a good fit with $p > .05$. Item C1 (i.e., “I am not sure all the work required in adopting new technology would be worth it in the end”), C9 (i.e., “New technology would demand a long-time investment”), C12 (i.e., “I worry that my firm would waste time if new technology will be only used for a short time in my firm”), and C18 (i.e., “Adopting new technology is too frustrating”), were found having the significant poor fit. These items were flagged for potential elimination from the item bank. Refer to table 4.13 for detailed S-X^2 statistic.

Reliability.

Reliability was assessed by checking the amount of information available from each single item and the overall item bank derived from the IIF. Each of the items had similar amount of information generated at the latent trait level of -2 to 2. Refer to appendix F for IIF of each item.

The overall item bank IIF illustrated a higher curve at the latent trait range of -2 to 2. It indicated that the initial item bank of perceived cost generated more information, or was more reliable, to test participants with average, 2 standard deviation lower than average, and 2 standard deviation above than average level of perceived cost. Refer to Figure 4.9 for IIF of the initial item bank. From the classical test theory perspective, the initial item bank was analyzed to have a reliability of .91 Cronbach’s alpha.

Figure 4.9. IIF of the initial item bank of perceived cost



To summarize, the initial item bank of perceived cost violated the two assumption of unidimensionality and local independence. More than one component was draw from reality observation, and interrelated items existed among the 18 items in the item bank. Some items were poor replications of the reality and could not precisely measure perceived cost. The overall item bank had a moderate model fit; however, it still had the potential to refine. Item eliminate process to reduce local dependence in the item bank was expected.

Item Reduction

Previous analysis of the three item banks disclosed that all of them violated the assumption of unidimensionality and local independence. Since the existence of local dependence could lead to multi-dimensionality and could result in a biased parameter estimation, researchers suggested that item pairs with local dependence need to be flagged and stepwise dropped (Reeve & Fayers, 2005; Edelen & Reeve, 2007; Revicki et al., 2014). Kamudoni (2014) also suggested deleting items which load on more than one dimension. Thus, in the item reduction process, item pair with the highest LD X^2 index was first flagged. Second, the item content, item parameters, and factor loading of both flagged items were reviewed. Item with general or ambiguous meaning in content, or with unacceptable item parameters, or had cross-loading on multiple dimensions, were deleted from the item pair. Then, the IRT assumptions, factor loadings, item parameters, and model fit for the altered item bank were assessed again. If the assumption of unidimensionality and local independence still could not meet, another pair of items with highest LD X^2 was identified and the reduction process was iteratively repeated, until all the assumptions were met, and the model fit of the altered item bank was acceptable. Specific item reduction process of each item bank was discussed in the section.

Expectancy

In the initial item bank of expectancy, a total of 153 item pairs had LD X^2 index above 10 and 7 items loaded on more than one dimension. Among these item pairs, item E15 (i.e., “I am confident that new technology would be effective in my firm”) and item E16 (i.e., “I am confident that adopting new technology would be an effective way to meet firm's need”) had the highest LD X^2 index (i.e., 87.45).

These two items were flagged and their content, parameter estimation and item fit were reviewed. The two items were deemed to capture similar content; however, item E16 cross-loaded on multiple components and the item fit was poor. Thus, E16 was first deleted from the item bank. Next, IRT assumptions, item parameter estimation, model fit, and item fit were checked again on the altered item bank. Item E9 (i.e., “People in my firm would be competent to meet new technology's requirements”) and item E10 (i.e., “My firm has managers who have vision to adopt new technology”) were then identified having the highest local dependence. Both of the items were neither cross-loaded nor similar in content; however, item E9 had an undesired discrimination parameter and poor item fit, indicating a bad differentiating ability for participants and a misfit with the proposed model. Thus, Item E9 was deleted from the item bank.

The same procedures were performed 9 additional times, resulting in a total of 11 iterations. Items having cross-loading, unacceptable parameter estimation, and poor item fit were iteratively removed. A total of 11 items were deleted from the initial item bank and left 8 items in the final item bank. No item was found to load on more than one dimension in the final item bank. Refer to Table 4.14 for the item reduction process.

Table 4.14.

Item Reduction for the Item Bank of Expectancy

Iteration	Action taken	Number of items	Flagged LD items	Cross-load items	Number of dimensions	M2	$RMSEA_2$	SRMR	CFI	TLI
0		19	Item E15~ E16	Item E2, E3, E6, E13, E16, E18, E19	6	M2 (114) = 225.55, $p<0.001$	0.04	0.05	0.87	0.85
1	Delete Item E16	18	Item E9~ E10	Item E2, E3, E6, E13, E18, E19	5	M2 (99) = 202.92, $p<0.001$	0.04	0.05	0.87	0.84
2	Delete Item E9	17	Item E1~ E2	Item E2, E3, E6, E13, E18, E19	5	M2 (85) = 175.63, $p<0.001$	0.04	0.05	0.87	0.84
3	Delete Item E1	16	Item E6~ E7	Item E2, E3, E6, E13, E14, E17, E18, E19	5	M2 (72) = 118.06, $p<0.001$	0.03	0.05	0.90	0.88
4	Delete Item E6	15	Item E5~ E19	Item E2, E3, E5, E13, E14, E17, E18, E19	5	M2 (60) = 97.92, $p<0.001$	0.03	0.05	0.90	0.88
5	Delete Item E5	14	Item E13~ E14	Item E3, E4, E17, E18, E19	4	M2 (49) = 79.59, $p<0.001$	0.03	0.05	0.90	0.87
6	Delete Item E14	13	Item E12~ E13	Item E3, E17, E18, E19	4	M2 (39) = 72.33, $p<0.001$	0.04	0.05	0.87	0.83
7	Delete Item E12	12	Item E2~ E3	Item E4, E17, E18, E19	3	M2 (30) = 58.61, $p>0.001$	0.04	0.05	0.87	0.83
8	Delete Item E3	11	Item E13~ E18	Item E4, E13, E15, E17, E19	3	M2 (22) = 41.90, $p>0.001$	0.04	0.05	0.90	0.85
9	Delete Item E18	10	Item E18~ E19	Item E4, E13, E18, E19	3	M2 (15) = 26.34, $p>0.001$	0.04	0.05	0.92	0.87
10	Delete Item E19	9	Item E4~ E18	Item E4, E13	2	M2 (9) = 13.40, $p>0.001$	0.03	0.04	0.95	0.91
11	Delete Item E4	8			1	M2 (4) = 4.02, $p>0.001$	0.002	0.03	0.99	0.99

Perceived Benefit

In the initial item bank of perceived benefit, a total of 646 item pairs had LD X^2 index above 10 and 10 items loaded on more than one dimension. Among these item pairs, item B3 (i.e., “Being good at solving problems which involves using new technology is important to my firm”) and item B19 (i.e., “Using new technology would make financial gains for my firm”) had the highest LD X^2 index (i.e., 126).

These two items were flagged and their content, parameter estimation and item fit were reviewed. In item B3, “being good at solving problems” was deemed to have a general meaning that may cover “making financial gains”. Since item B3 was also cross-loaded on multiple components as well as had an unacceptable discrimination parameter, it was deleted from the item bank. Next, IRT assumptions, item parameter estimation, model fit, and item fit were checked again on the altered item bank. Item B7 (i.e., “I think working with new technology in my firm is very interesting”) and item B8 (i.e., “I like working with new technology in my firm”) were then identified having the highest local dependence. The two items were similar in content. However, item B7 had cross-loading and was not as simple as item B8 in term of item description, thus, item B7 was deleted from the item bank.

The same procedures were performed 27 additional times, resulting in a total of 29 iterations. Items having cross-loading, unacceptable parameter estimation, and poor item fit, were iteratively removed. A total of 29 items were deleted from the initial item bank and left 8 items in the final item bank. No item was found to load on more than one dimension in the final item bank. Refer to Table 4.15 for the item reduction process.

Table 4.15.

Item Reduction for the Item Bank of Perceived Benefit

Iteration	Action taken	Number of items	Flagged LD items	Cross-load items	Number of dimensions	M2	$RMSEA_2$	SRMR	CFI	TLI
0		37	Item B3~ B19	Item B1, B3, B4, B7, B16, B18, B20, B23, B34, B37	10	M2 (555) = 1463.33, p<0.001	0.05	0.06	0.87	0.86
1	Delete Item B3	36	Item B7~ B8	Item B1, B4, B6, B7, B16, B18, B23, B34, B36, B37	9	M2 (522) = 1404.90, p<0.001	0.05	0.06	0.87	0.86
2	Delete Item B7	35	Item B18~ B19	Item B1, B4, B6, B9, B18, B23, B34, B36, B37	9	M2 (490) = 1252.87, p<0.001	0.05	0.06	0.87	0.86
3	Delete Item B18	34	Item B1~ B26	Item B1, B4, B6, B8, B9, B10, B16, B34, B37	9	M2 (459) = 1116.48, p<0.001	0.05	0.06	0.88	0.88
4	Delete Item B1	33	Item B22~ B23	Item B4, B8, B10, B16, B28, B34, B36, B37	8	M2 (429) = 1027.14, p<0.001	0.05	0.06	0.87	0.86
5	Delete Item B23	32	Item B4~ B5	Item B2, B4, B6, B10, B16, B28, B34, B36, B37	8	M2 (400) = 948.88, p<0.001	0.05	0.06	0.87	0.86

Table 4.15. (Continued)

Iteration	Action taken	Number of items	Flagged LD items	Cross-load items	Number of dimensions	M2	$RMSEA_2$	SRMR	CFI	TLI
6	Delete Item B4	31	Item B8~ B11	Item B2, B6, B8, B10, B16, B28, B34, B35, B37	7	M2 (372) = 883.30, $p<0.001$	0.05	0.06	0.89	0.88
7	Delete Item B8	30	Item B21~ B21	Item B2, B10, B16, B27, B28, B32, B34, B35, B37	7	M2 (345) = 755.28, $p<0.001$	0.05	0.06	0.90	0.89
8	Delete Item B21	29	Item B34~ B35	Item B6, B10, B12, B16, B26, B27, B28, B32, B34, B37	6	M2 (319) = 695.05, $p<0.001$	0.04	0.06	0.90	0.89
9	Delete Item B34	28	Item B20~ B28	Item B6, B10, B12, B26, B27, B28, B32, B36, B37	6	M2 (294) = 650.00, $p<0.001$	0.04	0.06	0.90	0.89
10	Delete Item B28	27	Item B12~ B13	Item B6, B10, B12, B26, B32, B36, B37	6	M2 (270) = 598.86, $p<0.001$	0.04	0.06	0.90	0.89
11	Delete Item B12	26	Item B29~ B30	Item B10, B26, B32, B36, B37	5	M2 (247) = 546.73, $p<0.001$	0.04	0.06	0.89	0.88

Table 4.15. (Continued)

Iteration	Action taken	Number of items	Flagged LD items	Cross-load items	Number of dimensions	M2	$RMSEA_2$	SRMR	CFI	TLI
12	Delete Item B30	25	Item B5~ B6	Item B10, B26, B32, B36, B37	5	M2 (225) = 519.90, p<0.001	0.04	0.06	0.89	0.88
13	Delete Item B6	24	Item B13~ B15	Item B10, B26, B32, B36, B37	5	M2 (204) = 493.39, p<0.001	0.04	0.06	0.87	0.86
14	Delete Item B15	23	Item B20~ B25	Item B10, B16, B26, B32, B36, B37	5	M2 (184) = 435.67, p<0.001	0.04	0.06	0.87	0.85
15	Delete Item B25	22	Item B20~ B32	Item B9, B10, B26, B32, B36, B37	5	M2 (165) = 394.64, p<0.001	0.04	0.06	0.87	0.85
16	Delete Item B32	21	Item B19~ B27	Item B9, B10, B20, B26, B36, B37	5	M2 (147) = 352.92, p<0.001	0.04	0.06	0.86	0.84
17	Delete Item B27	20	Item B14~ B19	Item B9, B10, B20, B26, B36, B37	5	M2 (130) = 330.78, p<0.001	0.05	0.06	0.85	0.84
18	Delete Item B14	19	Item B21~ B31	Item B10, B16, B19, B20, B26, B31, B36, B37	5	M2 (114) = 271.80, p<0.001	0.04	0.06	0.86	0.86

Table 4.15. (Continued)

Iteration	Action taken	Number of items	Flagged LD items	Cross-load items	Number of dimensions	M2	$RMSEA_2$	SRMR	CFI	TLI
19	Delete Item B31	18	Item B20~ B21	Item B10, B16, B19, B20, B26, B31, B36, B37	5	M2 (99) = 241.91, p<0.001	0.04	0.06	0.86	0.86
20	Delete Item B20	17	Item B11~ B29	Item B2, B10, B16, B19, B26, B36, B37	4	M2 (85) = 216.59, p<0.001	0.04	0.06	0.85	0.86
21	Delete Item B11	16	Item B36~ B37	Item B2, B10, B16, B19, B26, B36, B37	4	M2 (72) = 157.84, p<0.001	0.04	0.05	0.88	0.87
22	Delete Item B37	15	Item B13~ B36	Item B2, B16, B19, B26, B36	3	M2 (60) = 124.47, p<0.001	0.04	0.05	0.89	0.88
23	Delete Item B36	14	Item B2~ B5	Item B2, B16, B19, B26, B29	3	M2 (49) = 94.30, p<0.001	0.04	0.05	0.91	0.89
24	Delete Item B2	13	Item B19~ B22	Item B10, B19, B26, B29	3	M2 (39) = 73.07, p<0.001	0.04	0.05	0.93	0.91
25	Delete Item B19	12	Item B10~ B13	Item B10, B26, B29	3	M2 (30) = 57.11, p<0.001	0.04	0.05	0.93	0.91

Table 4.15. (Continued)

Iteration	Action taken	Number of items	Flagged LD items	Cross-load items	Number of dimensions	M2	$RMSEA_2$	SRMR	CFI	TLI
26	Delete Item B10	11	Item B26~ B33	Item B26, B29	2	M2 (22) = 41.56, p>0.001	0.04	0.05	0.93	0.92
27	Delete Item B26	10	Item B9~ B13	Item B9	2	M2 (15) = 24.07, p>0.001	0.04	0.04	0.94	0.93
28	Delete Item B9	9	Item B22~ B33		1	M2 (9) = 13.73, p>0.001	0.03	0.04	0.94	0.95
29	Delete Item B22	8			1	M2 (4) = 5.36, p>0.001	0.02	0.04	0.96	0.98

Perceived Cost

In the initial item bank of perceived cost, a total of 163 item pairs had LD X^2 index above 10 and 11 items loaded on more than one dimension Among these item pairs, item C1 (i.e., “I am not sure all the work required in adopting new technology would be worth it in the end”) and item C10 (i.e., “Adopting new technology would take time away from other activities my firm wants to pursue”) had the highest LD X^2 index (i.e., 86.76).

These two items were flagged and their content, parameter estimation and item fit were reviewed. None of them were cross-loaded and their discrimination parameters were acceptable. However, item C1 had a poor item fit comparing with item C10. Thus, item C1 was deleted from the item bank. Next, IRT assumptions, item parameter estimation, model fit, and item fit were checked again on the altered item bank. Item C7 (i.e., “Adopting new technology would demand too much of money”) and item C9 (i.e., “New technology would demand a long-time investment”) were then identified having the highest local dependence. The two items were similar in content, and it was not surprised that participants would consider “a long-time investment” as “demanding too much of money”. Even though item C7 and item C9 were both cross-loaded, item C9 had a poor item fit. Therefore, item C9 was deleted from the item bank.

The same procedures were performed 8 additional times, resulting in a total of 10 iterations. A total of 10 items were deleted from the initial item bank and left 8 items in the final item bank. No item was found to load on more than one dimension in the final item bank. Refer to Table 4.16 for the item reduction process.

Table 4.16.

Item Reduction for the Item Bank of Perceived Cost

Iteration	Action taken	Number of items	Flagged LD items	Cross-load items	Number of dimensions	M2	$RMSEA_2$	SRMR	CFI	TLI
0		18	Item C1~ Item C10	Item C3, C4, C5, C6, C7, C8, C9, C12, C14	3	M2 (99) = 210.69, p<0.001	0.04	0.08	0.94	0.95
1	Delete Item C1	17	Item C7~ Item C9	Item C6, C7, C9, C14	2	M2 (85) = 186.97, p<0.001	0.04	0.08	0.95	0.95
2	Delete Item C9	16	Item C3~ Item C4	Item C2, C4, C6, C7, C14	2	M2 (72) = 162.72, p<0.001	0.04	0.08	0.95	0.95
3	Delete Item C3	15	Item C5~ Item C7	Item C2, C4, C6, C7, C14	2	M2 (60) = 101.04, p<0.001	0.04	0.08	0.96	0.96
4	Delete Item C5	14	Item C15~ Item C16	Item C2, C4, C6	2	M2 (49) = 81.28, p<0.001	0.03	0.07	0.96	0.96
5	Delete Item C15	13	Item C11~ Item C12	Item C2, C4, C6, C14	2	M2 (39) = 74.93, p<0.001	0.04	0.08	0.96	0.96
6	Delete Item C11	12	Item C12~ Item C13	Item C2, C4, C6, C14	2	M2 (39) = 74.93, p<0.001	0.04	0.07	0.95	0.96
7	Delete Item C12	11	Item C18~ Item C6	Item C2, C4, C6, C14	2	M2 (22) = 25.85, p>0.001	0.03	0.08	0.97	0.96

Table 4.16.

Item Reduction for the item bank of perceived cost

Iteration	Action taken	Number of items	Flagged LD items	Cross-load items	Number of dimensions	M2	$RMSEA_2$	SRMR	CFI	TLI
8	Delete Item C6	10	Item C17~ Item C18	Item C2, C4, C14	2	M2 (15) = 18.37, p>0.001	0.03	0.08	0.97	0.97
9	Delete Item C18	9	Item C14~ Item C16	Item C4, C14	2	M2 (9) = 15.69, p>0.001	0.04	0.06	0.97	0.98
10	Delete Item C14	8			1	M2 (4) = 6.77, p>0.001	0.03	0.05	0.97	0.99

Final Item Bank Analysis

In this section, the analysis of IRT assumptions, item parameters, model fit, reliability, test-fairness and convergent validity were conducted on each final item bank.

Expectancy

The final item bank of expectancy consisted of a total of 8 items, represented by 6 items for efficacy expectancy (i.e., item E2, E7, E8, E10, E11) and 2 items for outcome expectancy (i.e., item E13, E15). All response categories of the 8 items were endorsed by participants. The final scale was shown in Table 4.17.

Table 4.17.

Final Scale of Expectancy

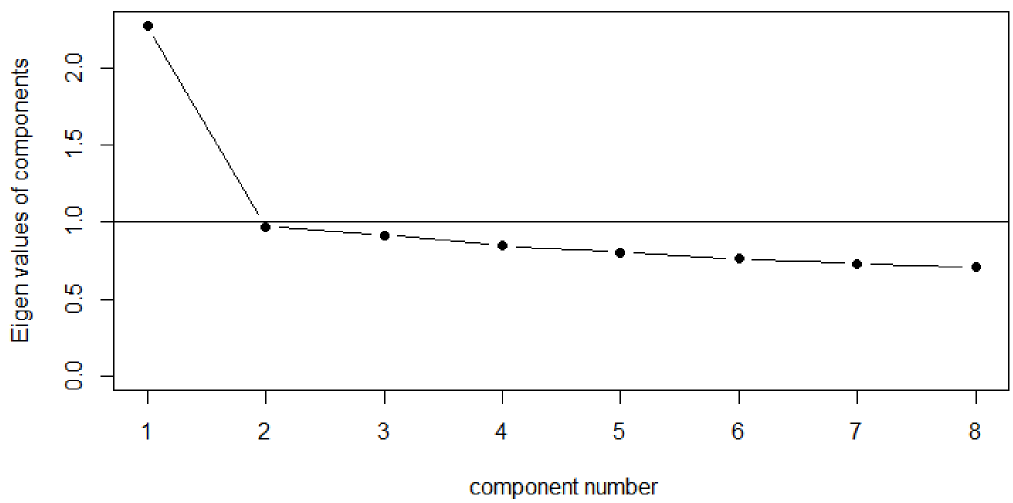
	Item (English)	Item (Chinese)
E2	People in my firm could understand the knowledge of new technology	公司人员了解（这一）新技术所使用的知识
E7	People in my firm could coordinate their efforts to adopt new technology	公司人员能够协同合作去采纳（这一）新技术
E8	People in my firm could work unitedly to adopt new technology	公司人员能够团结一致地去采纳（这一）新技术
E10	My firm has managers who have vision to adopt new technology	公司管理层有足够的远见去采纳（这一）新技术
E11	My firm has money to adopt new technology	公司拥有采纳（这一）新技术的资金
E13	My firm has infrastructure to use new technology	公司拥有采纳（这一）新技术的设施
E15	I am confident that new technology would be effective in my firm	我相信(这一)新技术将在我公司起到效果
E17	I am confident that new technology would be compatible with the existing working environment in my firm	我相信(这一)新技术将会与目前我公司的工作环境兼容

IRT assumptions.

The three IRT assumptions were assessed and established in the final item bank of expectancy. Monotonicity was met by checking the plots generated with Mokken Scaling (Mokken, 1971). Two plots were generated for each item. The first plot of each item demonstrated that three item-step-response functions monotonically increased with the increased rest score, indicating that participants with high expectancy tend to choose high score response (Van der Ark, 2007). For example, for item E13, the three curves showed an increased tendency with the participants' rest scores increasing. Particularly, participants' probability of endorsing the last response category rather than the third response category for item E13 increased from approximately .1 to .4, as the participant's rest score increased from under 10 to above 20. The second plot of each item also represented that item response function grew monotonically, indicating that participants tend to choose high-score response category when their expectancy of new technology increase. For example, for item E13, participants with rest score over 20 tend to choose a higher response category than the participants with rest score 7-11. Therefore, the final scale of expectancy was considered to satisfy the assumption of monotonicity in IRT. Refer to Appendix G for overall plots.

Unidimensionality was assessed and established by reviewing the underlying structure of the item bank generated with PCA (Revicki et al., 2014). Using the criterion of eigenvalue greater than 1 (Kaiser, 1960), PCA yielded one principal dimensions for the item bank of expectancy, accounting for 28.44% of the total variance. All eight items of the expectancy scale loaded on to this one dimension with loadings ranging from .50 to .59. In addition, the ratio of eigenvalues within dominant and the second dimension was 2.48. Additionally, the scree-test confirmed a distinct single dimension to lie above the point of inflexion as shown in Figure 4.10 (Costello & Osborne, 2005; DeVellis, 2003; Field, 2005).

Figure 4.10. Scree plot of the final item bank of expectancy



The third assumption, local independence, was assessed by checking LD X^2 index for each item pair in the item bank of expectancy. The largest LD X^2 index was 32.45, which was much lower than the initial item bank (i.e., 87.45). Even though most of the LD X^2 index was still above 10, a consistency of relatively low values existed in the LD X^2 index matrix. In the upper right triangle, standardized values were included and all of them were close to 0, which verified the consistency.

To confirm local independence, another commonly used assessment index named Q3 statistics was applied (Yen, 1984). Q3 statistic is the Pearson correlation between the residual scores of every individual item of the item bank, generated by the explored scale structure with its underlying dimensions. If there is no any residual correlation, or a low residual correlation between items in the item bank after controlling for the latent trait, then the local independence assumption is met (Revicki et al., 2014). A cut-off value of 0.2 is suggested for detecting possible local dependence (Chen & Thissen, 1997; Revicki et al., 2014). The Q3 statistic of final expectancy scale showed none value above 0.2 and then local independence was met. Refer to Appendix I for the LD X2 index matrix and Q3 statistic matrix.

Item parameters and model fit.

Participants' expectancy of new technology was mapped to a scale of -6 to 6 standard deviation below and above the average level of expectancy. The IRT model fit was assessed by using M2 statistic. The M2 statistics for the final item bank was computed as M2 (4) = 4.02, p = .4. The $RMSEA_2$ was evaluated as .002, a value lower than the cut-off of .05. The fit indices of SRMR was 0.035, CFI was .99 and TLI was .99. All of these indicated a good fit of the data to the model, and the model well replicated the observed reality. At the item-level, $S\text{-}X^2$ was used to assess the fit of each individual item. All items were found to have non-significant difference between the observed and expected observations. Refer Table 4.17 for item fit statistics of each item.

The discrimination parameter of the final item bank ranged from 0.79 to 1.02. Considering that the suggested value for well discrimination was from 0.8 to 2.5, even though 0.79 was slightly below 0.8, all the 8 items were deemed to have acceptable discriminating power according to Baker's (2001) discrimination parameter thresholds. Item E11 (i.e., "my firm has money to adopt new technology") had the highest discrimination parameter among all items, while item E8 (i.e., "People in my firm could work unitedly to adopt new technology") had the lowest discrimination parameter. Refer to Table 4.17 for discrimination parameter of each item.

The threshold parameters of the final item bank ranged from -5.63 to 1.23 standard deviation below and above average expectancy. The first threshold parameter had a range from -5.63 to -3.72. The second threshold parameter had a range from -2.63 to -1.51. The third threshold parameter had a range from 0.25 to 1.23. This indicated that participants with lower and average levels of expectancy were prone to answer higher score response options in each item. Refer to Figure 4.11 for Item characteristic curve and Table 4.18 for threshold parameters of each item.

Figure 4.11. ICC of the final item bank of expectancy

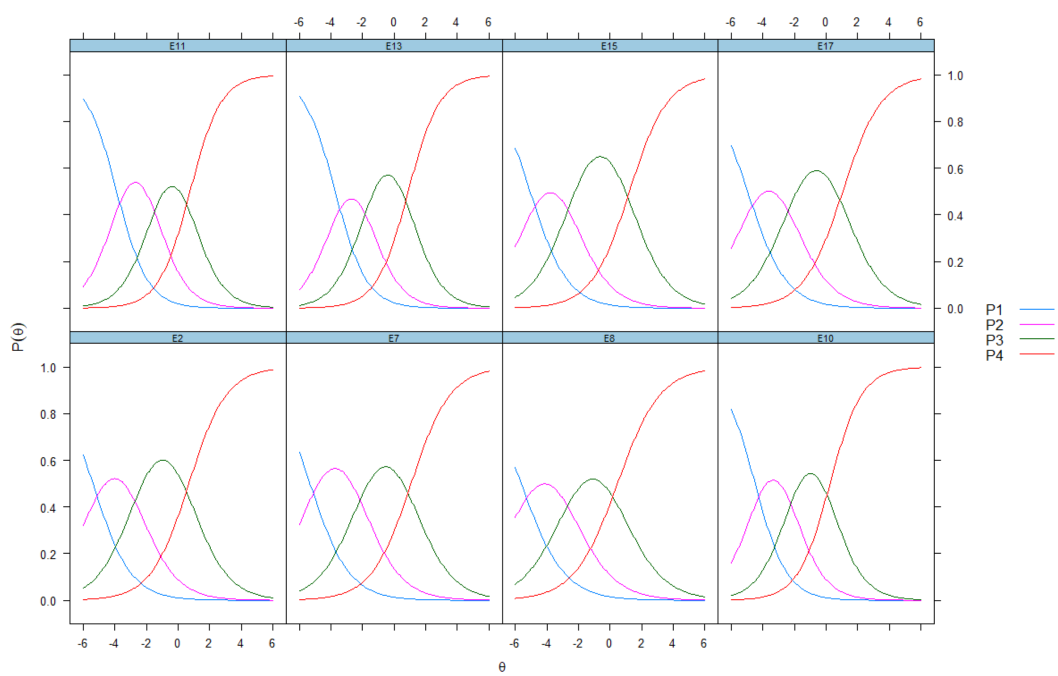


Table 4.18.

Item Parameter Estimates and Item Fit Statistics

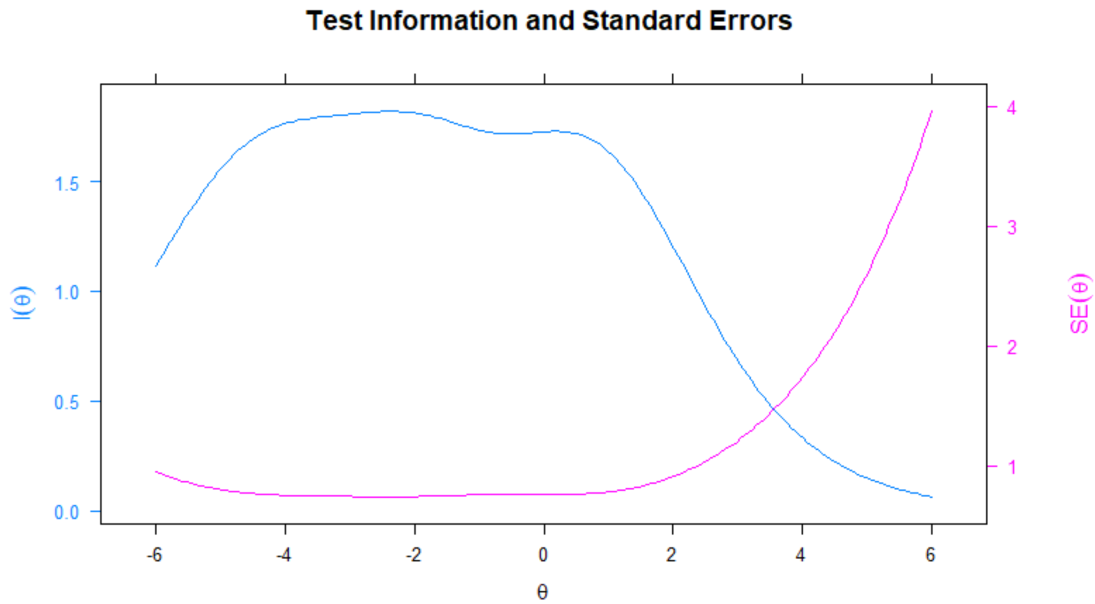
Item	a	b1	b2	b3	S-X2	df	p
E2	0.837	-5.394	-2.630	0.684	30.866	20	0.057
E7	0.806	-5.324	-2.148	1.079	20.899	19	0.342
E8	0.787	-5.626	-2.653	0.468	19.361	21	0.562
E10	0.993	-4.493	-2.200	0.250	26.379	20	0.154
E11	1.019	-3.878	-1.514	0.757	28.453	25	0.287
E13	1.001	-3.722	-1.691	0.899	28.111	25	0.303
E15	0.836	-5.062	-2.472	1.231	17.268	20	0.636
E17	0.815	-4.971	-2.271	1.052	34.865	24	0.070

Reliability.

Reliability of the final item bank was assessed by checking the amount of information available from a single item and the overall item bank derived from item information function (IIF). For each item, IIF indicated that all the item obtained the most amount of information at their peak height approximately from 4 standard deviation below to 1 standard deviation above average expectancy. Refer to Appendix G for IIFs of the eight items.

The overall item bank IIF still illustrated a high curve at the range of 4 standard deviation below to 1 standard deviation above average expectancy. Thus, the final scale was then considered to be reliable at the range of 4 standard deviation below to 1 standard deviation above average expectancy. Refer to Figure 4.12 for IIF of the final item bank. From the classical test theory perspective, the final scale was analyzed to have a reliability of .72 Cronbach’s alpha. This was lower than the initial item bank but was still deemed to be acceptable.

Figure 4.12. IIF of the final item bank of expectancy



Test-fairness.

Test-fairness requires that a scale should generate the same or similar results while measuring individuals with similar levels of the latent trait, in regardless of the participants' demographic or background difference. The participants' gender, age, and firm types were considered in this study to assess test-fairness of final expectancy scale through TSW likelihood ratio test (Thissen, Steinberg, & Wainer, 1988).

DIF analysis was first conducted related to gender. Thirteen participants were not included in this dataset as they preferred not disclosing their gender identity. Male (n = 311) was set as reference group and female (n= 275) was set as focal group in this analysis. The analysis was terminated in one iteration and no items was identified for gender-related DIF. Both male and female participants were found to similarly endorse the scale items with none of the items being biased to either of the gender categories.

Next, participants within different age categories were tested. Since there were no responses from age of 20 and below as well as 61 and above, both of them were deleted from this study. Responses from age of 41-50 and 51-60 were relatively less comparing with the other groups, thus these two categories were merged as one 41-60. Therefore, three age categories were tested in this analysis, as age of 21-30 (n = 215), 31-40 (n = 318) and 41-60 (n = 66). A total of 3 DIF assessments were conducted, between the age of 21-30 and 31-40, 21-30 and 41-60, as well as 31-40 and 41-60. All analyses were terminated in one iteration and no items was identified for ager-related DIF. Participants from all age categories were found to similarly endorse the scale items with none of the items being biased to age categories.

Participants from different types of firm were then analyzed for DIF. First, participants were grouped as coming from apparel firm (n = 322) and textile firm (n = 277). No DIF items was identified. Participants from both apparel firm and textile firm were found to similarly endorse the scale items. Next, participants were grouped as coming from private owned firm (n = 428), state owned firm (n = 68), and foreign joint firm (n = 103). A total of 3 DIF assessments were conducted between each pair of them. No DIF items was identified between the group of private owned and stated own firm as well as stated owned and foreign joint firm. However, one item, item E17 (i.e., "I am confident that new technology would be compatible with the existing working environment in my firm") was flagged as DIF item in the analysis of private owned and foreign joint firm.

In this analysis, the reference group and focal group were defined as private owned firm and foreign joint firm. The distribution of theta (i.e., expectancy) score was shown in Figure 4.13. Most of participants from both private owned and foreign joint firm showed an average level of expectancy, and the latent trait was distributed similarly within these two groups.

Figure 4.13. Trait distributions – private owned vs. foreign joint firm

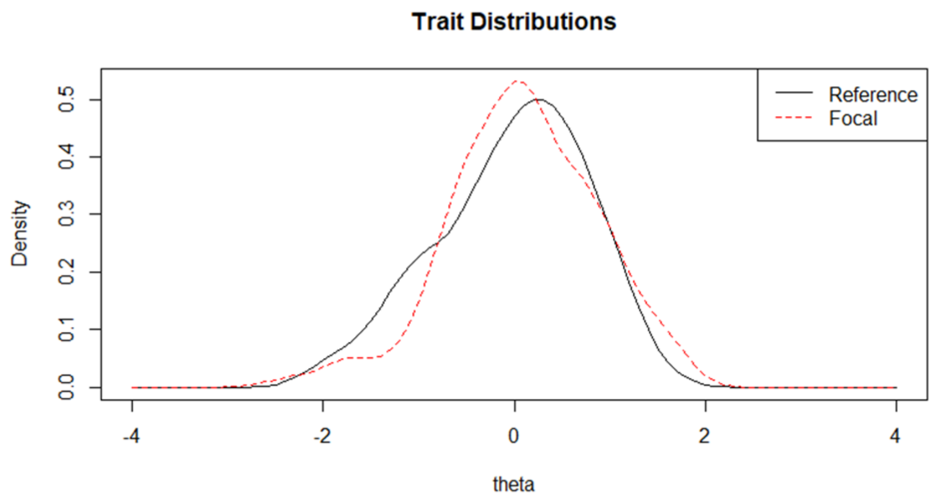
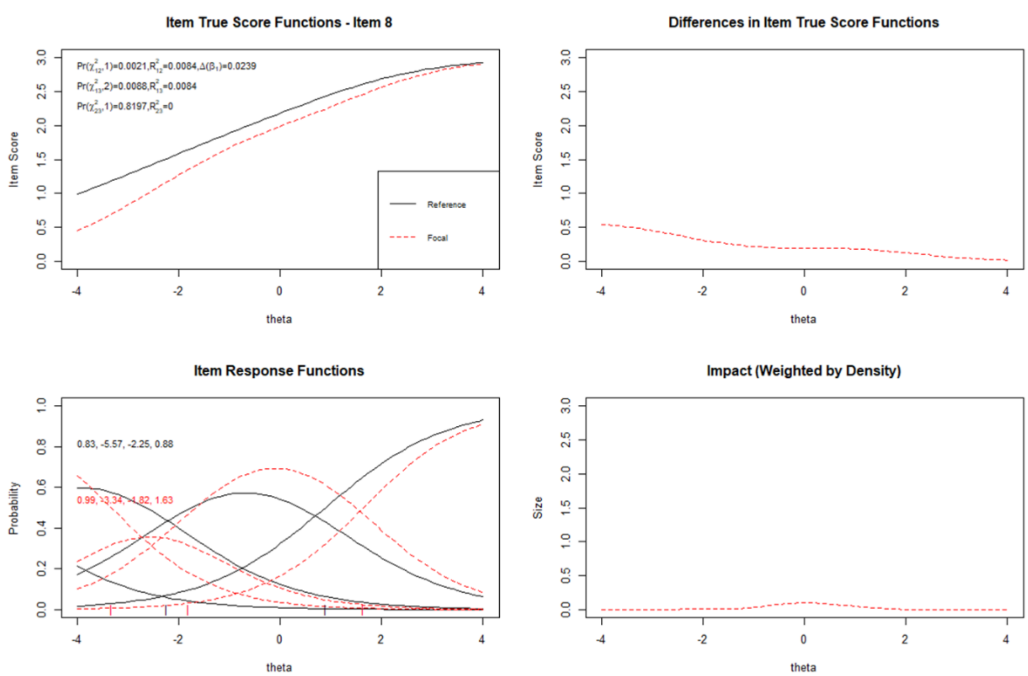


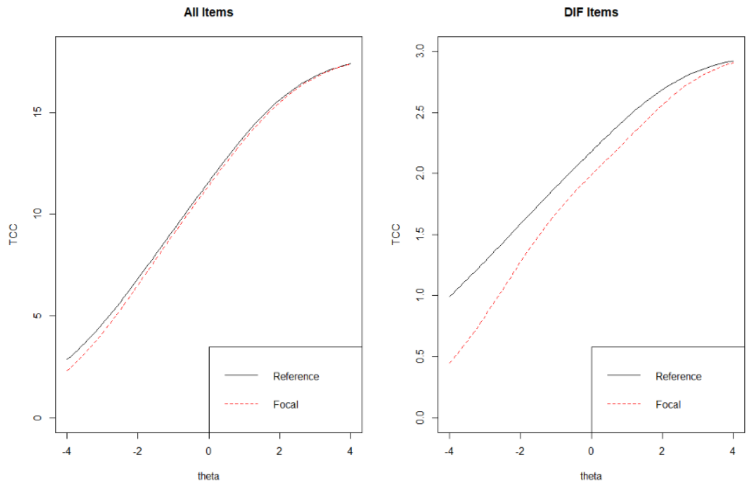
Figure 4.14. Graphical true score functions of item E17



Based on the item true score functions, the slope of item E17 for private owned firm was slightly lower than that for foreign joint firm. Participants with low expectancy level had a larger difference in score than participants with high expectancy between the two groups (see Figure 4.14 top two plots). The TSW likelihood ratio test for uniform DIF, comparing Model 1 and Model 2, was significant (p_{12} = .002) for item 8, whereas the test for non-uniform DIF comparing Model 2 and Model 3 was not significant (p_{23} = .82) (see Figure 4.14 top left plot). It indicated a uniform DIF existed between the two groups on item E17.

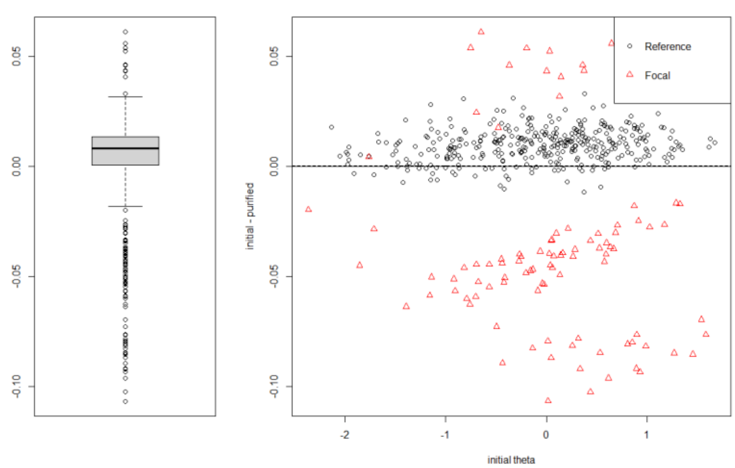
DIF impact on scores was measured by checking McFadden's pseudo-R^2 measures which were shown at top left in figure 4.14. According to Crane et al.'s (2007) suggested thresholds of DIF magnitude (i.e., when weighted by the focal group trait distribution, DIF impact could be negligible when pseudo-R^2 statistics is less than .035, be moderate when pseudo-R^2 statistics is less < .07, and be large when pseudo-R^2 statistics is above .07), in this study, the small McFadden's pseudo-R^2 measures (R^2_{12} = .008, R^2_{13} = .008) for item E17 indicated the expected impact of DIF on scores was negligible when weighted by the focal group trait distribution (see Figure 4.14 bottom right plot).

Figure 4.15. Impact of DIF item on test characteristic curves



The impact of DIF items on test characteristic curves (TCCs) was also checked. Based on TCC of overall scale (including DIF items), participants from two groups had similar scores, indicating the DIF items had very small impact on overall scale (see Figure 4.15 left). Only for DIF item, participants from private owned firm scored higher than participants from foreign joint firm (see Figure 4.15 right).

Figure 4.16. Individual–level DIF impact



The difference in score between dataset that ignore DIF (i.e., purified) and those that account for DIF (i.e., initial) was shown in figure 4.15. The interquartile range of differences, representing the middle 50% of the differences (bound between the bottom and top of the shaded box), ranged roughly from 0 to 0.01 with a median of approximately 0.07 (see Figure 4.15 left). At the individual score level, accounting for DIF led to lower impact for participants belonging to private owned firm than participants belonging to foreign joint firm along with various expectancy level. However, the impact within participants belonging to foreign joint firm became less as their expectancy level increasing (see Figure 4.15 right).

Finally, DIF analysis was conducted on different firm size. Participants were grouped as coming from micro-size firm (n = 33), small-size firm (n = 245), middle-size firm (n = 271) and big-size firm (n = 50). A total of 6 comparations were tested, and no DIF item was identified. Participants from different firm sizes were found to similarly endorse the expectancy scale items.

Convergent validity.

The satisfaction of unidimensionality ensures that the expectancy scale underlined a single trait by a set of measures (Gerbing & Anderson, 1988), and the previous reliability test ensures the consistency or stability of a measure (Bollen, 1989). Then, the convergent validity was assessed by measuring the relationship between the scales of expectancy and motivation. Theoretically, expectancy would be positively correlated or associated with motivation. That is, a high score in expectancy toward one new technology would lead to a high score of motivation to adopt this technology. Pearson correlation analysis was performed between the scores of the two measures. The coefficient of the Pearson correlation showed significant association between the overall scores of expectancy items and motivation scores (r = .46, $p < .01$). Thus, the expectancy scale had demonstrated a strong association with motivation of adopting new technology, establishing convergent validity.

Perceived Benefit

The final item bank of perceived benefit consisted of a total of 8 items, represented by 1 item for attainment value (i.e., item B5), 3 items for intrinsic value (i.e., item B13, B16, B17), and 4 items for utility value (i.e., item B24, B29, B33, B35). All response categories of the 8 items were endorsed by participants. The final scale was shown in Table 4.19.

Table 4.19.

Final scale of perceived benefit

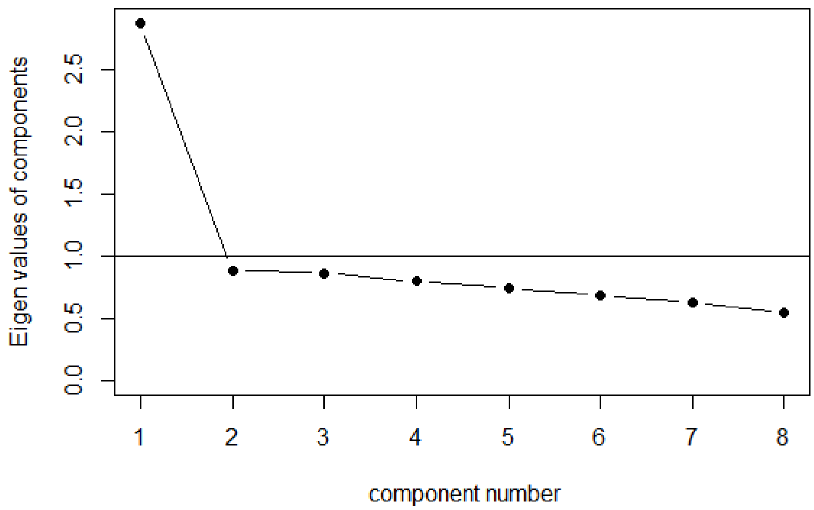
	Item (English)	Item (Chinese)
B5	Adopting new technology would fit with the government's suggestion or guidance	采纳（这一）新技术符合政府的政策或建议
B13	People in my firm like working with new technology	公司人员喜欢使用（这一）新技术
B16	People in my firm think learning new technology is interesting	公司人员认为学习（这一）新技术是十分有趣的
B17	Using new technology would make people in my firm enjoying their work	使用（这一）新技术将令公司人员享受他们的工作
B24	Using new technology would enhance the relationship between my firm and its business partners	使用（这一）新技术能够增进公司与商业伙伴的关系
B29	Using new technology would improve the quality of work	使用（这一）新技术能够提升工作质量.
B33	Using new technology would give control over work	使用（这一）新技术能够提高对工作的控制力.
B35	Using new technology would help my firm catch up with major competitors	使用（这一）新技术能够帮助公司追上主要的竞争者.

IRT assumptions.

Monotonicity was met by checking the plots generated with Mokken Scaling (Mokken, 1971). Two plots were generated for each item. The first plot of each item demonstrated that three item-step-response functions monotonically increased with the increasing rest score, indicating that participants with high perceived benefit tend to choose high score response (Van der Ark, 2007). For example, for item B33, the three curves showed an increase tendency with the participant's rest scores increasing. Particularly, participant's probability of endorsing the last response category rather than the third response category for item B33 increased from approximately .1 to .4, as the participant's rest score increased from under 10 to above 20. The second plot of each item also represented that item response function grew monotonically, indicating that participants tend to choose high-score response category when their perceived benefit of new technology increase. For example, for item B33, participants with rest score over 20 tend to choose a higher response category than the participants with rest score 7-11. Therefore, the final scale of perceived benefit was considered to satisfy the assumption of monotonicity in IRT. Refer to Appendix G for overall plots.

Unidimensionality was assessed and established by reviewing the underlying structure of the item bank generated with PCA (Revicki et al., 2014). Using the criterion of eigenvalue greater than 1 (Kaiser, 1960), PCA yielded one principal dimensions for the item bank of perceived benefit, accounting for 35.87% of the total variance. All eight items of the expectancy scale loaded on to this one dimension with loadings ranging from .51 to .62. In addition, the ratio of eigenvalues within dominant and the second dimension was 3.26. Additionally, the scree-test confirmed a distinct single dimension to lie above the point of inflexion as shown in Figure 4.17 (Costello & Osborne, 2005; DeVellis, 2003; Field, 2005).

Figure 4.17. Scree plot of the final item bank of perceived benefit



The third assumption, local independence, was assessed by checking LD X^2 index for each item pair in the item bank of perceived benefit. The largest LD X^2 index was 32.53, which was much lower than the initial item bank (i.e., 126). Even though most of the item pair's LD X^2 index was still above 10, a consistency of relatively low values existed in the LD X^2 index matrix. In the upper right triangle, standardized values were included and all of them were close to 0, which verified the consistency. Q3 statistic was also calculated to detect local independence. All of the Q3 statistic were below the cut-off value 0.2, verifying that local independence was met in the item bank of perceived benefit. Refer to Appendix G for the LD X2 index matrix and Q3 statistic matrix.

Item parameters and model fit.

Participants' perceived benefit of new technology was mapped to a scale of -6 to 6 standard deviation below and above the average level of perceived benefit. The IRT model fit was assessed by using M2 statistic. The M2 statistics for the final item bank was computed as M2 (4) = 5.36, p = .25. The $RMSEA_2$ was evaluated as .02, a value lower than the cut-off of .05. The fit indices of SRMR was 0.04, CFI was .96 and TLI was .99. All of these indicated a good fit of the data to the model, and the model well replicated the observed reality. At the item-level, $S\text{-}X^2$ was used to assess the fit of each individual item. All items were found to have non-significant difference between the observed and expected observations. Refer Table 4.20 for item fit statistics of each item.

The discrimination parameter of the final item bank ranged from 0.87 to 1.47. Considering that the suggested value for well discrimination was from 0.8 to 2.5, all the 8 items were deemed to have acceptable discriminating power according to Baker's (2001) discrimination parameter thresholds. Item B17 (i.e., "Using new technology would make people in my firm enjoying their work") had the highest discrimination parameter among all items, while item B29 (i.e., "Using new technology would improve the quality of work) would work together in adopting new technology") had the lowest discrimination parameter. Refer to Table 4.20 for discrimination parameter of each item.

The threshold parameters of the final item bank ranged from -5.24 to 1.3 standard deviation below and above average expectancy. The first threshold parameter had a range from -5.24 to -2.78. The second threshold parameter had a range from -2.97 to -0.92. The third threshold parameter had a range from 0.41 to 1.3. This indicated that participants with lower and average levels of perceived benefit were prone to answer higher score response options in each item. Refer to Figure 4.18 for Item characteristic curve and Table 4.20 for threshold parameters of each item.

Figure 4.18. ICC of the final item bank of perceived benefit

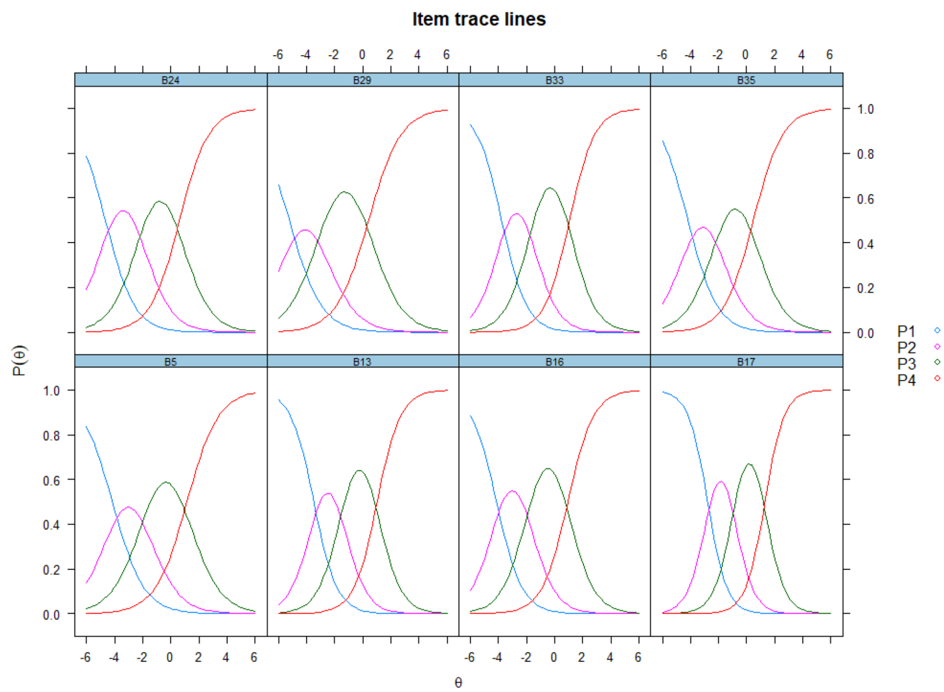


Table 4.20.

Item Parameter Estimates and Item Fit Statistics

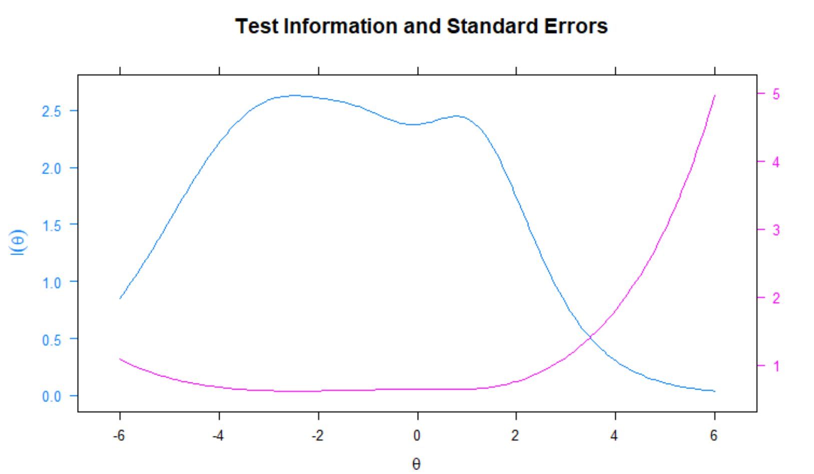
Item	a	b1	b2	b3	S-X2	df	p
B5	0.892	-4.177	-1.861	1.15	42.653	21	0.053
B13	1.21	-3.49	-1.494	1.022	21.601	22	0.484
B16	1.099	-4.147	-1.886	0.935	20.604	19	0.359
B17	1.465	-2.78	-0.919	1.303	30.185	22	0.114
B24	0.968	-4.666	-2.154	0.614	40.177	18	0.052
B29	0.87	-5.239	-2.968	0.41	18.557	19	0.486
B33	1.126	-3.768	-1.669	1.06	30.16	21	0.089
B35	0.966	-4.182	-2.081	0.479	30.32	25	0.213

Reliability.

Reliability of the final item bank was assessed by checking the amount of information available from a single item and the overall item bank derived from item information function (IIF). For each item, IIF indicated that all the item obtained the most amount of information at their peak height approximately from 3 standard deviation below to 1 standard deviation above average expectancy. Refer to Appendix G for IIFs of the eight items.

The overall item bank IIF still illustrated a high curve at the range of 3 standard deviation below to 1 standard deviation above average perceived benefit. Thus, the final scale was then considered to be reliable at the range of 3 standard deviation below to 1 standard deviation above average perceived benefit. Refer to Figure 4.19 for IIF of the final item bank. From the classical test theory perspective, the final scale was analyzed to have a reliability of .74 Cronbach's alpha. This was lower than the initial item bank but was still deemed to be acceptable.

Figure 4.19. Item information function of the final item bank



Test-fairness.

DIF analysis on gender was first conducted. Similar with in expectancy, male (n = 311) was set as reference group and female (n= 275) was set as focal group. The analysis was terminated in one iteration and no items was identified for gender-related DIF. Both male and female participants were found to similarly endorse the scale items with none of the items being biased to either of the gender categories.

Next, participants within different age categories were tested. Three age categories were tested in this analysis, as age of 21-30 (n = 215), 31-40 (n = 318) and 41-60 (n = 66). A total of 3 DIF assessments were conducted. All analyses were terminated in one iteration and no items was identified for ager-related DIF. Participants from all age categories were found to similarly endorse the scale items with none of the items being biased to age categories.

Participants from different types of firm were then analyzed for DIF. First, participants coming from apparel firm (n = 322) and textile firm (n = 277) were grouped and analyzed. No DIF item was identified. Participants from both apparel firm and textile firm were found to similarly endorse the scale items. Next, participants from private owned firm (n = 428), state owned firm (n = 68), and foreign joint firm (n = 103) were compared. A total of 3 DIF assessments were conducted between each pair of them. No DIF items was identified between the group of private owned and foreign joint firm as well as stated owned and foreign joint firm. However, two items, item B24 (i.e., "Using new technology would enhance the relationship between my firm and its business partners.") and item B29 (i.e., "Using new technology would improve the quality of work”), were flagged as DIF item in the analysis of private owned (i.e., reference group) and stated owned firm (i.e., focal group).

Most of participants from both private owned and state owned firm showed a slight higher than average level of perceived benefit, and the latent trait was distributed similarly within these two groups. The distribution of theta (i.e., perceived benefit) score was shown in Figure 4.20.

Figure 4.20. Trait distributions – private owned vs. state owned firm.

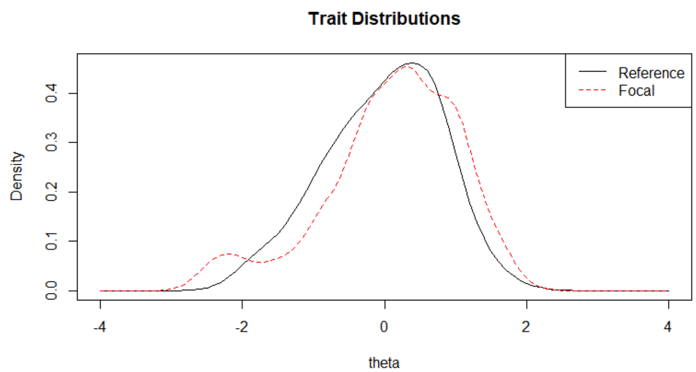
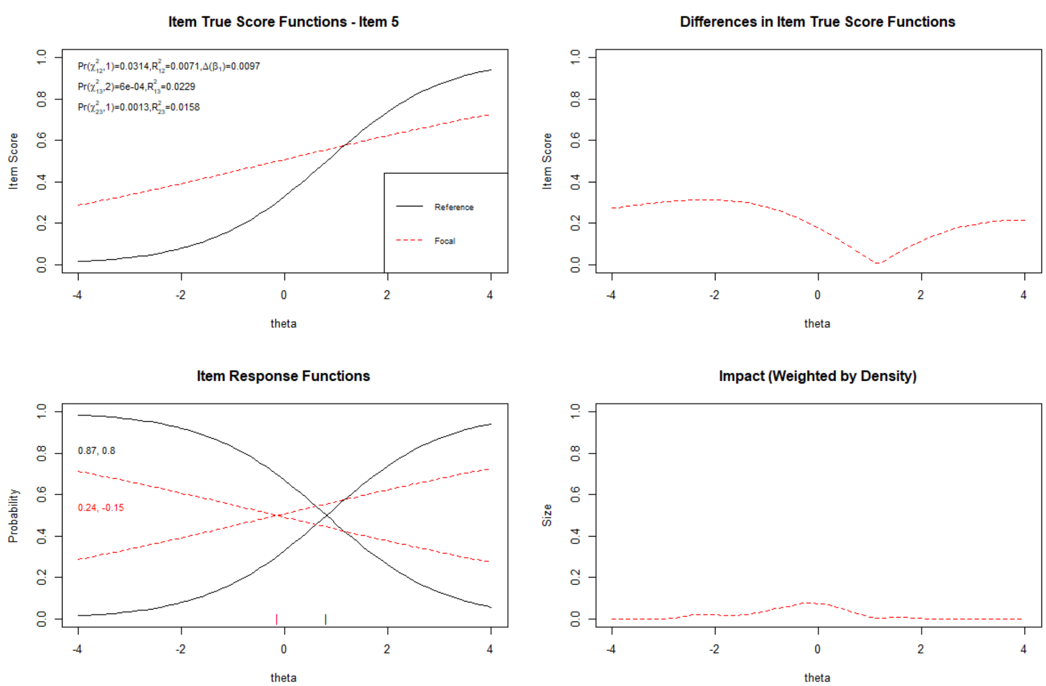
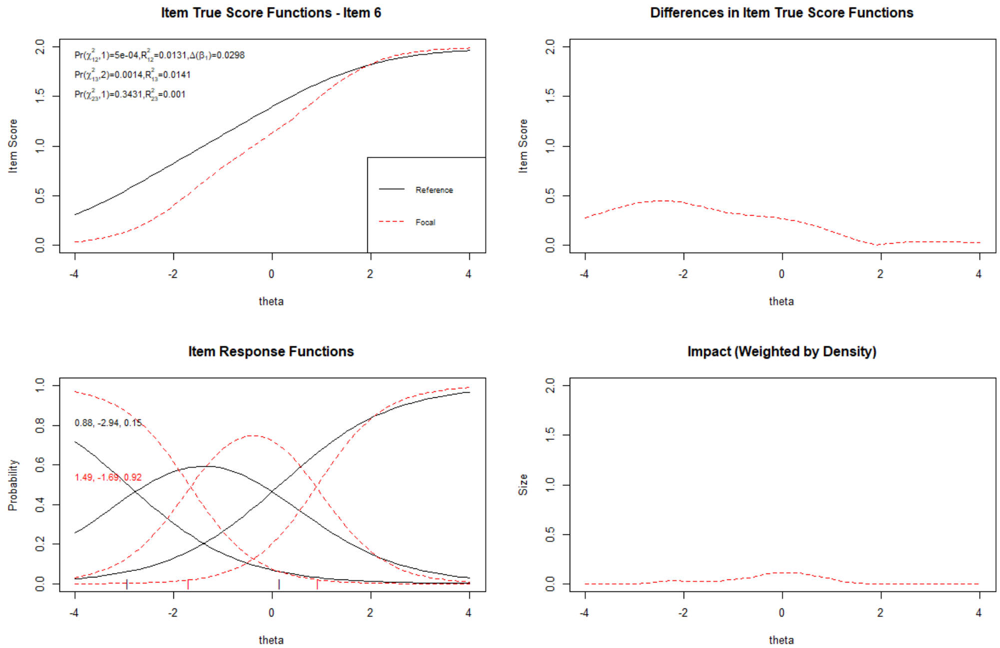


Figure 4.21. Graphical true score functions of item B24



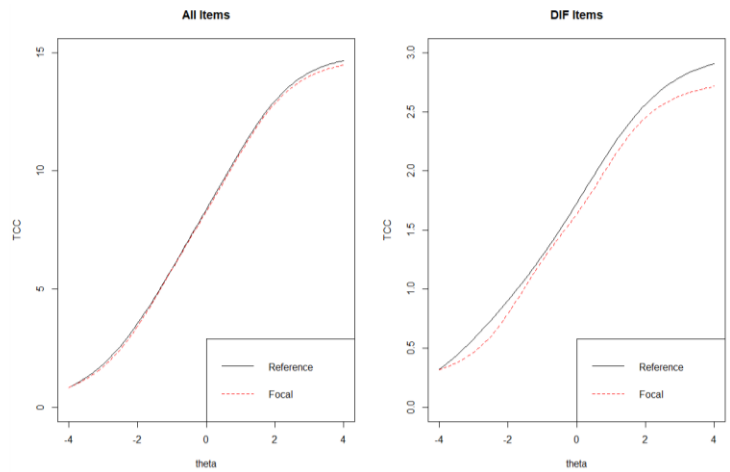
Based on the item true score functions, the slope of item B24 for private owned firm was higher than that for state owned firm. Participants belonging to state owned firm had a high score than participates belonging to private owned firm when they had an average, lower than average and slightly higher than average of perceived benefit. Participates belonging to private owned firm had a higher score compared with participates belonging to state owned firm when they both had a higher than average level of perceived benefit (see Figure 4.21 top two plots). The TSW likelihood ratio test for uniform DIF, comparing Model 1 and Model 2, was significant (p_{12} = .03) (when a = 0.05) but insignificant (when a = 0.01) for item B24, whereas the test for non-uniform DIF comparing Model 2 and Model 3 was significant (p_{23} = .001) (see Figure 4.21 top left plot). It indicated a non-uniform DIF existed between the two groups on item 5. DIF impact on scores was measured by checking McFadden's pseudo-R^2 measures. According to Crane et al.'s (2007) suggested thresholds of DIF magnitude, the small McFadden's pseudo-R^2 measures (R^2_{23} = .015, R^2_{13} = .022) for item B24 indicated the expected impact of DIF on scores was negligible when weighted by the focal group trait distribution (see Figure 4.21 bottom right plot).

Figure 4.22. Graphical true score functions of item B29



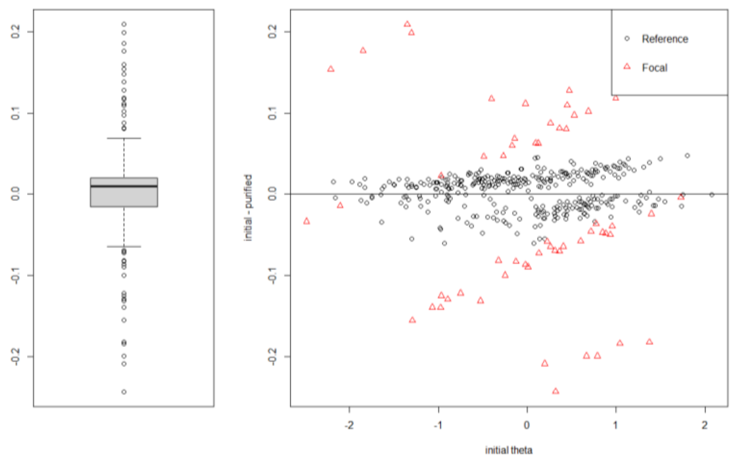
Another flagged item was item B29. Based on the item true score functions, the slope of item 6 for private owned firm was slightly lower than that for state owned firm. Participants with low perceived benefit level had a larger difference in score than participants with high perceived benefit between the two groups (see Figure 4.22 top two plots). The TSW likelihood ratio test for uniform DIF, comparing Model 1 and Model 2, was significant (p_{12} = .000) for item 6, whereas the test for non-uniform DIF comparing Model 2 and Model 3 was not significant (p_{23} = .343) (see Figure 4.22 top left plot). It indicated a uniform DIF existed between the two groups on item B29. DIF impact on scores was measured by checking McFadden's pseudo-R^2 measures. According to Crane et al.'s (2007) suggested thresholds of DIF magnitude, the small McFadden's pseudo-R^2 measures (R^2_{12} = .013, R^2_{13} = .014) for item B29 indicated the expected impact of DIF on scores was negligible when weighted by the focal group trait distribution (see Figure 4.22 bottom right plot).

Figure 4.23. Impact of DIF item on test characteristic curves



The impact of DIF items on test characteristic curves (TCCs) was also checked. Based on TCC of overall scale (including DIF items), participants from two groups had similar scores, indicating the DIF items had very small impact on overall scale (see Figure 4.23left). Only for DIF item, participants from private owned firm scored higher than participants from state owned firm (see Figure 4.23 right).

Figure 4.24. Individual–level DIF impact



The difference in score between dataset that ignore DIF (i.e., purified) and those that account for DIF (i.e., initial) ranged roughly from -0.02 to 0.02 with a median of approximately 0.01 (see Figure 4.24 left). At the individual score level, accounting for DIF led to lower impact for participants belonging to private owned firm than participants belonging to state owned firm along with various expectancy level. However, the impact within participants belonging to state owned firm became less as their perceived benefit level increasing (see Figure 4.24 right).

Finally, DIF analysis was conducted on different firm size. A total of 6 comparisons were tested among four firm size categories, and no DIF item was identified. Participants from different firm sizes were found to similarly endorse the perceived benefit scale items.

Convergent validity.

The satisfaction of unidimensionality ensures that the perceived benefit scale underlined a single trait underlies a set of measures (Gerbing & Anderson, 1988), and the previous reliability test ensures the consistency or stability of a measure (Bollen, 1989). Theoretically, perceived benefit would be positively correlated or associated with motivation. That is, a high score in perceived benefit toward one new technology would lead to a high score of motivation to adopt this technology. Pearson correlation analysis was performed between the scores of the two measures. The coefficient of the Pearson correlation showed significant association between the overall scores of perceived benefit items and motivation scores ($r = .51$, $p < .01$). Thus, the perceived benefit scale had demonstrated a strong association with motivation of adopting new technology, establishing convergent validity.

Perceived Cost

The final item bank of perceived benefit consisted of a total of 8 items, represented by 4 items for effort cost (i.e., item C2, C4, C7, C8), 1 item for opportunity cost (i.e., item C10), and 3 items for psychological cost (i.e., item C13, C16, C17). All response categories of the 8 items were endorsed by participants. The final scale was shown in Table 4.21.

Table 4.21.

Final scale of perceived cost

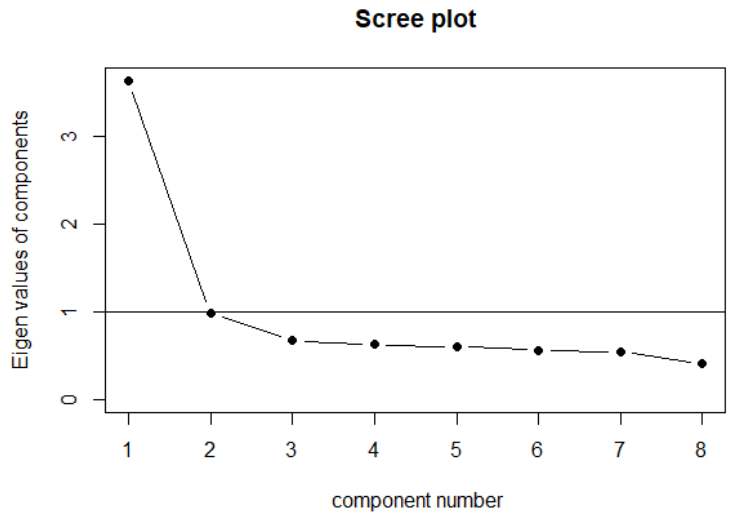
	Item (English)	Item (Chinese)
C2	Adopting new technology would demand too much of time	采纳（这一）新技术需要大量的时间
C4	Adopting new technology means too much of work	采纳（这一）新技术意味着大量的工作
C7	Adopting new technology would demand too much of money	采纳（这一）新技术需要大量的资金投入
C8	It is hard to see the return in a short time	采纳（这一）新技术很难在短期内得到回报
C10	Adopting new technology would take time away from other activities my firm wants to pursue	用在采纳（这一）新技术上的时间将会挤占公司用在其他必要事情上的时间.
C13	I worry that my firm would waste money if new technology will be only used for a short time in my firm	我担心公司浪费金钱，当（这一）新技术只在公司使用较短时间
C16	I am concerned that my firm would not be able to handle the stress that working with new technology	我担心公司人员不能够处理好使用(这一) 新技术所带来的压力
C17	Adopting new technology is emotionally draining	采纳这一新技术让人身心憔悴

IRT assumptions.

Monotonicity was met by checking the plots generated with Mokken Scaling (Mokken, 1971). Two plots were generated for each item. The first plot of each item demonstrated that three item-step-response functions monotonically increased with the increasing rest score, indicating that participants with high perceived benefit tend to choose high score response (Van der Ark, 2007). For example, for item C8, the three curves showed an increase tendency with the participant's rest scores increasing. Particularly, participant's probability of endorsing the last response category rather than the third response category for item C8 increased from approximately 0 to .4, as the participant's rest score increased from under 6 to above 20. The second plot of each item also represented that item response function grew monotonically, indicating that participants tend to choose high-score response category when their perceived cost of new technology increase. For example, for item C8, participants with rest score over 20 tend to choose a higher response category than the participants with rest score 6. Therefore, the final scale of perceived benefit was considered to satisfy the assumption of monotonicity in IRT. Refer to Appendix G for overall plots.

Unidimensionality was assessed and established by reviewing the underlying structure of the item bank generated with PCA (Revicki et al., 2014). Using the criterion of eigenvalue greater than 1 (Kaiser, 1960), PCA yielded one principal dimensions for the item bank of perceived benefit, accounting for 45.29% of the total variance. All eight items of the expectancy scale loaded on to this one dimension with loadings ranging from .63 to .75. In addition, the ratio of eigenvalues within dominant and the second dimension was 3.72. Additionally, the scree-test confirmed a distinct single dimension to lie above the point of inflex as shown in Figure 4.25 (Costello & Osborne, 2005; DeVellis, 2003; Field, 2005).

Figure 4.25. Scree plot of the final item bank of perceived cost



The third assumption, local independence, was assessed by checking LD X^2 index for each item pair in the item bank of perceived cost. The largest LD X^2 index was 39.75, which was much lower than the initial item bank (i.e., 86.64). Even though most of the item pair's LD X^2 index was still above 10, a consistency of relatively low values existed in the LD X^2 index matrix. In the upper right triangle, standardized values were included and all of them were close to 0, which verified the consistency. Q3 statistic was also calculated to detect local independence. None Q3 statistics were above the cut-off value 0.2, verifying that local independence was met in the item bank of perceived cost. Refer to Appendix G for the LD X2 index matrix and Q3 statistic matrix.

Item parameters and model fit.

Participants' perceived cost of new technology was mapped to a scale of -6 to 6 standard deviation below and above the average level of perceived cost. The IRT model fit was assessed by using M2 statistic. The M2 statistics for the final item bank was computed as M2 (4) = 6.77, p = .19. The $RMSEA_2$ was evaluated as .03, a value lower than the cut-off of .05. The fit indices of SRMR was 0.05, CFI was .97 and TLI was .99. All of these indicated a good fit of the data to the model, and the model well replicated the observed reality. At the item-level, S-X^2 was used to assess the fit of each individual item. All items were found to have non-significant difference between the observed and expected observations expect item C13 (p = .044, “I worry that my firm would waste money if the technology will be only used for a short time”). However, this item was addressed in the item bank development process by multiple content experts and deemed to cover the measured content of perceived cost. Thus, item C13 was kept in the final item bank. Refer Table 4.22 for item fit statistics of each item.

The discrimination parameter of the final item bank ranged from 1.31 to 2.07. Considering that the suggested value for well discrimination was from 0.8 to 2.5, all the 8 items were deemed to have acceptable discriminating power according to Baker’s (2001) discrimination parameter thresholds. Item C2 (i.e., “Adopting new technology would demand too much of time”) had the highest discrimination parameter among all items, while item C17 (i.e., “Adopting new technology is emotionally draining”) had the lowest discrimination parameter. Refer to Table 4.22 for discrimination parameter of each item.

The threshold parameters of the final item bank ranged from -2.51 to 1.97 standard deviation below and above average perceived cost. The first threshold parameter had a range from -2.51 to -1.36. The second threshold parameter had a range from -1.08 to 0.67. The third threshold parameter had a range from 0.92 to 1.97. This indicated that participants with around average and higher than average levels of perceived cost were prone to answer higher score response options in each item. Refer to Figure 4.26 for Item characteristic curve and Table 4.22 for threshold parameters of each item.

Figure 4.26. ICC of the final item bank of perceived cost

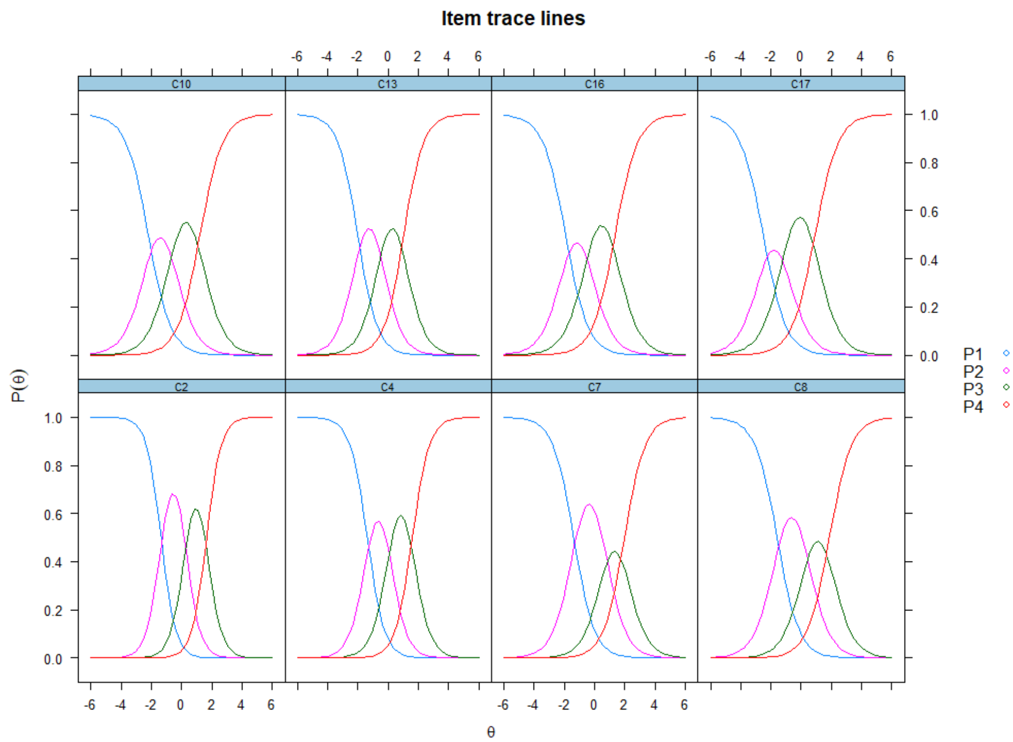


Table 4.22.

Item Parameter Estimates and Item Fit Statistics

Item	a	b1	b2	b3	S-X2	df	p
C2	2.072	-1.364	0.250	1.657	33.424	35	0.544
C4	1.780	-1.384	0.067	1.600	37.581	34	0.308
C7	1.469	-1.385	0.671	1.971	38.990	35	0.295
C8	1.381	-1.595	0.344	1.872	44.406	33	0.089
C10	1.345	-2.208	-0.618	1.223	46.544	34	0.074
C13	1.534	-2.017	-0.494	1.033	46.819	32	0.044
C16	1.347	-1.926	-0.429	1.357	43.015	34	0.138
C17	1.310	-2.508	-1.077	0.918	27.516	30	0.596

Reliability.

Reliability of the final item bank was assessed by checking the amount of information available from a single item and the overall item bank derived from item information function (IIF). For each item, IIF indicated that all the item obtained the most amount of information at their peak height approximately from 2 standard deviation below to 2 standard deviation above average expectancy. Refer to Appendix G for IIFs of the eight items.

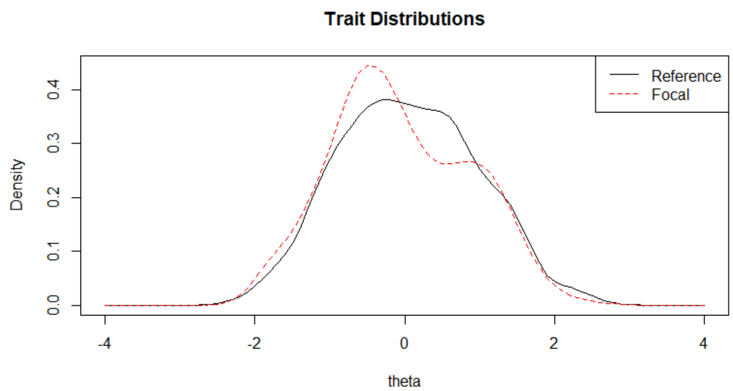
The overall item bank IIF still illustrated a high curve at the range of 2 standard deviation below to 2 standard deviation above average expectancy. Thus, the final scale was then considered to be reliable at the range of 2 standard deviation below to 2 standard deviation above average perceived cost. Refer to figure 4.27 for IIF of the final item bank. From the classical test theory perspective, the final scale was analyzed to have a reliability of .85 Cronbach's alpha.

Figure 4.27. IFF of the final item bank of perceived cost

Test-fairness.

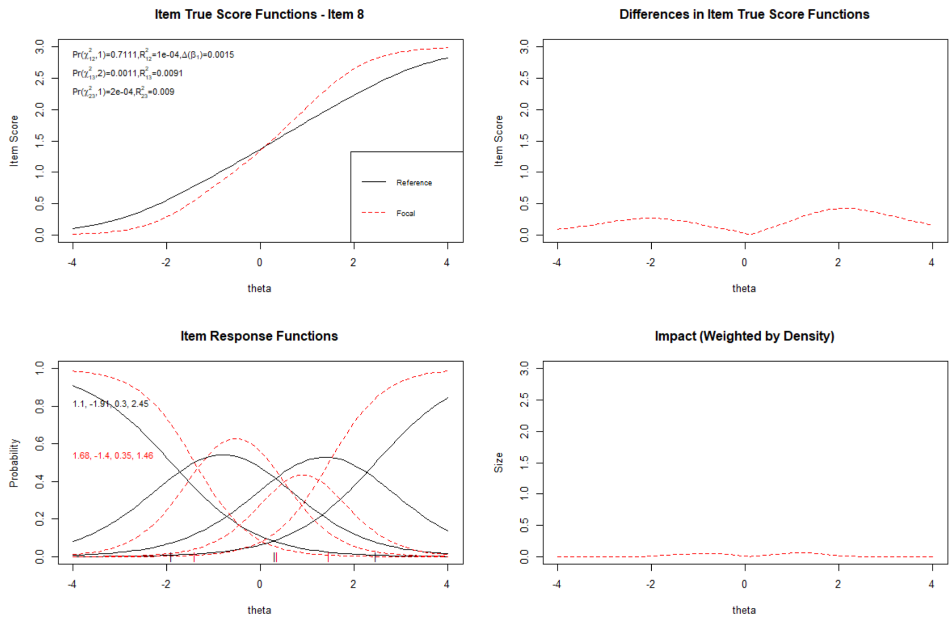
DIF analysis on gender was first conducted. Similar with previous latent trait DIF tests, male (n = 311) was set as reference group and female (n= 275) was set as focal group. Item C8 (i.e., "It is hard to see the return in a short time when adopt new technology") was flagged as DIF item in the analysis of male and female.

Figure 4.28. Trait distributions – male vs. female



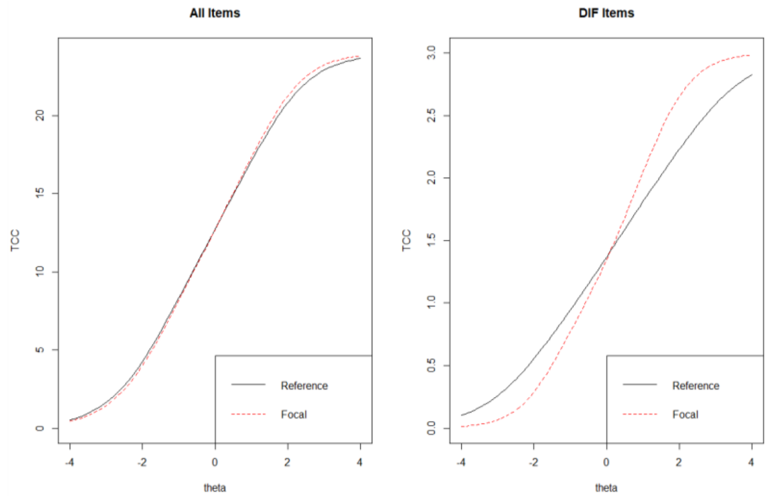
The distribution of theta (i.e., perceived cost) score was shown in figure 4.28. Most of participants showed a slightly lower than average level of perceived cost, and the latent trait was distributed similarly within male and female.

Figure 4.29. Graphical true score functions of item C8



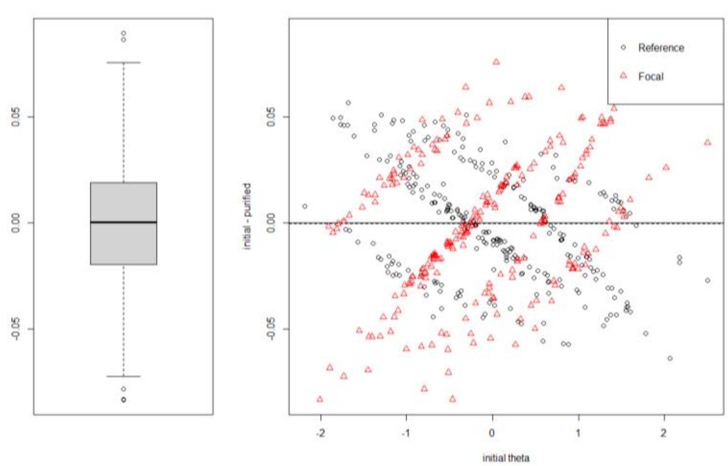
Based on the item true score functions, the slope of item C8 for female was higher than that for male. Male had a higher score than female when their perceived cost was lower than average. Female had a higher score than male when their perceived cost was higher than average (see Figure 4.29 top two plots). The TSW likelihood ratio test for uniform DIF, comparing Model 1 and Model 2, was insignificant (p_{12} = .0.711), whereas the test for non-uniform DIF comparing Model 2 and Model 3 was significant (p_{23} = .0002) (see Figure 4.29 top left plot). It indicated a non-uniform DIF existed between the two groups on item C8. DIF impact on scores was measured by checking McFadden's pseudo-R^2 measures. According to Crane et al.'s (2007) suggested thresholds of DIF magnitude, the small McFadden's pseudo-R^2 measures (R^2_{23} = .009, R^2_{13} = .009) for item C8 indicated the expected impact of DIF on scores was negligible when weighted by the focal group trait distribution (see Figure 4.29 bottom right plot).

Figure 4.30. Impact of DIF item on test characteristic curves



The impact of DIF items on test characteristic curves (TCCs) was also checked. Based on TCC of overall scale (including DIF items), participants from two groups had similar scores, indicating the DIF items had very small impact on overall scale (see Figure 4.30 left). Only for DIF item, male had a higher score than female when their perceived cost was lower than average and female had a higher score than male when their perceived cost was higher than average (see Figure 4.30 right).

Figure 4.31. Individual–level DIF impact



The difference in score between dataset that ignore DIF (i.e., purified) and those that account for DIF (i.e., initial) ranged roughly from -0.02 to 0.02 with a median of approximately at 0 (see Figure 4.31 left). At the individual score level, accounting for DIF led to a lower impact for most male and female when they had an around average level of perceived cost (see Figure 4.31 right).

Next, participants within different age categories were tested. Three age categories were tested in this analysis, as age of 21-30 (n = 215), 31-40 (n = 318) and 41-60 (n = 66). A total of 3 DIF assessments were conducted. All analyses were terminated in one iteration and no items was identified for ager-related DIF. Participants from all age categories were found to similarly endorse the scale items with none of the items being biased to age categories.

Participants from different types of firm were then analyzed for DIF. First, participants coming from apparel firm (n = 322) and textile firm (n = 277) were grouped and analyzed. No DIF item was identified. Participants from both apparel firm and textile firm were found to similarly endorse the scale items. Next, participants from private owned firm (n = 428), state owned firm (n = 68), and foreign joint firm (n = 103) were compared. A total of 3 DIF assessments were conducted between each pair of them. No DIF items were identified. Participants from various ownership types of firms were found to similarly endorse the scale items. Finally, DIF analysis was conducted on different firm size. A total of 6 comparations were tested among four firm size categories, and no DIF item was identified. Participants from different firm sizes were found to similarly endorse the perceived cost scale items.

Convergent Validity.

The satisfaction of unidimensionality ensures that the perceived cost scale underlined a single trait underlies a set of measures (Gerbing & Anderson, 1988), and the previous reliability test ensures the consistency or stability of a measure (Bollen, 1989). Theoretically, perceived cost would be negatively correlated or associated with motivation. That is, a high score in perceived cost toward one new technology would lead to a low score of motivation to adopt this technology. Pearson correlation analysis was performed between the scores of the two measures. The coefficient of the Pearson correlation showed significant association between the overall scores of perceived cost items and motivation scores ($r = -.18$, $p < .01$). Thus, the perceived cost scale had demonstrated a negative association with motivation of adopting new technology, establishing convergent validity.

CHAPTER V: CONCLUSIONS

This chapter includes (a) summary of the study, (b) discussion of the important results, (c) contributions and implications, and (d) study limitations and future research suggestions.

Summary of the Study

The development of T&A industry has benefited from the usage of new technologies in the past industry revolutions. However, the rates of acceptance or adoption of new technologies vary (Wang & Ha-Brookshire, 2018). Great division has emerged between developed and developing countries in the global T&A industry. The T&A industry in developed countries is more involved in knowledge-intensive, technology-intensive and capital-intensive activities, while the T&A business in most of developing countries is still labor-intensive, focusing on manual, simple and repetitive tasks (Stone & Farnan, 2018). With a new industrial revolution (i.e., Industry 4.0) is coming, the T&A business in developing countries could lose its cost advantage and fall even further behind if business in these countries cannot adopt new innovations and technologies appropriately and effectively.

Thus, developing countries must hurry to upgrade their T&A activities to reflect the technological advancement, and to get ready for the technology-intensive future. As the world's largest textile and apparel producer and exporter, as well as the largest developing country, China has been alerted by the coming trends of Industry 4.0. The Chinese T&A industry has made its industrial upgrade plan to shift the current low cost-driven T&A industry to technology-driven industry. However, challenges still exist. One of the major challenges is that the T&A employers' motivations toward new technology adoption are questionable. Facing with continual competitions growth and cost advantage losing, Chinese T&A firms tend to lower their margin via a price-war rather than to make prudent investment strategies on new technology adoption (China Daily, 2016; R. Sun, 2017; Yang, 2010). Thus, the reason T&A firms in China have limited motivation for technical upgrades or what restrains their motivation are critical for Chinese T&A industry upgrades.

To explore factors that may influence motivation to adopt new technology, firm managers' expectancy, perceived benefit and perceived cost of new technology were addressed in this study. These three concepts were draw from the framework of EVT. Being one of the most important, long-standing and vibrant views on explaining humans' attitude, choice, persistence, and performance of behavior, EVT suggested that high expectancy, high perceived benefit and low perceived cost of performing one task would trigger a high motivation for the task. Thus, adapting the three concepts to the domain of new technology adoption, firm managers' expectancy, perceived benefit and perceived cost of new technology, might have the capacity to explain firm managers' motivation to adopt new technology.

However, a lack of proper and relevant scales to measure such concepts was observed in the literature. Currently, DOI, TOE, and TAM are the three most addressed technology adoption theories. A few instruments to measure related concepts, such as relative advantage and perceived usefulness, have been discussed in these theories. However, researchers argued that the explanatory power of these theories are inconsistent when facing various organizational and technological contexts (Baker, 2012; Zmud, 1982), which may make the use of these theories problematic for analyzing the diverse new technology adoption situations in Chinese T&A industry. In addition, existing characteristics, contexts or factors have been explained by various constructs and tested by inconsistent instruments, suggesting a lack of clarity and consensus in the understanding of motivation factors of technology adoption. Thus, to clearly and effectively understand factors that may influence Chinese T&A firm managers' motivation to adopt new technology, this study was designed to develop scales that measure their expectancy, perceived benefit and perceived cost of new technology adoption.

EVT literature suggested that each of the three concepts have different underlying constructs. Individuals' belief of their own capacity (i.e., efficacy expectancy) and belief of possibility that desired outcome would come (i.e., outcome expectancy) would be associated with their expectancy of the task. They perceived task importance (i.e., attainment value), enjoyment (i.e., intrinsic value) and utility (i.e., utility value) would contribute to the overall perceived benefit of the task. The effort given to perform the task (i.e., effort cost), opportunity loss for engaging in the task (i.e., opportunity cost) and mental suffering (i.e. psychological cost) are involved in the perceived cost of the task. Thus, following propositions were proposed:

Proposition 1: Efficacy expectancy will be salient to firm managers' expectancy of new technology.

Proposition 2: Outcome expectancy will be salient to firm managers' expectancy of new technology.

Proposition 3: Attainment value will be salient to firm managers' perceived benefit of new technology.

Proposition 4: Intrinsic value will be salient to firm managers' perceived benefit of new technology.

Proposition 5: Utility value will be salient to firm managers' perceived benefit of new technology.

Proposition 6: Effort cost will be salient to firm managers' perceived cost of new technology.

Proposition 7: Opportunity cost will be salient to firm managers' perceived cost of new technology.

Proposition 8: Psychological cost will be salient to firm managers' perceived cost of new technology.

To develop and preliminarily validate the scale of expectancy, perceived benefit and perceived cost of new technology, the psychometric method of IRT, was used as the data collection and analysis paradigm for the research. The study was conducted in three stages: (a) item generation, (b) item bank development, and (c) psychometric evaluation. In the first stage, a thorough review of literature on EVT, DOI and TAM was conducted. Constructs and instruments that were relevant to expectancy, perceived benefit and perceived cost were identified, and then adopted, adapted and translated into the initial item bank of each concept. Overall, a total of 55 items were generated in expectancy, 65 items in perceived benefit and 41 items in perceived cost.

In the item bank development stage, a series of qualitative sub-phases were conducted to organize and evaluate the items in item banks, including binning, winnowing, content expert validation, item revisions, and cognitive interviews. In binning and winnowing process, items were systematically grouped (or binned), and items that were inconsistent with construct definitions or redundant in nature, were removed (or winnowed), resulting in 37 items left in the item bank of expectancy, 48 items in perceived benefit and 29 items in perceived cost. Next, 9 Chinese firm managers, who work in various Chinese T&A firms and have authority in the decision-making process of new technology adoption, were interviewed for content expert validation. They were asked about their perceptions regarding items' representability with real-life experiences, wording and vocabulary, and redundancy and missing in the item bank. As a result, a total of 19 items left in the item bank of expectancy, 37 items in perceived benefit and 18 items in perceived cost. Next, all items were revised to four-point Likert style following IRT suggestion (Dalal, Carter, & Lake, 2014). Finally, 10 Chinese T&A firm managers were recruited in the cognitive interviews and asked to complete the survey questionnaire constructed by all items. Their feedback of the questionnaire concluded that the overall items and survey design were clear and understandable, and the instruction of survey was considered appropriate and adequate. No major changes were made.

In final stage of psychometric evaluation stage, a self-reported survey was conducted to empirically test and evaluate the psychometric properties of the developed scale of expectancy, perceived benefit and perceived cost of new technology. Participants were T&A firm managers with power in the technology adoption decision making process. They were asked to indicate their expectancy, perceived benefit and perceived cost of the new technology that their firm or department was considering adopting or would adopt (or plan to adopt) according to the designed survey. Here, the new technology was defined as any technologies that can work for practical purposes and have not been used in participants' firm before, including hardware and software. In addition, participants were asked to indicate their motivation to adopt the new technology in their firm. A total of 2,147 Chinese T&A firm managers from various firm types were invited to finish the online research survey in January 2019, and 599 participants completed the survey within one month, collected through a national research firm, Wenjuanxing.

Discussion of Major Findings

A summary and discussion of the major findings of psychometric evaluation for the Chinese T&A firm managers' expectancy, perceived benefit and perceived cost of new technology are discussed in this section.

Expectancy

A graded response model was fitted to the data for item calibration and to check for the scale's psychometric properties. The three IRT assumptions— monotonicity, unidimensionality and local independence, were first assessed and established. It indicated that expectancy was the only latent trait being measured by the eight items in the final scale of expectancy, and no other latent factors were represented among items even after controlling the major trait of expectancy, and a high score measured by the scale represented a high level of expectancy possessed by the participants.

All eight items' discrimination parameter values were within the acceptable range, indicating that all the items were able to distinguish participants well based on their levels of expectancy of new technology. The eight items' threshold parameters indicated that the final scale seemed to capture lower levels of expectancy well, as participants with average levels of expectancy would mostly select the higher two response categories. The model fit indices (i.e., M2 statistics, $RMSEA_2$, SRMR, CFI and TLI) suggested the model replicated the observed date well, and the GRM used to calibrate the expectancy scale items seemed to be the right choice. An analysis of the individual item fits also showed that all eight items had good fit with the GRM.

The TIF and SEE curve indicated that the final scale was most informative for estimating expectancy for a range from -4 to 1. Thus, the final expectancy scale seemed to be more reliable to measure participants with lower than average level to slightly higher than average level of expectancy. Classical tests of reliability indicated the reliability of the final expectancy scale was acceptable. The results of DIF analysis indicated that there was no significant difference of responses when using the expectancy scale to measure participants with different age, gender, or from different firm types.

Since the expectancy scale underlined a single trait by the eight items and the consistency of measurement was acceptable, convergent validity was then verified after assessing the relationship between participants' expectancy and their motivation to adopt new technology. The results indicated a significant positive relationship between the two variables. It was consistent with literature and further substantiated that an increasing expectancy of new technology would lead to an increasing motivation to adopt the new technology.

Specifically, as suggested by EVT literature, the expectancy was conceptualized as a complex of two theoretical constructs, such as efficacy expectancy and outcome expectancy. The IRT assumption of unidimensionality was met within the expectancy scale, indicating efficacy expectancy and outcome expectancy underline a unidimensional structure of expectancy. Six items in the expectancy scale represented the construct of efficacy expectancy, describing participants' perception of their firms' competence for adopting new technology. What is notable in this study is that human factor was dominated in the participants' efficacy expectancy. For example, the item "People in my firm would understand the knowledge of new technology" emphasized potential new technology users' ability to learn and to understand new technology's working mechanism and relevant knowledge. Consistent with Wang and Ha-Brookshire's (2018) findings, understanding the new technology would be the basement and start point for future application, analysis and evaluation of the new technology and relevant outcomes. The items "People in my firm would coordinate their efforts to adopt new technology" and "People in my firm would work together in adopting new technology" highlighted people's collective work in new technology adoption. As Riggs et al. (1994) suggested, new technology adoption in one firm was not only performed by individuals in the firm, but also performed in groups or by the entire organization as a collective. Especially, when faced with complicated new technologies which require multiple departments' support in a firm, collective work from various end-users would be important and necessary. In addition, collective work is deemed to align with eastern culture which is dominated by collectivism. Working as a unit or team, rather than individually, is preferred in the eastern society. The item "My firm has managers who have vision to adopt new technology" addressed managers' leadership in new technology adoption. This was consistent with Bass's (1990) conclusion that managers should understand the need for change and share their vision with followers. Similarly, in this study, the other two items "My firm has money to adopt new technology" and "My firm has infrastructure to adopt new technology" also emphasized by participants about the physical resource or asset associated with new technology adoption.

Out of eight, two items in the expectancy scale represented the construct of outcome expectancy, describing the participants' belief that adopting new technology would generate desired outcomes. For example, Item "I am confident that new technology would be effective in my firm in the near future" addressed participants' confidence about the new technology's effectiveness. Another item "I am confident that new technology would be compatible with the existing working environment in my firm" underlined the compatibility of new technology. This was aligned with the Cheng et al.'s (2004) observation that compatibility is a significant factor in determining users' attitude towards new technology adoption in China.

Perceived Benefit

For the scale of perceived benefit, the three IRT assumptions of monotonicity, unidimensionality and local independence, were first assessed and established. The study data indicated that perceived benefit was the only latent trait being measured by the eight items in the final scale of perceived benefit. No other latent factors were detected among items after controlling the major trait of perceived benefit, and a high score measured by the scale represented a high level of perceived benefit possessed by the participants.

All eight items' discrimination parameter values were in the acceptable range, indicated that all the items were able to distinguish participants well based on their levels of perceived benefit of new technology. The eight items' threshold parameters indicated that the final scale seemed to capture lower levels of perceived benefit well, such as participants with average levels of perceived benefit would mostly select the higher two response categories. The model fit indices (i.e., M2 statistics, $RMSEA_2$, SRMR, CFI and TLI) suggested the model replicated the observed date well, and the GRM used to calibrate the perceived benefit scale items seemed to be the right choice. An analysis of the individual item fits also showed that all eight items had good fit with the GRM.

The TIF and SEE curve indicated that the final scale was most informative for estimating perceived benefit for a range from -3 to 1. Thus, the final perceived benefit scale seemed to be more reliable to measure participants with lower than average level to slightly higher than average level of perceived benefit. Classical test of reliability also indicated the reliability of the final perceived benefit scale was acceptable. The results of DIF analysis indicated that there was no significant difference of responses when using the perceived benefit scale to measure participants with different age, gender, or from different firm types.

Convergent validity of perceived benefit scale was verified by assessing the relationship between participants' perceived benefit and their motivation to adopt new technology. The results indicated a significant positive relationship between the two variables, which were consistent with literature and further substantiated that an increasing perceived benefit of new technology would lead to an increasing motivation to adopt the new technology.

Specifically, as suggested by EVT literature, the scale of perceived benefit was constructed by attainment value, intrinsic value and utility value. The satisfaction of unidimensionality assumption indicated that all the three constructs underline a unidimensional structure of perceived benefit. Among them, one item “Adopting new technology would fit with government's suggestion or guidance” represented the attainment value perceived by participants. Following government’s guidance to adopt new technology or meeting with government’s expectancy to adopt new technology was perceived to be important, as which may lead to potential benefit given by the government or authority. Otherwise, failing meeting with the guidance may lead to potential penalty or opportunity losing. This would be particularly expected in Chinese T&A industry as government plays an important role in macroeconomic management (Yusuf, 1994). For example, Chinese government called upon energy conservation and emission reduction in the T&A industry and such new green technologies that could reduce resource use would be preferred by the Chinese T&A firms (people.cn, 2019).

Three items represented the construct of intrinsic value, focusing on end users’ feeling and enjoyment about the new technology. It was in line with Deci and Ryan (2010) that if the new technology could meet users’ psychological needs, personal curiosities and innate striving for growth, an intrinsic value driven motivation would then generate to adopt the new technology. Particularly, the three items highlighted the technology’s end users’ psychological needs (e.g., “Using new technology would make people in my firm enjoying their work” and “People in my firm would like working with new technology”), and personal curiosities and innate striving for growth (e.g., “People in my firm would think learning new technology is interesting”). These showed that participants would emphasize end users' intrinsic value when make decision on new technology adoption, and they believe that a satisfaction of intrinsic demands would contribute to the overall benefit gained by the new technology adoption.

The left four item reflected the construct of utility value. Two of them emphasized outside relationships, such as "Using new technology would enhance the relationship between my firm and its business partners" and "Using new technology would help my firm catch up with major competitors." The other two items focused on performance intra firm, such as "Using new technology would improve the quality of work" and "Using new technology would give control over work." It was worthy to note that, in this study, finical benefit, what used to play an important role in extrinsic motivation from psychology view (Deci &Ryan, 2010; Reeve, 2005), was not the priority in these utility value items. Instead, network (or relationship) and work performance were underlined. Participants pined their hope on new technology to create and maintain well relationships with business partners. This aligned with that industry practitioners' beliefs that information and data sharing and communication would be one key function of future workplace technologies, such as information sharing within the whole supply chain partners (Forbes, 2017). Moreover, this network could provide firm with real-time industry dynamic and help participants to master industry trend, which would essentially help increase their performance and eliminate gaps between competitors. In addition, the study participants considered that new technology should help human control their work and improve work quality, echoing the industry's quality concern of made-in-China products (Dusharme, 2018).

Perceived Cost

Similar with the previous two concepts, the three IRT assumptions were first assessed and established. The data suggested that perceived cost was the only latent trait being measured by the eight items in the final scale of perceived cost, and no other latent factors were represented. A high score measured by the scale represents a high level of perceived cost possessed by the participants.

All eight items' discrimination parameter values were within the acceptable range, indicated that all the items were able to distinguish participants well based on their levels of perceived cost of new technology. The eight items' threshold parameters indicated that the final scale seemed to capture -3 to +3 levels of perceived cost well. The model fit indices (i.e., M2 statistics, $RMSEA_2$, SRMR, CFI and TLI) suggested the model replicated the observed date well, and the GRM used to calibrate the perceived cost scale items seemed to be the right choice. An analysis of the individual item fits also showed that except the item "I worry that my firm would waste money if the technology will be only used for a short time" ($p = 0.044$), all the other items had good fit with the GRM. However, researchers argued that the choice of p-value for statistical significance might be arbitrary (Kaye, 1986), the item was not simply deleted. Since this item was addressed in the item bank development process by multiple content experts, and a thorough review of the item content indicated that this item was unique in capturing psychological cost, the item was kept in the perceived cost scale.

The TIF and SEE curve indicated that the final scale was to be more reliable to measure participants with -2 to +2 standard deviation than average level of perceived cost. Classical test of reliability also indicated the reliability of the final perceived cost scale was acceptable. The results of DIF analysis indicated that there was no significant difference of responses when using the perceived cost scale to measure participants with different age, gender, or from different firm types.

Convergent validity of perceived cost scale was verified by assessing the relationship between participants' perceived cost and their motivation to adopt new technology. The results indicated a significant negative relationship between the two variables, which were consistent with literature and further substantiated that an increasing perceived cost of new technology would lead to a decreasing motivation to adopt the new technology.

Specifically, as suggested by EVT literature, the scale of perceived cost was constructed by effort cost, opportunity cost and psychological cost. The satisfaction of unidimensionality assumption indicated that all the three constructs underline a unidimensional structure of perceived cost.

Four items represented the effort cost perceived by firm manager in new technology adoption. Time (e.g. "Adopting new technology would demand too much of time"), workload (e.g. "Adopting new technology means too much of work"), and money (e.g. "Adopting new technology would demand too much of money" and "It is hard to see the return in a short time when adopt new technology") were the three aspects addressed in effort cost. This was consistent with Chau and Hui's (2001) findings that cost may impede firm from adopting new technology. Thus, time, workload and money spend on adopting new technology would be treated as effort cost in the adopting process.

One item illustrated the opportunity cost that participants concerned. Time spend on adopting new technology was highlighted again as “Adopting new technology would take time away from other activities my firm wants to pursue.” This indicated a tense work schedule in current Chinese T&A firms, and also suggested that technology adoption would be a time-consuming activity in participants’ mind of view. They may be afraid of breaking existing working schedule to adopt one new technology, especially when the technology would need a long time to be digested within their firm. This might be one reason to explain why current Chinese T&A firm managers tend to stay with the old working paradigm rather than adopt a new one.

The left three items represented psychological cost that firm manager considered as mental suffering in new technology adoption. Money was mentioned again in the item “I worry that my firm would waste money if the technology will be only used for a short time.” Since earning profit is the essential goal of firm (Rumelt & Lamb, 1997), it is not hard to understand participants’ care and thought of finical investment on technology adoption. At the same time, technologies have been rapidly developed and updated, so firms have to update or renew their technology frequently. In this light, one new technology that can only be used in a short while would be considered as a waste of money. The other two items related to the pressure generated by new technology adoption, such as “I am concerned that people in my firm would not be able to handle the stress that working with new technology” and “Adopting new technology is emotionally draining.” Kiefer (2005) suggested that a negative emotions or psychological status of employees would lead to imperfect work performance and even a withdrawal from job.

Thus, it is reasonable that participants concerned about technology users' mental suffering when they decided to adopt new technology.

Contributions and Implications

The study findings have several important contributions and implications. First, the study created reliable and valid scales for measuring Chinese T&A firm managers' expectancy, perceived value and perceived cost of new technology, filling a critical gap in the literature. Though the EVT framework has been broadly used in behavioral research in the domain of education, employment, economics and marketing, the three concepts drawn from EVT have had limited research in firm managers' decision making in technology adoption. At the same time, even a few scales, such as relative advantage and complexity from technology adoption literature, were considered to have the potential to measure motivation factors that may influence firm managers' motivation to adopt new technology; however, these scales' explanatory power was questionable when facing with various organizational and technological contexts (Baker, 2012; Zmud, 1982). In addition, these existing scales did not show clear and identical constructs when being used in different research, suggesting a lack of clarity and consensus in the understanding of motivation factors in technology adoption.

In this research, the three scales for measuring firm managers' expectancy, perceived value and perceived cost of new technology were generated within a qualitative item generation process and a quantitative psychometric property evaluation process, following the suggestion of IRT framework. No specific technology was assigned in these processes, and the test-fairness assessment suggested that firm type and firm size have limited impacts on all scales' measurement abilities. Moreover, the internal structure of each scale was identified and verified, as efficacy expectancy and outcome expectancy in expectancy, attainment value, intrinsic value and utility value in perceived benefit, and effort cost, opportunity cost and psychological cost in perceived cost. Thus, the three scales were deemed to be reliable, valid, and comprehensive and to have some consistent measurement abilities in measuring Chinese T&A firm managers' expectancy, perceived benefit and perceived cost of new technology when faced with various organizational and technological contexts.

Second, the three scales would help research Chinese T&A firm managers' motivation to adopt new technology. Currently, most research focusing on new technology adoption in China's T&A industry concentrate on arousing the awareness and need for new technology, while limiting the study of firm managers' motivation to adopt new technology and its relevant influential factors. Without knowing these, it would be hard for academics, industry and policy makers to fully understand T&A firms' willingness and capacity to adopt new technology. Guided by the framework of EVT, the finding of this research suggests that Chinese T&A firm managers' expectancy and perceived benefit of new technology have a positive correlation with their motivation to adopt new technology, while their perceived cost of new technology has a negative correlation with their motivation. Thus, firm managers' expectancy, perceived benefit and perceived cost would be used as three key antecedents to research their motivation to adopt new technology. Lensed with these three concepts and their items, how to increase firm mangers' expectancy and perceived benefit of new technology, and how to decrease firm managers' perceived cost of new technology would inspire the new technology adoption motivation research.

In further step, the three scales would have the potential to gauge the difference of firm managers' motivation to adopt new technology between western and eastern, or developed and developing countries, or among various industries. Scales developed in this research were created and tested in the context of Chinese T&A industry, which may reflect the reality within a circumstance of eastern, developing country and the T&A industry. For example, the item "People in my firm would coordinate their efforts to adopt new technology" and "People in my firm would work together in adopting new technology" may represent the thinking of collectivism which dominates eastern societies. However, since individualism is admired in western societies, these two items may have different measurement ability in a western society context. Exploring the difference may help us gain insight of the social structure's impact on motivation to adopt new technology. Likewise, items in the three scales represented the T&A firm managers' perception of adopting new technology, and it may be different with the firm managers' perception in other industries. Thus, the three scales would have the potential to measure the difference in factors that could influence firm managers' motivation to adopt new technology.

Third, the research supports the usefulness of IRT and provides new thinking for scale development in technology adoption literature. Being different with traditional factor analysis that was broadly used in previous technology adoption literature (Davis, 1989), IRT can provide a clear picture of the performance of each item in the scale and how the scale functions overall for measuring the latent trait, as well as make scale items and their parameters invariant of the population (Edelen & Reeve, 2007; Foster, Min, & Zickar, 2017). Guided by the framework of IRT, this research conceptualized, generated, and scored Chinese T&A firm managers' expectancy, perceived benefit and perceived cost of new technology. As recommended by IRT researchers, a series of qualitative item bank development process and a quantitative psychometric property assessment process worked together in this research, to help gain the validity of measures and to avoid over-reliance on statistical approaches (Revicki et al., 2014). Therefore, the three scales developed in this research are deemed to be robust and maintain methodological and social objectivity (Fisher, 2000).

In addition, since IRT can provide a clear picture of each item's performance for measuring certain latent trait, it would be possible to gain insight of items' measurement ability based on IRT analysis. For example, the IIF analysis of this study suggested that the scale of expectancy would be more reliable to test participants' expectancy of new technology at the range of 4 standard deviation below to 1 standard deviation above average expectancy. This indicated that the scale would have a better measurement capacity when being used to test Chinese firm managers who have a low expectancy of new technology. Likewise, reliability test of perceived benefit scale also indicated the scale would be more suitable to test Chinese firm managers who have a low perceived benefit of new technology. In another words, the scales would not be appropriate to assess subjects who have high expectancy and perceived benefit. Because China's T&A industry is still at the infant stage for new technology upgrading and the firm managers' expectancy and perceived benefit of new technology were deemed to be low, the measurement capacity of these scales were desired and expected. However, a classical and traditional factor analysis method would not have provided such information to researcher for recognizing each item's measurement capacity. This is another reason why IRT might be a more appropriate tool to develop scales of constructs, such as expectancy, perceived benefits, and perceived costs.

Forth, items in each scale provide a holistic view of firm managers' concerns in the decide-making process of new technology adoption, which would guide industry upgrades in China. Key points that were addressed in these scales, such as employees' competency (e.g., "People in my firm would understand the knowledge of new technology") and managers' vision (e.g., "My firm has managers who have vision to adopt new technology"), would benefit Chinese T&A firm managers' awareness of the requirements of adopting new technology and help them detect if their firm is ready to adopt new technology. The Chinese T&A firm managers may use these items as reference to adjust their management strategies and improve firm's readiness for potential new technology adoption.

Items in the scales could also benefit employees prepare for future new technology adoption in their workplace. Implied by the items, for example, firm managers would ask if their employees possess relevant knowledge about new technology (e.g., "People in my firm would understand the knowledge of new technology"), collaborative working ability toward new technology (e.g., "People in my firm would coordinate their efforts to adopt new technology"), and anti-pressure working ability (e.g., "I am concerned that people in my firm would not be able to handle the stress of working with new technology") when working with new technology. Thus, in order to succeed in a new technology working environment, employees may need to be open-minded and proactive with learning how to effectively and collaboratively use the targeted new technology.

Items in the scales could also provide insight of firm managers' needs for new technology to technology providers. For example, according to the items, firm managers want the new technology to be compatible with the existing working environment (e.g., "I am confident that new technology would be compatible with the existing working environment in my firm"), fitting with government's guidance (e.g., "Adopting new technology would fit with government's suggestion or guidance"), being user friendly (e.g., "People in my firm would like working with new technology"), and requiring less resource usage (e.g., "Adopting new technology demands too much time/money"). Thus, in order to promote new technology distribution, technology providers may need to address these concerns in the technology development process and try to meet firm managers' needs. In addition, firm managers showed their interest in the new technology's function of improving work quality (e.g., "Using new technology would improve the quality of work"), enhancing job control (e.g., "Using new technology would give control over work") and business network building (e.g., "Using new technology would enhance the relationship between my firm and its business partners"). Thus, technology providers may need to consider or add these functions in their new technology product.

Items in the scales could help government make precise policies or plans to promote new technology adoption in Chinese T&A industry and hasten industrial upgrade processes. For example, financial resources and human resources were highlighted in firm managers' concerns about new technology adoption. With this evidence, government may be able to make pointed and precise policies to relieve T&A firms' financial burden and shortage of qualified new technology users, such as reducing or remitting taxes for new technology adopters and offering public service or training programs to unskilled industry workers.

Finally, this research would guide education to prepare a future workforce adequate for a new technology environment. Employees would be required to at least understand the knowledge of new technology from the managers' perspective. Thus, educational institutions may need to add relevant support courses in their curriculum, such as digital data analysis class for offering student background knowledge of big data techniques and training them to become familiar with relevant digital data analysis tools. In addition, employers would be expected to have a vision of new technology. Thus, to help students grow to be qualified firm managers in future, courses such as introducing students to the trend of technology development and usage in industry would be necessary. As suggested by the items, other courses or training programs, such as developing students' collaborative working ability and anti-pressure working ability with new technologies, may also benefit students in quickly adapting to working with new technology and help them succeed in their future careers.

Limitations and Future Research

The study has certain limitations related to external validity, discriminant validity, test-retest reliability, and identified DIF items. First, the study developed scales within the context of Chinese T&A firm managers. This may lead to an external validity concern for generalizing these scales into other countries or non-T&A industries. Even though the scales could be used to measure the difference in factors that may influence motivation to adopt new technology between China and the other countries, or T&A industry and other industries, directly applying the scales to measure non-Chinese or non-T&A firm managers' perception of new technology would be arbitrary. Future new technology adoption research involving firm managers from other countries or industries should redo the item development process and psychometric evaluation process within corresponding research contexts.

In addition, it is worthy to note that scale items developed in this research were tested only in Chinese. Even though the initial items were generated from literature in English, the items were translated into Chinese for Chinese firm managers' easy understanding, and the following item revision was based on Chinese version item. English version final scales were reported in this study for English-speaking readers' understanding; however, adopting these English version items to test participants in English-speaking environment should be done with caution. Potential meaning changes or dropping from items may happen in the translation process, which may reduce validity of the three scales. Using full English items through all research procedures (i.e., item bank development and psychometrical property evaluation) would be recommended for future research, to develop English version scales of firm managers' expectancy, perceived benefit and perceived cost of new technology.

Second, in this research, only convergent validity was verified by testing the correlation between the three new developed scales and the concept of motivation. However, discriminant validity is also required for providing solid evidence of construct validity of the three scales. Researchers suggested that convergent validity and discriminant validity were two subtype of construct validity (Wang, French, & Clay, 2015). When convergent validity represents the degree that new variable is related with the concept that it is theoretically correlated with, discriminant validity reflects the degree that the new variable is not related and exists as unique different entities with the concept that it is theoretically distinct from. Thus, future research could test the relationship between the three scales and the variable that may not be theoretically correlated (e.g. attitude towards new technology). Confirmatory factor analysis (CFA) could be used to check if the compared two variables are suggested as being separated, and the variables' correlations could also be assessed for providing supplement evidence.

Third, a test-retest reliability was not assessed in this research. Test-retest reliability refers to the degree to which test results are consistent over time (Weir, 2005). It is assessed by administering the scale twice or more over a period of time and analyzing the correlation between the scores, representing the stability of the scale. In this research, Chinese T&A firm managers' expectancy, perceived benefit and perceived cost of new technology were assessed before the adoption decision was made. While, a longitudinal research that retests scales' psychometric properties with the same participants, especially after the new technology was adopted in their firm, could help detect the changes of firm managers' beliefs before and after the technology was adopted. This may provide evidence to verify the reliability and psychometric properties of the three scales.

Lastly, identified DIF items need future research. There was 1 item (E17) in the scale of firm managers' expectancy of new technology found to have DIF conditions and bias towards groups of participants from different ownerships of firms (i.e., private owned firm and foreign joint firm), 2 items (B24 and B29) in the scale of perceived benefit of new technology found to have DIF conditions and bias towards groups of participants from different ownerships of firms (i.e., private owned and stated owned firm), and 1 item (C8) in the scale of firm managers' perceived cost of new technology found to have DIF conditions and bias towards groups of participants based on their gender. Even though the statistical results suggested that expected impact of DIF items on participants' response score was negligible when weighted by group's trait distribution, these items may still have bias toward the different groups and demography characteristics in population. Thus, future DIF research could be conducted to verify the need to remove such items from the scales, which may help ameliorate applicability of the scales.

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APPENDIX A

INITIAL ITEM GENERATION

FOR EXPECTANCY, PERCEIVED BENEFIT AND PERCEIVED COST OF NEW TECHNOLOGY

Initial Item Generated for Expectancy of New Technology

Concept	Source		Items	Reported Reliability	Action taken	
Efficacy Expectancy	Items from EVT	Eccles and Harold (1991)	1. How good are you at sports? (not at all good-very good)	greater than .70	Adapted/ Translated	1. My firm is good at using new technology. /我公司擅长使用这一新技术.
			2. How good are you at sports compared to other subjects? (not at all good-very good)		Adapted/ Translated	2. My firm is good at using new technology compared to other technologies. /相比于其他技术，我公司更擅长于使用这一新技术.
			3. How good are you at sports compared to other children? (much worse than other children-much better than other children)		Adapted/ Translated	3. My firm is good at using new technology compared to other firms. /相比于其他公司，我公司更擅长于使用这一新技术.
			4. How well do you expect to do in sports in the future? (not at all well-very well)		Adapted/ Translated	4. I expect that My firm would do well in using new technology in the future. /我认为我公司将来会对这一新技术使用的很好
		Eccles and Wigfield (1995)	1. Compared to other students, how well do you expect to do in math this year? (much worse than other students, much better than other students)	α = 0.92	Adapted/ Translated	1. Compared to other firms, my firm does well in using new technology this year. /相比于其他公司，我公司今年更擅长于使用这一新技术
			2. How well do you think you will do in your math course this year? (very poorly, very well)		Adapted/ Translated	2. My firm would do well in using new technology this year. /我公司今年将会很好地使用这一新技术
			3. How good at math are you? (not at all good, very good)		Adapted/ Translated	3. My firm is good at using new technology. /我公司擅长使用这一新技术
			4. If you were to order all the students in your math class from the worst to the best in math, where would you put yourself? (the worst, the best)		Adapted/ Translated	4. My firm performs well at using new technology compared to other firms. /相比于其他公司，我公司更擅长使用这一新技术
			5. How have you been doing in math this year? (very poorly, very well)		Adapted/ Translated	5. My firm has been doing well in using new technology this year. /我公司一直对这一新技术使用的很好
		Miller, Behrens, Greene, and Newman (1993)	1. My statistical skills are better than those of other students in this class.	α = 0.88	Adapted/ Translated	1. My firm is better than the other firms in using new technology. /相比于其他公司，我公司更擅长使用这一新技术
			2. I am not very good in mathematics.		Adapted/ Translated	2. My firm is not very good at using new technology. /我公司不擅长使用这一新技术

Initial Item Generated for Expectancy of New Technology from Literature (Continued)

Concept		Source	Items	Reported Reliability	Action taken	
Efficacy Expectancy	Items from EVT		3. Compared with other students in this class I don't know very much about the subject.	α = 0.88	Adapted/ Translated	3. Compared with other firms, my firm doesn't know very much about new technology. /相比于其他公司，我公司对这一新技术并不太了解
		Miller, Behrens, Greene, and Newman (1993)	4. I understood the ideas taught in this course.	α = 0.88	Adapted/ Translated	4. My firm understands the idea used in new technology. /我公司了解这一新技术所使用的方法与概念
			5. I have limited understanding of the concepts in this class.		Adapted/ Translated	5. My firm has limited understanding of the concept in new technology. /我公司对这一新技术的了解有限
			6. I did well in this class.		Adapted/ Translated	6. My firm did well in using new technology. /我公司过去能够很好地使用新技术
			7. Compared with other students in this class I think I did well.		Adapted/ Translated	7. Compared to other firms, my firm does well in using new technology this year. /相比于其他公司，我公司能够更好的使用这一新技术
			8. My knowledge of the statistics in this class is pretty weak.		Adapted/ Translated	8. My firm has a weak knowledge of new technology. /我公司对关于这一新技术的知识掌握有限
			9. If I were to take another statistics course, I'm sure I would do well.		Adapted/ Translated	9. If my firm is to adopt a new technology, I am sure it would do well. /如果我公司要采纳这一新技术，我认为它能采纳地很好
		Maddux, Norton, and Stoltenberg (1986)	1. I believe I could learn how to use the broken-record technique	α = 0.68	Adapted/ Translated	1. I believe my firm could learn how to use new technology. /我相信我公司能够学习怎么使用这一新技术
			2. The broken-record technique would be difficult for me to learn		Adapted/ Translated	2. New technology would be difficult for my firm to learn. /学习使用这一新技术对我公司来说是困难的
			3. The next time someone tries to talk me into something I don't want to do, I believe I could use the broken record technique if I wanted to		Adapted/ Translated	3. My firm can use new technology if it wants to. /如果它想的话，我公司能够使用这一新技术
		Riggs, Warka, Babasa, Betancourt, and Hooker (1994)	1. The department I work with has above average ability.	α = 0.88	Adapted/ Translated	1. My firm has above average ability to use new technology. /我公司具有超出行业平均水平的能力去使用这一新技术

Initial Item Generated for Expectancy of New Technology from Literature (Continued)

Concept	Source		Items	Reported Reliability	Action taken	
Efficacy Expectancy	Items from EVT	Riggs, Warka, Babasa, Betancourt, and Hooker (1994)	2. This department is poor compared to other departments doing similar work.	α = 0.88	Adapted/ Translated	2. My firm is poor compared to other firms using new technologies. /相比于其他公司，我公司对于新技术的使用表现并不好
			3. This department is not able to perform as well as it should.		Adapted/ Translated	3. My firm is not able to perform as well as it should when using new technology. /对于使用这一新技术，我公司不能表现出它的正常水平
			4. The members of this department have excellent job skills.		Adapted/ Translated	4. Members in my firms have excellent skills of using new technology. /我公司的人员具有良好的技能去使用这一新技术
			5. Some members of this department should be fired due to lack of ability.		Adapted/ Translated	5. Some members in my firm are lack of ability to use new technology. /我公司的一些人员缺少使用这一新技术的能力
			6. This department is not very effective.		Adapted/ Translated	6. My firm is not effective in using new technology. /我公司不能有效地使用这一新技术
			7. Some members in this department cannot do their jobs well.		Adapted/ Translated	7. Some members in my firm cannot use new technology well. /我公司的一些人员不能很好的使用这一新技术
		Bohn (2010)	1. People in this organization can take on any challenge	α = 0.94	Adapted/ Translated	1. Members in my firm can take on any challenge when adopt new technologies. /我公司的人员能够承担采纳这一新技术所带来的的挑战
			2. This organization can beat our competition.		Adapted/ Translated	2. My firm can beat our competitors to adopt new technology. /我公司能够击败竞争公司来采纳这一新技术
			3. This organization is far more innovative than most organizations.		Adapted/ Translated	3. My firm is far more innovative than most firms. /我公司要比其他公司更有创新性
			4. In this organization, we coordinate our efforts to complete difficult projects		Adapted/ Translated	4. In my firm we coordinate our efforts to adopt new technology. /我公司人员能够整合各自的精力与体力去采纳这一新技术
			5. People in this organization can work together to accomplish a goal.		Adapted/ Translated	5. Members in my firm can work together to adopt new technology. /我公司人员能够合作去采纳这一新技术
			6. People in this organization can mobilize efforts to accomplish difficult and complex goals.		Adapted/ Translated	6. Members in my firm can mobilize efforts to adopt new technology. /我公司人员能够动员起来去采纳这一新技术

Initial Item Generated for Expectancy of New Technology from Literature (Continued)

Concept	Source		Items	Reported Reliability	Action taken	
Efficacy Expectancy	Items from EVT	Bohn (2010)	7. In this organization, everyone works together very effectively.	α = 0.94	Adapted/ Translated	7. In my firm, everyone works together very effectively in adopting new technology. /我公司人员能够有效地合作去采纳这一新技术
			8. This organization can meet customer requirements because the employees are extremely competent.		Adapted/ Translated	8. Members in my firm are competent enough to meet new technology's requirements. /对于这一新技术的要求，我公司人员是称职的
			9. People here have a sense of purpose.		Adapted/ Translated	9. Members in my firm have a sense of purpose to adopt new technology. /采纳这一新技术是我公司人员的目标
			10.This organization has a strong vision of the future.		Adapted/ Translated	10. My firm has a strong vision of adopting new technology. /我公司有强烈的愿景去采纳这一新技术
			11. This organization is confident about its future.		Adapted/ Translated	11. My firm is confident about adopting new technology. /我公司有信心来采纳这一新技术
			12. This company will double in size in the next 10 years.		Deleted	
			13. During an economic downturn, this organization will come out strong.		Deleted	
			14. This organization is likely to fall apart in a few years.		Deleted	
			15. This organization has no hope of surviving more than a year or two.		Deleted	
			16. I would be surprised if this organization exists in 5 years.		Deleted	
			17. Because this organization is likely to fail, I would never recommend that a friend work here.		Deleted	
	Items from DOI	Moore and Benbasat (1991)	1. I would have no difficulty telling others about the results of using a PWS	α = 0.77	Adapted/ Translated	1. I would have no difficulty telling others about the results of using new technology. /对我而言，向其他人描述使用这一新技术所带来的结果是没有困难的
			2. I believe I could communicate to others the consequences of using a PWS		Adapted/ Translated	2. I believe I could communicate to others the consequences of using new technology. /我相信我能够向其他人描述使用这一新技术所带来的结果

Initial Item Generated for Expectancy of New Technology from Literature (Continued)

Concept	Source		Items	Reported Reliability	Action taken	
Efficacy Expectancy	Items from DOI	Moore and Benbasat (1991)	3. The results of using a PWS are apparent to me	α = 0.77	Adapted/ Translated	3. The results of using new technology are apparent to me. / 使用这一新技术所带来的结果对我来说是显而易见的
			4. I would have difficulty explaining why using a PWS may or may not be beneficial		Adapted/ Translated	4. I would have difficulty explaining why using new technology may or may not be beneficial. /对我而言，解释为什么使用这一新技术是有益的或有害的是困难的
Outcome Expectancy	Items from EVT	Feather and Davenport (1981)	1. How confident are you of getting a job in the near future? (not at all confident/very confident)	not reported	Adapted/ Translated	1. I am confident that new technology will do well in my firm in the near future. /我有信心这一新技术将在我公司运作的很好
			2. What would you say your chances were of getting a job, compared with other people of your age who are unemployed? (much less/much more)		Adapted/ Translated	2. Compared to other firms, new technology would do well in my firm. /和其他公司相比，这一新技术将在我公司运作的很好
			3. How confident were you of getting a job when you first left school? (not at all confident/very confident)		Adapted/ Translated	3. I am confident that new technology would do well in my firm after we adopt it. /我有信心在我公司采纳了这一新技术之后，这一新技术将在我公司运作的很好
		Vansteenkiste, Lens, De Witte, and Feather (2005)	1. I am optimistic about finding a job in the near future.	α = 0.60	Adapted/ Translated	1. I am optimistic that new technology would work well in my firm. /对于这一新技术将可以在我公司运作的很好，我很乐观
			2. I don’t expect to find a job in the near future.		Adapted/ Translated	2. I don’t expect that new technology would work well in my firm. /我并不期待这一新技术能在我公司运作的很好
			3. I have been rejected so many times during application interviews that I don’t expect to find a job any longer.		Adapted/ Translated	3. My firm has failed to adopt new technology, so I don't expect (the) new technology would work well. /我公司曾经在采纳这一新技术上失败过，因此我并不期待（这一）这一新技术能在我公司运作的很好

Initial Item Generated for Expectancy of New Technology from Literature (Continued)

Concept	Source		Items	Reported Reliability	Action taken	
Outcome Expectancy	Items from EVT	Maddux, Norton, and Stoltenberg (1986)	1. For those who can use it, the broken-record technique is a very effective way to avoid giving in to other people	α = 0.78	Adapted/ Translated	1. New technology is an effective way to meet my firm's need once we adopt it. /在我们采纳了这一新技术之后，这一新技术能够有效的满足我公司的需求
			2. If I were able to use the broken-record technique, it would be much harder for other people to take advantage of me		Adapted/ Translated	2. If my firm is able to adopt new technology, it would be much harder for other firms to compete with us. /如果我公司采纳了这一新技术，其他公司将很难与我们竞争
	Items from DOI	Moore and Benbasat (1991)	1. Using a Personal Work Stations (PWS) is compatible with all aspects of my work	α = 0.84	Adapted/ Translated	1. Using new technology is compatible with all aspects of my firm. /使用这一新技术与我公司的各个方面都兼容
			2. Using a PWS is completely compatible with my current situation		Adapted/ Translated	2. Using new technology is completely compatible with my firm's current situation. /使用这一新技术与我公司目前的状况兼容
			3. I think that using a PWS fits well with the way I like to work		Adapted/ Translated	3. I think that using new technology fits well with the way my firm likes to work. /我认为使用这一新技术符合我公司所喜欢的工作方式
			4. Using a PWS fits into my work style		Adapted/ Translated	4. Using new technology fits into my firm's work style. /使用这一新技术符合我公司的工作方式

Initial Item Generated for Perceived Benefit of New Technology

Concept	Source		Items	Reported Reliability	Action taken	
Attainment Value	Items from EVT	Eccles and Wigfield (1995)	1. Is the amount of effort it will take to do well in advanced high school math courses worthwhile to you? (not very worthwhile, very worthwhile)	α = 0.70	Adapted/ Translated	1. The amount of effort it will take to adopt new technology would be worthwhile to my firm. /为了采纳这一新技术而付出的所有努力都是值得的.
			2. I feel that, to me, being good at solving problems which involve math or reasoning mathematically is (not at all important, very important)		Adapted/ Translated	2. Being good at solving problems which involve using new technology is important to my firm. /能够使用这一新技术解决公司遇到的问题，对公司来说是十分重要的.
			3. How important is it to you to get good grades in math?” (not at all important, very important)		Adapted/ Translated	3. Successfully adopting new technology is important to my firm. /成功地采纳这一新技术对公司来说是十分重要的.
		Battle and Wigfield (2003)	1. I would be very upset if I was not able to go to graduate school.	α = 0.88	Adapted/ Translated	1. I would be upset if my firm is not able to be good at new technology. /我会很伤心如果我公司不能擅长这一新技术.
			2. I feel that attending graduate school is a necessary part of what will make me feel good about myself in the future.		Adapted/ Translated	2. I feel that adopting new technology is a necessary part of making my firm to be good in the future. /我认为采纳这一新技术对我公司能够在未来变得更好是十分必要的.
			3. A graduate education is of great personal value to me.		Adapted/ Translated	3. Using new technology is of great value to my firm. /使用这一新技术对我公司具有巨大的价值.
			4. I feel that I have something to prove to myself by going to graduate school.		Adapted/ Translated	4. I feel that adopting new technology would let my firm to prove something. /我认为通过采纳这一新技术能够让我公司证明一些事情.
			5. I value the prestige that comes with a graduate diploma.		Adapted/ Translated	5. I value the prestige that my firm can enjoy which comes with adopting new technology. /我很重视采纳这一新技术所带给我公司的威望.
		Trautwein et al. (2012)	1. I am really keen to learn a lot in mathematics/English.	no α reported (greater than .75 for the whole value scale used in the research	Adapted/ Translated	1. My firm is keen to learn a lot in new technology. /我公司渴望学习这一新技术.
			2. Mathematics/English is important to me personally.		Adapted/ Translated	2. New technology is important to my firm. /这一新技术对我公司是很重要的.

Initial Item Generated for Perceived Benefit of New Technology from Literature (Continued)

Con cept	Source		Items	Reported Reliability	Action taken	
Attainment Value			3. It is important to me personally to be a good mathematician/good at English.		Adapted/ Translated	3. It is important to my firm to be good at using new technology. / 我公司能够擅长使用这一新技术是十分重要的.
	Items from DOI	Moore and Benbasat (1991)	1. Using a PWS improves my image within the organization	α = 0.80	Adapted/ Translated	1. Using new technology would improve my firm's image in the industry. /使用这一新技术能够提升我公司在行业中的形象.
			2. People in my organization who use a PWS have more prestige than those who do not		Adapted/ Translated	2. Firms adopt new technology would have more prestige than those who do not. /采纳这一新技术的公司会比那些没采纳的公司拥有更多的威望.
			3. People in my organization who use a PWS have a high profile		Adapted/ Translated	3. Using new technology would give my firm a high profile. /采纳这一新技术让我公司更加引人注目.
			4. Having a PWS is a status symbol in my organization		Adapted/ Translated	4. Using new technology is a status symbol for my firm. /使用这一新技术对我公司来说是一种身份的象征.
Intrinsic Value	Items from EVT	Eccles and Wigfield (1995)	1. In general, I find working on math assignments (very boring, very interesting)	α = 0.76	Adapted/ Translated	1. I think working with new technology in my firm is very interesting. /我认为在我公司使用这一新技术进行工作是十分有趣的.
			2. How much do you like doing math? (not very much, very much)		Adapted/ Translated	2. I like working with new technology in my firm. /我喜欢我公司能够使用这一新技术.
		Battle and Wigfield (2003)	1. I find the idea of being a graduate student to be very appealing.	α = 0.96	Adapted/ Translated	1. I find the idea of being new technology user to be very appealing. /我发现成为这一新技术的使用者是十分吸引人的.
			2. It is exciting to think about the challenge of graduate-level schoolwork.		Adapted/ Translated	2. It is exciting to think about the challenge of adopting new technology in my firm. /考虑采纳这一新技术所带来的挑战是一件令人激动的事情.
			3. I am excited about the idea of gong to graduate school.		Adapted/ Translated	3. I am excited about the idea of adopting new technology in my firm. /对于我公司采纳这一新技术这一事情，我很激动.
			4. I look forward to taking graduate school classes from professors who are experts in their field.		Adapted/ Translated	4. I am look forward that my firm can use new technology. /我渴望我公司能够使用这一新技术.
			5. I like the idea of attending stimulating lectures in graduate school.		Delete	

Initial Item Generated for Perceived Benefit of New Technology from Literature (Continued)

Concept	Source		Items	Reported Reliability	Action taken	
Intrinsic Value	Items from EVT	Battle and Wigfield (2003)	6. I would welcome the challenge of doing the work to get good grades in graduate school.	α = 0.96	Adapted/ Translated	5. I would welcome the challenge of doing the work to successfully adopt new technology in my firm. /我会欢迎我公司采纳这一新技术所带来的挑战.
			7. I like the idea of writing a graduate-level paper on a topic of special interest to me.		Delete	
			8. I look forward to advancing my knowledge by exploring new and challenging ideas in graduate school.		Adapted/ Translated	6. I look forward to advancing my knowledge by exploring new and challenging ideas in new technology. 我期待能在探索这一新技术的过程中拓展我的知识.
		Trautwein et al. (2012)	1. I enjoy puzzling over mathematics/English problems.	no α reported (greater than .75 for the whole value scale used in the research	Adapted/ Translated	1. I enjoy overcoming the challenges to adopt new technology in my firm. /我享受在我公司采纳这一新技术时克服困难的过程.
			2. I would like to have more mathematics/English lessons.		Adapted/ Translated	2. I would like my firm to adopt more new technologies. /我希望我公司能采纳更多的新的技术.
			3. When I'm working on a mathematics/English problem, I sometimes don't notice time passing.		Delete	
			4. I always look forward to mathematics/English lessons.		Adapted/ Translated	3. I always look forward to new technology. /我总是期待着这一新技术.
			5. If I can learn something new in mathematics/English, I'm prepared to use my free time to do so.		Delete	
		Feather and Davenport (1981)	1. Should a job mean more to a person than just money? (not at all/yes, definitely)	no α reported	Adapted/ Translated	1. Adopting new technology means more than just money to my firm. /采纳这一新技术对我公司而言将不仅仅只是金钱上的收获.
			2. Does most of the satisfaction in a person's life come from his work? (definitely not/yes, definitely)		Adapted/ Translated	2. I am satisfied if my firm can adopt new technology. /我很满意如果我公司能够采纳这一新技术.
			3. How much should people be interested in their work? (no need to be interested/people should be very interested)		Adapted/ Translated	3. I am interested in adopting new technology in my firm. /对于我公司采纳这一新技术，我对此很感兴趣.

Initial Item Generated for Perceived Benefit of New Technology from Literature (Continued)

Concept	Source		Items	Reported Reliability	Action taken	
Intrinsic Value	Items from EVT	Miller et al. (1993)	1. Working with statistics was personally satisfying	α = 0.86	Adapted/ Translated	1. Using new technology in my firm is satisfying. /我公司能够使用这一新技术，是令人满意的事情.
			2. I found working with statistics enjoyable		Adapted/ Translated	2. Working with new technology is enjoyable. /使用这一新技术是一件让人享受的事情.
			3. I found learning statistics interesting		Adapted/ Translated	3. Learning new technology is interesting. /学习这一新技术是令人感兴趣的事情.
			4. Learning statistics does not hold my interest		Adapted/ Translated	4. Learning new technology does not hold my interest. /学习这一新技术并不能让我感兴趣.
Utility Value		Eccles and Wigfield (1995)	1. How useful is learning advanced high school math for what you want to do after you graduate and go to work? (not very useful, very useful)	α = 0.62	Adapted/ Translated	1. Using new technology is useful for what my firm wants to do. /使用这一新技术能都让我公司做它想做的事情.
			2. How useful is what you learn in advanced high school math for your daily life outside school? (not at all useful, very useful)		Delete	
		Battle and Wigfield (2003)	1. I don't think a graduate degree will be very useful for what I want to do in the future.	α = 0.76	Adapted/ Translated	1. I do not think new technology would be useful for what my firm want to do in the future. /我并不认为采纳这一新技术能让我公司做它想做的事情.
			2. I want to get a graduate degree so that I can support myself.		Delete	
			3. I want to get a graduate degree so that I can support my children, if necessary.		Delete	
			1. Reason for attending graduate school is I will make more money.	each question has more than 44% chosen	Adapted/ Translated	1. Using new technology would make financial gains for my firm. /使用这一新技术能够为我公司带来经济收益.
			2. Reason for attending graduate school is I will enjoy the status of having the degree.		Adapted/ Translated	2. Using new technology would give my firm an enjoyable status. /使用这一新技术能够为我公司带来令人满意的地位.
			3. reason for attending graduate school is I will get a more prestigious job.		Adapted/ Translated	3. Using new technology would make my firm to be prestigious. /使用这一新技术能够让我公司具有威望.

Initial Item Generated for Perceived Benefit of New Technology from Literature (Continued)

Concept	Source		Items	Reported Reliability	Action taken	
Utility Value	Items from EVT	Battle and Wigfield (2003)	4. Reason for attending graduate school is I will have more job opportunities.	each question has more than 44% chosen	Adapted/ Translated	4. Using new technology would give my firm more opportunities in business. /使用这一新技术能够让我公司获得更多的市场机会.
			5. Reason for attending graduate school is I will be better able to support myself/my family.		Delete	
			6. Reason for attending graduate school is I will be a better provider for my children.		Delete	
			7. Reason for attending graduate school is I can't do what I want to do in my professional life without a graduate degree.		Delete	
			8. Reason for attending graduate school is an undergraduate degree in my field is practically useless.		Adapted/ Translated	5. Current technologies used in my firm are useless. /目前我公司所使用的技术是无用的.
		Wiklund, Davidsson, and Delmar (2003)	1. Would the small business manager have to work more or less hours?	α = 0.72	Adapted/ Translated	1. Using new technology would make managers in my firm being able to spend less time on their work. /使用这一新技术能够让公司管理者减少工作时间.
			2. Would he or she be able to spend more or less time on favored work tasks?		Adapted/ Translated	2. Using new technology would make employees in my firm being able to spend less time on their work task. /使用这一新技术能够让公司员工者减少工作时间.
			3. Would employees enjoy work more or less? (The original Swedish word for wellbeing connotes work atmosphere as well.)		Adapted/ Translated	3. Using new technology would make members in my firm enjoying their work. /使用这一新技术能够让公司人员享受他们的工作.
			4. Would the small business manager's income and other disposable economic benefits increase or decrease?		Adapted/ Translated	4. Using new technology would bring economic benefit for my firm. /使用这一新技术能够为公司带来经济利益.
			5. Would his or her ability to survey and control operations increase or decrease?		Adapted/ Translated	5. Using new technology would increase members' ability to control firm's operation. /使用这一新技术能够增强公司人员掌控公司运营的能力.

Initial Item Generated for Perceived Benefit of New Technology from Literature (Continued)

Concept	Source		Items	Reported Reliability	Action taken	
Utility Value	Items from EVT	Wiklund, Davidsson, and Delmar (2003)	6. Would the firm's independence in relation to customers, suppliers, and lenders increase or decrease?	α = 0.72	Adapted/ Translated	6. Using new technology would enhance the relationship between my firm and its customers and suppliers. /使用这一新技术能够增进公司与消费者和供应商的关系.
			7. Would it be easier or harder for the firm to survive a severe crisis?		Adapted/ Translated	7. Using new technology would make my firm to be easy to survive a severe crisis. /使用这一新技术能够让公司在危机中更容易生存.
			8. Would it be easier or harder for the firm to maintain the quality of products and services?		Adapted/ Translated	8. Using new technology would make my firm to be easy to maintain the quality of products and services. /使用这一新技术能够让公司更容易保持产品与服务的质量.
	Items from DOI	Moore and Benbasat (1991)	1. Using a Personal Work Stations (PWS) enables me to accomplish tasks more quickly	α = 0.93	Adapted/ Translated	1. Using new technology would enable my firm to accomplish tasks more quickly. /使用这一新技术能够让公司更快的完成工作任务.
			2. Using a PWS improves the quality of work I do		Adapted/ Translated	2. Using new technology would improve the quality of work. /使用这一新技术能够提升工作质量.
			3. Using a PWS makes it easier to do my job		Adapted/ Translated	3. Using new technology would make jobs easy. /使用这一新技术能够让工作变得更容易.
			4. Using a PWS improves my job performance		Adapted/ Translated	4. Using new technology would improve job performance. /使用这一新技术能够提升工作的表现.
			5. Overall, I find using a PWS to be advantageous in my job		Adapted/ Translated	5. Using new technology is advantage in my firm. /使用这一新技术是我公司的一项优势.
			6. Using a PWS enhances my effectiveness on the job		Adapted/ Translated	6. Using new technology would enhance job effectiveness. /使用这一新技术能够增强工作的有效性.
			7. Using a PWS gives me greater control over my work		Adapted/ Translated	7. Using new technology would give great control over work. /使用这一新技术能够提高对工作的控制力.
			8. Using a PWS increases my productivity		Adapted/ Translated	8. Using new technology would increase my firm's productivity. /使用这一新技术能够增强公司的生产力.

Initial Item Generated for Perceived Benefit of New Technology from Literature (Continued)

Concept	Source		Items	Reported Reliability	Action taken	
Utility Value	Items from DOI	Hsu et al. (2006)	1. To expand market for existing product/services	α = 0.77	Adapted/ Translated	1. Using new technology would expand market for existing product/services. /使用这一新技术能够扩大现有产品或服务的市场.
			2. To enter new businesses or markets		Adapted/ Translated	2. Using new technology would help my firm enter new businesses or markets. /使用这一新技术能够帮助公司进入新的市场.
			3. To catch up with major competitors that are on-line		Adapted/ Translated	3. Using new technology would help my firm catch up with major competitors. /使用这一新技术能够帮助公司追上主要的竞争者.
	Items from TAM	Davis (1989)	1. The technology would enable me accomplish tasks more quickly	α = 0.98	Adapted/ Translated	1. Using new technology would enable my firm to accomplish tasks more quickly. /使用这一新技术能够更快的完成工作任务.
			2. The technology would improve my job performance		Adapted/ Translated	2. Using new technology would improve job performance. /使用这一新技术能够提高工作表现.
			3. The technology would increase my productivity		Adapted/ Translated	3. Using new technology would increase productivity. /使用这一新技术能够提高生产力.
			4. The technology would enhance my effectiveness on the job		Adapted/ Translated	4. Using new technology would enhance job effectiveness. /使用这一新技术能够提高工作有效性.
			5. The technology would make it easier to do my job		Adapted/ Translated	5. Using new technology would make jobs easier to be done. /使用这一新技术能够让工作变得更容易.
			6. The technology would be useful in my job		Adapted/ Translated	6. Using new technology would be useful in my firm. /使用这一新技术能够帮助到我公司.

Initial Item Generated for Perceived Cost of New Technology

Concept	Source		Items	Reported Reliability	Action taken	
Effort Cost	Items from EVT	Battle and Wigfield (2003)	1. When I think about all the work required to get through graduate school, I am not sure that getting a graduate degree is going to be worth it in the end.	α = 0.85	Adapted/ Translated	1. I am not sure all the work required in adopting new technology would be worth it in the end. / 我不确定为了采纳这一新技术所付出的努力会是值得的.
			2. I am not sure if I have got the energy to work (either outside the university or as graduate assistant) and go to graduate school at the same time.		Adapted/ Translated	2. I am not sure if my firm has the energy to adopt new technology. / 我不确定是否公司具有能量去采纳这一新技术.
			3. Graduate school would not be worth it if I had to work hard after I got out to re-pay a long-term tuition loan.		Delete	
		Flake, Barron, Hulleman, McCoach, and Welsh (2015)	1. This class demands too much of my time.	α = 0.97	Adapted/ Translated	1. Adopting new technology would demand too much of time. /采纳这一新技术需要大量的时间.
			2. I have to put too much energy into this class.		Adapted/ Translated	2. My firm has to put too much energy into adopting new technology. /我公司不得不付出大量的能量在采纳这一新技术上.
			3. This class takes up too much time.		Adapted/ Translated	3. Adopting new technology would take up too much of time. /采纳这一新技术占用了大量的时间.
			4. This class is too much work.		Adapted/ Translated	4. Adopting new technology means too much of work. /采纳这一新技术意味着大量的工作.
			5. This class requires too much effort		Adapted/ Translated	5. Adopting new technology would require too much of effort. /采纳这一新技术需要大量的体力与精力.
			6. I have so many other commitments that I can’t put forth the effort needed for this class.		Adapted/ Translated	6. Adopting new technology would demand too much of effort that my firm does not have enough effort for the other activities. /采纳这一新技术需要大量的体力与精力，这将导致公司用于其他事情上的体力与精力变少.

Initial Item Generated for Perceived Cost of New Technology from Literature （Continued）

Con cept	Source		Items	Reported Reliability	Action taken	
Effort Cost	Items from EVT	Flake, Barron, Hulleman, McCoach, and Welsh (2015)	7. Because of the all the other demands on my time, I don’t have enough time for this class.	α = 0.97	Adapted/ Translated	7. Because of other activities, my firm would not have enough time for adopting new technology. /因为公司里其他的事情，我公司没有足够的时间去采纳这一新技术.
			8. I have so many other responsibilities that I am unable to put in the effort that is necessary for this class.		Adapted/ Translated	8. Because of other activities, my firm would be unable to put in the effort that is necessary for adopting new technology. /因为公司里其他的事情，我公司不能投入必要的体力与精力去采纳这一新技术.
			9. Because of other things that I do, I don’t have time to put into this class.		Adapted/ Translated	9. Because of other activities, my firm would not have enough time for adopting new technology. /因为公司里其他的事情，我公司没有足够的时间去采纳这一新技术.
	Items from DOI	Moore and Benbasat (1991)	1. I believe that a PWS is cumbersome to use	α = 0.80	Adapted/ Translated	1. New technology is cumbersome to use. /这一新技术难以使用.
			2. I believe that it is easy to get a PWS to do what I want it to do		Adapted/ Translated	4. It is easy to get new technology to do what my firm wants it to do. /用这一新技术去实现公司的工作设想是一件很容易的事情.
			3. Overall, I believe that a PWS is easy to use		Adapted/ Translated	5. New technology is easy to use. /这一新技术是容易使用的.
			4 Learning to operate a PWS is easy for me		Adapted/ Translated	6. Learning how to use new technology is easy for my firm. /学习使用这一新技术对我公司来说很容易.
		Al-Jabri and Sohail (2012)	1. Mobile banking requires technical skills	α = 0.83	Adapted/ Translated	1. New technology would require technical skills. /使用这一新技术要求专业技能.
	Items from TAM	Davis (1989)	1. Learning to operate the technology would be easy for me	α = 0.95	Adapted/ Translated	2. Learning how to operate new technology is easy for my firm. /学习操作这一新技术对我公司来说很容易.
			2. I find it easy to get the technology to do what I want it to do		Adapted/ Translated	3. It is easy to get new technology to do what my firm wants it to do. /用这一新技术去实现公司的工作设想是一件很容易的事情.

Initial Item Generated for Perceived Cost of New Technology from Literature （Continued）

Concept	Source		Items	Reported Reliability	Action taken	
Effort Cost	Items from TAM	Davis (1989)	3. My interaction with the technology would be clear and understandable	α = 0.95	Adapted/ Translated	4. The interaction with new technologies is clear and understandable. /与这一新技术的交互是清晰并容易理解的.
			4. The technology is flexible to interact with		Adapted/ Translated	5. New technology is flexible to interact with. /与这一新技术的交互是灵活的.
			5. Easy for me to become skillful at using the technology		Adapted/ Translated	6. Easy for the members in my firm to become skillful at using new technology. /熟练使用这一新技术对我公司人员来说很容易.
			6. The technology would be easy to use		Adapted/ Translated	7. New technology is easy to use. /这一新技术是容易使用的 .
Opportunity Cost	Items from EVT	Battle and Wigfield (2003)	4. I worry that spending all the time in graduate school will take time away from other activities I want to pursue while I am still young.	α = 0.85	Adapted/ Translated	3. Adopting new technology would take time away from other activities my firm wants to pursue. /用在采纳这一新技术上的时间将会挤占公司花在其他必要事情上的时间.
			5. I would rather leave more time for fun after I graduate from college before I jump into something as intense as graduate school.		Delete	
		Flake, Barron, Hulleman, McCoach, and Welsh (2015)	10. I have to sacrifice too much to be in this class.	α = 0.89	Adapted/ Translated	10. My firm has to sacrifice too much to adopt new technology. /为了采纳这一新技术我公司不得不牺牲很多.
			11. This class requires me to give up too many other activities I value.		Adapted/ Translated	11. Adopting new technology would require my firm to give up too many other valued activities. /为了采纳这一新技术我公司不得不放弃很多其他有价值的事情.
			12. Taking this class causes me to miss out on too many other things I care about.		Adapted/ Translated	12. Adopting new technology would cause my firm to miss out too many other things that the firm cares about. /为了采纳这一新技术我公司错过了很多本公司看重的其他事情.
			13. I can't spend as much time doing the other things that I would like because I am taking this class.		Adapted/ Translated	13. Adopting new technology would demand too much of time that my firm does not have enough time for the other activities. /为了采纳这一新技术我公司没有足够的时间去做别的事情.

Initial Item Generated for Perceived Cost of New Technology from Literature （Continued）

Concept	Source		Items	Reported Reliability	Action taken	
Psychological Cost	Items from EVT	Battle and Wigfield (2003)	6. I am concerned that I am not a good enough student to do well in graduate school.	α = 0.85	Adapted/ Translated	4. I am concern that my firm is not good enough to do well with new technology. /我担心我公司不够好去采纳这一新技术.
			7. I worry that I will waste a lot of time and money before I find out that I do not want to continue in graduate school.		Adapted/ Translated	5. I worry that my firm would waste a lot of time and money before we find that we do not want to continue using new technology. /我担心我公司将会浪费时间和金钱当公司并不想继续使用这一新技术的时候.
			8. I would be embarrassed if I started graduate school and found out that my work was inferior to that of my peers.		Adapted/ Translated	6. I would be embarrassed if my firm started to adopt new technology, but we could not do it as well as the other firms. /我会感到很难堪如果我公司采纳这一新技术但是我们不能像其他公司那样把它使用好.
		Battle and Wigfield (2003)	9. My self-esteem would suffer if I tried graduate school but was unsuccessful at it.	α = 0.85	Adapted/ Translated	7. My self-esteem would suffer if my firm started to adopt new technology but failed at the end. /我的自尊会受到伤害如果我公司开始采纳了这一新技术但是最后这一新技术的使用我在公司失败了.
			10. It frightens me that graduate level course work will be harder than my current college classes.		Adapted/ Translated	8. It would frighten me that using new technology will be harder than the current one used in my firm. /我害怕使用这一新技术会比使用目前的技术更加困难.
			11. I am concerned that I won't be able to handle the stress that goes along with graduate school.		Adapted/ Translated	9. I am concerned that people in my firm would not be able to handle the stress that working with new technology. /我担心我公司不能够处理好使用这一新技术所带来的压力.
		Flake, Barron, Hulleman, McCoach, and Welsh (2015)	13. I worry too much about this class.	α = 0.94	Adapted/ Translated	14. I worry too much about adopting new technology. /我非常担心采纳这一新技术.
			14. This class is too exhausting.		Adapted/ Translated	15. Adopting new technology would be too exhausting. /采纳这一新技术让人筋疲力尽.
			15. This class is emotionally draining.		Adapted/ Translated	16. Adopting new technology would be emotionally draining. /采纳这一新技术让人身心憔悴.
			16. This class is too frustrating.		Adapted/ Translated	17. Adopting new technology would be too frustrating. /采纳这一新技术让人觉得沮丧.

Initial Item Generated for Perceived Cost of New Technology from Literature （Continued）

Concept	Source		Items	Reported Reliability	Action taken	
Psychological Cost			17. This class makes me feel too anxious.	α = 0.94	Adapted/ Translated	18. Adopting new technology would make me feel too anxious. /采纳这一新技术让人忧虑.
			18. This class is too stressful.		Adapted/ Translated	18. Adopting new technology would be too stressful. /采纳这一新技术让人具有压力.
	Items from DOI	Moore and Benbasat (1991)	2. Using a PWS requires a lot of mental effort	α = 0.80	Adapted/ Translated	2. Using new technology would require a lot of mental effort. /使用这一新技术需要大量的精力.
			3. Using a PWS is often frustrating		Adapted/ Translated	3. Using new technology would be too frustrating. /使用这一新技术让人觉得沮丧.

APPENDIX B

ITEM BANK OF EXPECANCY, PERCEIVED BENEFIT AND PERCEIVED COST OF NEW TECHNOLOGY AFTER BINNING AND WINNOWIN

Item Bank of Expectancy of New Technology after Binning and Winnowing

Concept	Source	Items	Action Taken
Efficacy Expectancy	Eccles and Harold (1991)	1. My firm is good at using new technology. /我公司擅长使用这一新技术.	binned
		2. My firm is good at using new technology compared to other technologies. /相比于其他技术，我公司更擅长于使用这一新技术.	binned
		3. My firm is good at using new technology compared to other firms. /相比于其他公司，我公司更擅长于使用这一新技术.	binned
		4. I expect that My firm will do well in using new technology in the future. /我认为我公司将来会对这一新技术使用的很好	binned and winnowed. Confusing to understand. None about the future ability.
	Eccles and Wigfield (1995)	5. Compared to other firms, my firm does well in using new technology this year. /相比于其他公司，我公司今年更擅长于使用这一新技术	binned and winnowed. Redundant to item 3 and too specific context.
		6. My firm will do well in using new technology this year. /我公司今年将会很好地使用这一新技术	binned and winnowed. Redundant to item 1 and too specific context.
		7. My firm is good using new technology. /我公司擅长使用这一新技术	binned and winnowed. Redundant to item 1.
		8. My firm performs good at utilizing new technology compared to other firms. /相比于其他公司，我公司更擅长使用这一新技术	binned and winnowed. Redundant to item 2.
		9. My firm has been doing well in using new technology this year. /我公司一直对这一新技术使用的很好	binned
	Miller, Behrens, Greene, and Newman (1993)	10. My firm is better than the other firms in using new technology. /相比于其他公司，我公司更擅长使用这一新技术	binned and winnowed. Redundant to item 3.
		11. My firm is not very good at using new technology. /我公司不擅长使用这一新技术	binned and winnowed. Redundant to item 1.
		12. Compared with other firms, my firm doesn't know very much about new technology. /相比于其他公司，我公司对这一新技术并不太了解	binned
		13. My firm understands the idea used in new technology. /我公司了解这一新技术所使用的方法与概念	binned
		14. My firm has limited understanding of the concept in new technology. /我公司对这一新技术的了解有限	binned
		15. My firm did well in using new technology. /我公司过去能够很好地使用新技术	binned and winnowed. Redundant to item 9.
		16. Compared to other firms, my firm does well in using new technology this year. /相比于其他公司，我公司能够更好的使用这一新技术	binned and winnowed. Redundant to item 3.
		17. My firm has a weak knowledge of new technology. /我公司对关于这一新技术的知识掌握有限	binned
		18. If my firm is to adopt a new technology, I am sure it would do well. /如果我公司要采纳这一新技术，我认为它能采纳地很好	binned

Item Bank of Expectancy of New Technology after Binning and Winnowing (Continued)

Concept	Source	Items	Action Taken
Efficacy Expectancy	Maddux, Norton, and Stoltenberg (1986)	19. I believe my firm could learn how to use new technology. /我相信我公司能够学习怎么使用这一新技术	binned
		20. New technology would be difficult for my firm to learn. /学习使用这一新技术对我公司来说是困难的	binned
		21. My firm can use new technology if it wants to. /如果它想的话，我公司能够使用这一新技术	binned
	Riggs, Warka, Babasa, Betancourt, and Hooker (1994)	22. My firm has above average ability to use new technology. /我公司具有超出行业平均水平的能力去使用这一新技术	binned
		23. My firm is poor compared to other firms using new technology. /相比于其他公司，我公司对于新技术的使用表现并不好	binned and winnowed. Redundant to item 3.
		24. My firm is not able to perform as well as it should when using new technology. /对于使用这一新技术，我公司不能表现出它的正常水平	binned and winnowed. Redundant to item 3.
		25. Members in my firms have excellent skills of using new technology. /我公司的人员具有良好的技能去使用这一新技术	binned
		26. Some members in my firm are lack of ability to use new technology. /我公司的一些人员缺少使用这一新技术的能力	binned and winnowed. Redundant to item 25.
		27. My firm is not effective in using new technology. /我公司不能有效地使用这一新技术	binned
		28. Some members in my firm cannot use new technology well. /我公司的一些人员不能很好的使用这一新技术	binned and winnowed. Redundant to item 25.
	Bohn (2010)	29. Members in my firm can take on any challenge when adopt new technology. /我公司的人员能够承担采纳这一新技术所带来的的挑战	binned
		30. My firm can beat our competitors to adopt new technology. /我公司能够击败竞争公司来采纳这一新技术	binned
		31. My firm is far more innovative than most firms. /我公司要比其他公司更有创新性	binned
		32. In my firm we coordinate our efforts to adopt new technology. /我公司人员能够整合各自的精力与体力去采纳这一新技术	binned
		33. Members in my firm can work together to adopt new technology. /我公司人员能够合作去采纳这一新技术	binned and winnowed. Redundant to item 32.
		34. Members in my firm can mobilize efforts to adopt new technology. /我公司人员能够动员起来去采纳这一新技术	binned
		35. In my firm, everyone works together very effectively in adopting new technology. /我公司人员能够有效地合作去采纳这一新技术	binned
		36. Members in my firm are competent enough to meet new technology's requirements. /对于这一新技术的要求，我公司人员是称职的	binned
		37. Members in my firm have a sense of purpose to adopt new technology. /采纳这一新技术是我公司人员的目标	binned

Item Bank of Expectancy of New Technology after Binning and Winnowing (Continued)

Concept	Source	Items	Action Taken
		38. My firm has a strong vision of adopting new technology. / 我公司有强烈的愿景去采纳这一新技术	binned
		39. My firm is confident about adopting new technology. /我公司有信心来采纳这一新技术	binned
	Moore and Benbasat (1991)	40. I would have no difficulty telling others about the results of using new technology. /对我而言，向其他人描述使用这一新技术所带来的结果是没有困难的	binned
		41. I believe I could communicate to others the consequences of using new technology. /我相信我能够向其他人描述使用这一新技术所带来的结果	binned
		42. The results of using new technology are apparent to me. / 使用这一新技术所带来的结果对我来说是显而易见的	binned
		43. I would have difficulty explaining why using new technology may or may not be beneficial. /对我而言，解释为什么使用这一新技术是有益的或有害的是困难的	binned
Outcome Expectancy	Feather and Davenport (1981)	44. I am confident that new technology will do well in my firm in the near future. /我有信心这一新技术将在我公司运作的很好	binned
		45. Compared to other firms, new technologies would do well in my firm. /和其他公司相比，这一新技术将在我公司运作的很好	binned
		46. I am confident that new technology would do well in my firm after we adopt it. /我有信心在我公司采纳了这一新技术之后，这一新技术将在我公司运作的很好	binned and winnowed. Redundant to item 44.
	Vansteenkiste, Lens, De Witte, and Feather (2005)	47. I am optimistic that new technology would work well in my firm. /对于这一新技术将可以在我公司运作的很好，我很乐观	binned and winnowed. Redundant to item 44.
		48. I don’t expect that new technology would work well in my firm. /我并不期待这一新技术能在我公司运作的很好	binned and winnowed. Redundant to item 44.
		49. My firm has failed to adopt new technology, so I don't expect the new technology would work well. /我公司曾经在采纳这一新技术上失败过，因此我并不期待（这一）这一新技术能在我公司运作的很好	binned and winnowed. Too specific context.
	Maddux, Norton, and Stoltenberg (1986)	50. New technology is an effective way to meet my firm's need once we adopt it. /在我们采纳了这一新技术之后，这一新技术能够有效的满足我公司的需求	binned
		51. If my firm is able to adopt new technology, it would be much harder for other firms to compete with us. /如果我公司采纳了这一新技术，其他公司将很难与我们竞争	binned
	Moore and Benbasat (1991)	52. Using new technology is compatible with all aspects of my firm. /使用这一新技术与我公司的各个方面都兼容	binned
		53. Using new technology is completely compatible with my firm's current situation. /使用这一新技术与我公司目前的状况兼容	binned
		54. I think that using new technology fits well with the way my firm likes to work. /我认为使用这一新技术符合我公司所喜欢的工作方式	binned
		55. Using new technology fits into my firm's work style. /使用这一新技术符合我公司的工作方式	binned

Item Bank of Perceived Benefit of New Technology after Binning and Winnowing

Concept	Source	Items	Action Taken
Attainment Value	Eccles and Wigfield (1995)	1. The amount of effort it will take to adopt the new technology would be worthwhile to my firm. /为了采纳这一新技术而付出的所有努力都是值得的.	binned to "cost". Winnowed as redundancy.
		2. Being good at solving problems which involve using new technology is important to my firm. /能够使用这一新技术解决公司遇到的问题，对公司来说是十分重要的.	binned
		3. Successfully adopting new technology is important to my firm. /成功地采纳这一新技术对公司来说是十分重要的.	binned and winnowed. Redundant to item 10.
	Battle and Wigfield (2003)	4. I would be upset if my firm is not able to be good at new technology. /我会很伤心如果我公司不能擅长这一新技术.	binned to "cost"
		5. I feel that adopting new technology is a necessary part of making my firm to be good in the future. /我认为采纳这一新技术对我公司能够在未来变得更好是十分必要的.	binned
		6. Using new technology is of great value to my firm. /使用这一新技术对我公司具有巨大的价值.	binned and winnowed. Too general.
		7. I feel that adopting new technology could let my firm to prove something. /我认为通过采纳这一新技术能够让我公司证明一些事情.	binned
		8. I value the prestige that my firm could enjoy which comes with adopting new technology. /我很重视采纳这一新技术所带给我公司的威望.	binned
	Trautwein et al. (2012)	9. My firm is keen to learn a lot in new technology. /我公司渴望学习这一新技术.	binned to "intrinsic value"
		10. New technology is important to my firm. /这一新技术对我公司是很重要的.	binned
		11. It is important to my firm to be good at using new technology. /我公司能够擅长使用这一新技术是十分重要的.	binned
	Moore and Benbasat (1991)	12. Using new technology would improve my firm's image in the industry. /使用这一新技术能够提升我公司在行业中的形象.	binned
		13. Firms adopt new technology would have more prestige than those who do not. /采纳这一新技术的公司会比那些没采纳的公司拥有更多的威望.	binned
		14. Using new technology would give my firm a high profile. /采纳这一新技术让我公司更加引人注目.	binned
		15. Using new technology is a status symbol for my firm. /使用这一新技术对我公司来说是一种身份的象征.	binned
Intrinsic Value	Eccles and Wigfield (1995)	16. I think working with new technology in my firm is very interesting. /我认为在我公司使用这一新技术进行工作是十分有趣的.	binned
		17. I like working with new technology in my firm. /我喜欢我公司能够使用这一新技术.	binned
	Battle and Wigfield (2003)	18. I find the idea of being new technology user to be very appealing. /我发现成为这一新技术的使用者是十分吸引人的.	binned
		19. It is exciting to think about the challenge of adopting new technology in my firm. /考虑采纳这一新技术所带来的挑战是一件令人激动的事情.	binned
		20. I am excited about the idea of adopting new technology in my firm. /对于我公司采纳这一新技术这一事情，我很激动.	binned

Item Bank of Perceived Benefit of New Technology after Binning and Winnowing (Continued)

Concept	Source	Items	Action Taken
Intrinsic Value		21. I am look forward that my firm can use new technology. /我渴望我公司能够使用这一新技术.	binned
		22. I would welcome the challenge of doing the work to successfully adopt new technology in my firm. /我会欢迎我公司采纳这一新技术所带来的挑战.	binned
		23. I look forward to advancing my knowledge by exploring new and challenging ideas in new technology. 我期待能在探索这一新技术的过程中拓展我的知识.	binned
	Trautwein et al. (2012)	24. I enjoy overcoming the challenges to adopt new technology in my firm. /我享受在我公司采纳这一新技术时克服困难的过程.	binned
		25. I would like my firm to adopt more new technologies. /我希望我公司能采纳更多的新的技术.	binned and winnowed. Confusing to understand.
		26. I always look forward to new technology. /我总是期待着这一新技术.	binned and winnowed. Redundant to item 21.
	Feather and Davenport (1981)	27. Adopting new technology means more than just money to my firm. /采纳这一新技术对我公司而言将不仅仅只是金钱上的收获.	binned
		28. I am satisfied if my firm can adopt new technology. /我很满意如果我公司能够采纳这一新技术.	binned
		29. I am interested in adopting new technology in my firm. /对于我公司采纳这一新技术，我对此很感兴趣.	binned and winnowed. Redundant to item 16.
	Miller et al. (1993)	30. Using new technology in my firm is satisfying. /我公司能够使用这一新技术，是令人满意的事情.	binned and winnowed. Redundant to item 28.
		31. Working with new technology is enjoyable. /使用这一新技术是一件让人享受的事情.	binned
		32. Learning new technology is interesting. /学习这一新技术是令人感兴趣的事情.	binned
		33. Learning new technology does not hold my interest. /学习这一新技术并不能让我感兴趣.	binned and winnowed. Redundant to item 32.
Utility Value	Eccles and Wigfield (1995)	34. Using new technology is useful for what my firm wants to do. /使用这一新技术能都让我公司做它想做的事情.	binned
	Battle and Wigfield (2003)	35. I do not think new technology would be useful for what my firm want to do in the future. /我并不认为采纳这一新技术能让我公司做它想做的事情.	binned and winnowed. Redundant to item 34.
		36. Using new technology would make financial gains for my firm. /使用这一新技术能够为我公司带来经济收益.	binned
		37. Using new technology would give my firm an enjoyable status. /使用这一新技术能够为我公司带来令人满意的地位.	binned to "attainment value"
		38. Adopting new technology would make my firm to be prestigious. /采纳这一新技术能够让我公司具有威望.	binned to "attainment value"

Item Bank of Perceived Benefit of New Technology after Binning and Winnowing (Continued)

Concept	Source	Items	Action Taken
Utility Value		39. Using new technology would give my firm more opportunities in business. /使用这一新技术能够让我公司获得更多的市场机会.	binned
		40. Current technologies used in my firm are useless. /目前我公司所使用的技术是无用的.	binned
	Wiklund, Davidsson, and Delmar (2003)	41. Using new technology would make managers in my firm being able to spend less time on their work. /使用这一新技术能够让公司管理者减少工作时间.	binned
		42. Using new technology would make employees in my firm being able to spend less time on their work task. /使用这一新技术能够让公司员工者减少工作时间.	binned
		43. Using new technology would make members in my firm enjoying their work. /使用这一新技术能够让公司人员享受他们的工作.	binned
		44. Using new technology would bring economic benefit for my firm. /使用这一新技术能够为公司带来经济利益.	binned and winnowed. Redundant to item 36.
		45. Using new technology would increase members' ability to control firm's operation. /使用这一新技术能够增强公司人员掌控公司运营的能力.	binned
		46. Using new technology would enhance the relationship between my firm and its customers and suppliers. /使用这一新技术能够增进公司与消费者和供应商的关系.	binned
		47. Using new technology would make my firm to be easy to survive a severe crisis. /使用这一新技术能够让公司在危机中更容易生存.	binned
		48. Using new technology would make my firm to be easy to maintain the quality of products and services. /使用这一新技术能够让公司更容易保持产品与服务的质量.	binned
	Moore and Benbasat (1991)	49. Using new technology would enable my firm to accomplish tasks more quickly. /使用这一新技术能够让公司更快的完成工作任务.	binned
		50. Using new technology would improve the quality of work. /使用这一新技术能够提升工作质量.	binned
	Moore and Benbasat (1991)	51. Using new technology would make jobs easy. /使用这一新技术能够让工作变得更容易.	binned
		52. Using new technology would improve job performance. /使用这一新技术能够提升工作的表现.	binned
		53. Using new technology is advantage in my firm. /使用这一新技术是我公司的一项优势.	binned
		54. Using new technology would enhance job effectiveness. /使用这一新技术能够增强工作的有效性.	binned
		55. Using new technology would give great control over work. /使用这一新技术能够提高对工作的控制力.	binned
		56. Using new technology would increase my firm's productivity. /使用这一新技术能够增强公司的生产力.	binned
	Hsu et al. (2006)	57. Using new technology would expand market for existing product/services. /使用这一新技术能够扩大现有产品或服务的市场.	binned and winnowed. Redundant to item 39.
		58. Using new technology would help my firm enter new businesses or markets. /使用这一新技术能够帮助公司进入新的市场.	binned and winnowed. Redundant to item 39.

Item Bank of Perceived Benefit of New Technology after Binning and Winnowing (Continued)

Concept	Source	Items	Action Taken
Utility Value		59. Using new technology would help my firm catch up with major competitors. /使用这一新技术能够帮助公司追上主要的竞争者.	binned
	Davis (1989)	60. Using new technology would enable my firm to accomplish tasks more quickly. /使用这一新技术能够更快的完成工作任务.	binned and winnowed. Redundant to item 49.
		61. Using new technology would improve job performance. /使用这一新技术能够提高工作表现.	binned and winnowed. Redundant to item 52.
		62. Using new technology would increase productivity. /使用这一新技术能够提高生产力.	binned and winnowed. Redundant to item 56.
		63. Using new technology would enhance job effectiveness. /使用这一新技术能够提高工作有效性.	binned and winnowed. Redundant to item 54.
		64. Using new technology would make jobs easier to be done. /使用这一新技术能够让工作变得更容易.	binned and winnowed. Redundant to item 51.
		65. Using new technology would be useful in my firm. /使用这一新技术能够帮助到我公司.	binned

Item Bank of Perceived Cost of New Technology after Binning and Winnowing

Concept	Source	Items	Action Taken
Effort Cost	Battle and Wigfield (2003)	1. I am not sure all the work required in adopting new technology would be worth it in the end. / 我不确定为了采纳这一新技术所付出的努力会是值得的.	binned
		2. I am not sure if my firm has the energy to adopt new technology. / 我不确定是否公司具有能量去采纳这一新技术.	binned
	Flake, Barron, Hulleman, McCoach, and Welsh (2015)	3. Adopting new technology would demand too much of time. /采纳这一新技术需要大量的时间.	binned
		4. My firm has to put too much energy into adopting new technology. / 我公司不得不付出大量的能量在采纳这一新技术上.	binned
		5. Adopting new technology would take up too much of time. /采纳这一新技术占用了大量的时间.	binned and winnowed. Redundant to item 3.
		6. Adopting new technology means too much of work. /采纳这一新技术意味着大量的工作.	binned
		7. Adopting new technology would require too much of effort. /采纳这一新技术需要大量的体力与精力.	binned
		8. Adopting new technology would demand too much of effort that my firm does not have enough effort for the other activities. /采纳这一新技术需要大量的体力与精力，这将导致公司用于其他事情上的体力与精力变少.	binned and winnowed. Redundant to item 7 and 24.
	Flake, Barron, Hulleman, McCoach, and Welsh (2015)	9. Because of other activities, my firm would not have enough time for adopting new technology. /因为公司里其他的事情，我公司没有足够的时间去采纳这一新技术.	binned and winnowed. Redundant to item 23.
		10. Because of other activities, my firm would be unable to put in the effort that is necessary for adopting new technology. /因为公司里其他的事情，我公司不能投入必要的体力与精力去采纳这一新技术.	binned and winnowed. Redundant to item 7. Too specific context.
		11. Because of other activities, my firm would not have enough time for adopting new technology. /因为公司里其他的事情，我公司没有足够的时间去采纳这一新技术.	binned and winnowed. Redundant to item 3. Too specific context.
	Moore and Benbasat (1991)	12. New technology is cumbersome to use. /这一新技术难以使用.	binned
		13. It is easy to get new technology to do what my firm wants it to do. / 用这一新技术去实现公司的工作设想是一件很容易的事情.	binned
		14. New technology is easy to use. /这一新技术是容易使用的.	binned and winnowed. Redundant to item 12.
		15. Learning how to use new technology is easy for my firm. /学习使用这一新技术对我公司来说很容易.	binned
	Al-Jabri and Sohail (2012)	16. New technology would require technical skills. /使用这一新技术要求专业技能.	binned
	Davis (1989)	17. Learning how to operate new technology is easy for my firm. /学习操作这一新技术对我公司来说很容易.	binned and winnowed. Redundant to item 15.

Item Bank of Perceived Cost of New Technology after Binning and Winnowing (Continued)

Concept	Source	Items	Action Taken
Effort Cost		18. It is easy to get new technology to do what my firm wants it to do. /用这一新技术去实现公司的工作设想是一件很容易的事情.	binned and winnowed. Redundant to item 13.
		19. The interaction with new technologies is clear and understandable. /与这一新技术的交互是清晰并容易理解的.	binned
		20. New technology is flexible to interact with. /与这一新技术的交互是灵活的.	binned
		21. Easy for the members in my firm to become skillful at using new technology. /熟练使用这一新技术对我公司人员来说很容易.	binned
		22. New technology is easy to use. /这一新技术是容易使用的.	binned and winnowed. Redundant to item 12.
Opportunity Cost	Battle and Wigfield (2003)	23. Adopting new technology would take time away from other activities my firm wants to pursue. /用在采纳这一新技术上的时间将会挤占公司花在其他必要事情上的时间.	binned
	Flake, Barron, Hulleman, McCoach, and Welsh (2015)	24. My firm has to sacrifice too much to adopt new technology. /为了采纳这一新技术我公司不得不牺牲很多.	binned
		25. Adopting new technology would require my firm to give up too many other valued activities. /为了采纳这一新技术我公司不得不放弃很多其他有价值的事情.	binned
		26. Adopting new technology would cause my firm to miss out too many other things that the firm cares about. /为了采纳这一新技术我公司错过了很多本公司看重的其他事情.	binned and winnowed. Redundant to item 25.
		27. Adopting new technology would demand too much of time that my firm does not have enough time for the other activities. /为了采纳这一新技术我公司没有足够的时间去做别的事情.	binned and winnowed. Redundant to item 23.
Psychological Cost	Battle and Wigfield (2003)	28. I am concern that my firm is not good enough to do well with new technology. /我担心我公司不够好去采纳这一新技术.	binned
		29. I worry that my firm would waste a lot of time and money before we find that we do not want to continue using new technology. /我担心我公司将会浪费时间和金钱当公司并不想继续使用这一新技术的时候.	binned
		30. I would be embarrassed if my firm started to adopt new technology, but we could not do it as well as the other firms. /我会感到很难堪如果我公司采纳这一新技术但是我们不能像其他公司那样把它使用好.	binned
		31. My self-esteem would suffer if my firm started to adopt new technology but failed at the end. /我的自尊会受到伤害如果我公司开始采纳了这一新技术但是最后这一新技术的使用我在公司失败了.	binned
		32. It would frighten me that using new technology will be harder than the current one used in my firm. /我害怕使用这一新技术会比使用目前的技术更加困难.	binned
		33. I am concerned that people in my firm would not be able to handle the stress that working with new technology. /我担心我公司不能够处理好使用这一新技术所带来的压力.	binned

Item Bank of Perceived Cost of New Technology after Binning and Winnowing (Continued)

Concept	Source	Items	Action Taken
Psychological Cost	Flake, Barron, Hulleman, McCoach, and Welsh (2015)	34. I worry too much about adopting new technology. /我非常担心采纳这一新技术.	binned
		35. Adopting new technology would be too exhausting. /采纳这一新技术让人筋疲力尽.	binned
		36. Adopting new technology would be emotionally draining. /采纳这一新技术让人身心憔悴.	binned
		37. Adopting new technology would be too frustrating. /采纳这一新技术让人觉得沮丧.	binned
		38. Adopting new technology would make me feel too anxious. /采纳这一新技术让人忧虑.	binned
		39. Adopting new technology would be too stressful. /采纳这一新技术让人具有压力.	binned
	Moore and Benbasat (1991)	40. Using new technology would require a lot of mental effort. /使用这一新技术需要大量的精力.	binned
		41. Using new technology would be too frustrating. /使用这一新技术让人觉得沮丧.	binned and winnowed. Redundant to item 37.

APPENDIX C

INFORMATION OF CONTENT EXPERT VALIDATION

Interview Questions for Content Expert Validation

(All interview questions were translated from Chinese version by the researcher)

English Version

Dear Experts,

This interview is an important part of my doctoral dissertation, which aims to study and explore the decision-making process of adopting new technology in Chinese textile and apparel firms, especially the firm managers' expectancy, perceived benefit and perceived cost of new technology.

This research proposed that efficacy expectancy and outcome expectancy construct the managers' expectancy of new technology, and attainment value, intrinsic value, and utility value construct the managers' perceived benefit of new technology, and effort cost, opportunity cost and psychological cost construct the managers' perceived cost of new technology. Then, by researching relevant literature, items that describe firm managers' expectancy, perceived benefit and perceived cost were generated.

In this interview, please first read the provided items of each salient construct of expectancy, perceived benefit and perceived cost. Questions will then be asked following each salient construct and please answer them based on your understanding or perception of the items and your real experience of new technology adoption. Your answer will be used for generating a more concise and relevant item bank of expectancy, perceived benefit and perceived cost of new technology. Your answer will be audio recorded in the interview.

Note: In this research, new technology refers to any technology that had not been previously used but your firm is going to use or plan to use in near future. It could be in the form of hardware or software, like technologies that be used in apparel product development, design, processing and manufacturing, product distribution and sales, after-sales service, enterprise management, and general office.

A. Efficacy expectancy refers to firm managers' belief that their firm is capable to adopt new technology. If firm managers believe their firm is capable to adopt new technology, then the firm managers would perceive a high probability for success at adopting new technology in their firm.

    1. What do you think about it? How to make a firm to be capable to adopt a new technology?
    2. Do you have any experience to share about the efficacy expectancy?
    3. What do you think of the items listed under this salient construct of expectancy? As you read them, do they give you a picture of efficacy expectancy?
    4. Which items do you think are more relevant with efficacy expectancy? Which items are not? And why?
    5. Which items are vague, or unclear about their meaning?
    6. Which items are repetitive in their meaning?

7. If you would want to get rid of some items, which of these would be your choice?
8. Are there any missing items that should be included in this scale?

B. Outcome expectancy refers to firm managers' beliefs that whether the outcome of adopting new technology can be performed up to the required standards. If firm managers believe the desired outcome of adopting new technology will follow by the adoption action, then the firm managers would perceive a high probability for success at adopting new technology in their firm.

1. What do you think about it?
2. Do you have any experience to share about the outcome expectancy?
3. What do you think of the items listed under this salient construct of expectancy? As you read them, do they give you a picture of outcome expectancy?
4. Which items do you think are more relevant with outcome expectancy? Which items are not? And why?
5. Which items are vague, or unclear about their meaning?
6. Which items are repetitive in their meaning?
7. If you would want to get rid of some items, which of these would be your choice?
8. Are there any missing items that should be included in this scale?

C. Attainment value refers to the importance of adopting new technology in firm. If firm managers believe new technology is important, the perceived benefit of the technology would be high.

1. What do you think about it?
2. Do you have any experience to share about the attainment value?
3. What do you think of the items listed under this salient construct of perceived value? As you read them, do they give you a picture of attainment value?
4. Which items do you think are more relevant with attainment value? Which items are not? And why?
5. Which items are vague, or unclear about their meaning?
6. Which items are repetitive in their meaning?
7. If you would want to get rid of some items, which of these would be your choice?
8. Are there any missing items that should be included in this scale?

D. Intrinsic value refers to the enjoyment or subjective interest in adopting new technology. If firm managers believe adopting new technology is enjoyable or interesting, the perceived benefit of the technology would be high.

1. What do you think about it?
2. Do you have any experience to share about the intrinsic value?

3. What do you think of the items listed under this salient construct of perceived value? As you read them, do they give you a picture of intrinsic value?
4. Which items do you think are more relevant with intrinsic value? Which items are not? And why?
5. Which items are vague, or unclear about their meaning?
6. Which items are repetitive in their meaning?
7. If you would want to get rid of some items, which of these would be your choice?
8. Are there any missing items that should be included in this scale?

E. Utility value refers to the extrinsic value or desired end state. If firm managers believe adopting new technology will bring up extrinsic value or desired end state, the perceived benefit of the technology would be high.

1. What do you think about it?
2. Do you have any experience to share about the utility value?
3. What do you think of the items listed under this salient construct of perceived value? As you read them, do they give you a picture of utility value?
4. Which items do you think are more relevant with utility value? Which items are not? And why?
5. Which items are vague, or unclear about their meaning?
6. Which items are repetitive in their meaning?
7. If you would want to get rid of some items, which of these would be your choice?
8. Are there any missing items that should be included in this scale?

F. Effort cost refers to the amount of effort given for adopting new technology. The effort cost of adopting new technology would contribute to the total perceived cost of new technology adoption and may decrease the perceived value of the technology.

1. What do you think about it? What kind of effort cost do you think about?
2. Do you have any experience to share about considering the effort cost of a technology?
3. What do you think of the items listed under this salient construct of effort cost? As you read them, do they give you a picture of effort cost?
4. Which items do you think are more relevant with effort cost? Which items are not? And why?
5. Which items are vague, or unclear about their meaning?
6. Which items are repetitive in their meaning?
7. If you would want to get rid of some items, which of these would be your choice?
8. Are there any missing items that should be included in this scale?

G. Opportunity cost refers to the loss that adopting new technology prevents firm from being able to participate in other valued activities. The opportunity cost of adopting new technology would contribute to the total perceived cost of new technology adoption and may decrease the perceived value of the technology.

9. What do you think about it? What kind of effort cost do you think about?
10. Do you have any experience to share about considering the opportunity cost of a technology?
11. What do you think of the items listed under this salient construct of opportunity cost? As you read them, do they give you a picture of effort cost?
12. Which items do you think are more relevant with opportunity cost? Which items are not? And why?
13. Which items are vague, or unclear about their meaning?
14. Which items are repetitive in their meaning?
15. If you would want to get rid of some items, which of these would be your choice?
16. Are there any missing items that should be included in this scale?

H. Psychological cost refers to the mental suffering related to adopting new technology. The psychological cost of adopting new technology would contribute to the total perceived cost of new technology adoption and may decrease the perceived value of the technology.

17. What do you think about it? What kind of psychological cost do you think about?
18. Do you have any experience to share about considering the psychological cost of a technology?
19. What do you think of the items listed under this salient construct of psychological cost? As you read them, do they give you a picture of psychological cost?
20. Which items do you think are more relevant with psychological cost? Which items are not? And why?
21. Which items are vague, or unclear about their meaning?
22. Which items are repetitive in their meaning?
23. If you would want to get rid of some items, which of these would be your choice?
24. Are there any missing items that should be included in this scale?

Chinese Version

尊敬的专家，您好！

此次访谈是本人博士论文的重要组成部分，旨在研究探索中国服装企业在新技术的采纳过程中的决策过程，尤其是企业管理者对于新技术的期望，感知利益和感知成本。

本研究假设，企业管理者对于新技术的期望包含效能期望与结果期望；对于新技术的感知利益包含成就价值，内在价值，和实用价值；对于新技术的感知成本包含实际成本，机会成本和心理成本。通过对于文献的研究，相关题项被总结归纳出来。

在本次访谈中，请您先阅读每一个子量表中的题项。然后，根据您的理解回答每一个子量表后的问题。您的回答将会被用来校正各题项。您的回答将会被录音。

注意：新技术泛指任何之前未在您企业使用过的，但是您的企业在不久的将来可能会使用或计划使用的技术，比如服装产品开发技术，设计技术，加工生产制造技术，产品流通销售技术，售后服务技术，企业管理技术，协同办公技术等，及相关的软硬件设备设施或平台。

A. 效能期望是企业管理者对于企业能够采纳使用新技术的能力的感知。当企业管理者认为企业采纳新技术的能力提高时，企业管理者会认为成功采纳新技术的可能性提高。
   1. 您怎么看待企业采纳接受新技术的能力？什么样的能力与新技术的采纳接受相关？
   2. 您有什么例子或经验可以分享吗？
   3. 您怎么看待以上所列出的题项？您认为他们是否描述了企业管理者对于企业采纳接受新技术的能力的感知？
   4. 哪些题项是您认为与“企业采纳接受新技术的能力的感知”相关的？为什么？
   5. 哪些题项是比较模糊或表达不清的，需要进一步解释的？为什么？
   6. 哪些题项您认为是可以合并的？
   7. 哪些题项您认为是可以删除的？为什么？
   8. 还有哪些题项您认为是作者忽略掉的，或者应该加入的？

B. 结果预期是企业管理者对于新技术能否带来预期效果的感知。如果企业管理者认为预期的效果将会随着新技术的采纳而产生，那么企业管理者认为成功采纳这一新技术的可能性很高。

   1. 您怎么看待新技术的采纳与使用在企业能取得预期效果？
   2. 您有什么例子或经验可以分享吗？
   3. 您怎么看待以上所列出的题项？您认为他们是否描述了企业管理者对于新技术的采纳与使用在企业能取得预期效果的感知？
   4. 哪些题项是您认为与“对于新技术的采纳与使用在企业能取得预期效果的感知”相关的？为什么？
   5. 哪些题项是比较模糊或表达不清的，需要进一步解释的？为什么？
   6. 哪些题项您认为是可以合并的？
   7. 哪些题项您认为是可以删除的？为什么？
   8. 还有哪些题项您认为是作者忽略掉的，或者应该加入的？

C. 成就价值指企业采纳新技术的重要性。如果企业管理者认为新技术的采纳是很重要的，那么企业管理者对于新技术的感知价值就会高。

1. 您怎么看待新技术所带来的成就价值？
2. 您有什么例子或经验可以分享吗？
3. 您怎么看待以上所列出的题项？您认为他们是否描述了企业管理者对于新技术所带来的成就价值的感知？
4. 哪些题项是您认为与“对于新技术所带来的成就价值的感知”相关的？为什么？
5. 哪些题项是比较模糊或表达不清的，需要进一步解释的？为什么？
6. 哪些题项您认为是可以合并的？
7. 哪些题项您认为是可以删除的？为什么？
8. 还有哪些题项您认为是作者忽略掉的，或者应该加入的？

D. 内在价值指对于采纳新技术的喜悦或兴趣。如果企业管理者对于新技术的采纳是感到喜悦或者有兴趣的，那么企业管理者对于新技术的感知价值就会高。

1. 您怎么看待新技术所带来的内在价值？
2. 您有什么例子或经验可以分享吗？
3. 您怎么看待以上所列出的题项？您认为他们是否描述了企业管理者对于新技术所带来的内在价值的感知？
4. 哪些题项是您认为与“对于新技术所带来的内在价值的感知”相关的？为什么？
5. 哪些题项是比较模糊或表达不清的，需要进一步解释的？为什么？
6. 哪些题项您认为是可以合并的？
7. 哪些题项您认为是可以删除的？为什么？
8. 还有哪些题项您认为是作者忽略掉的，或者应该加入的？

E. 实用价值指外在价值或渴望的结果。如果企业管理者认为新技术的采纳能带来较高的外在价值，那么企业管理者对于新技术的感知价值就会高。

1. 您怎么看待新技术所带来的实用价值？
2. 您有什么例子或经验可以分享吗？
3. 您怎么看待以上所列出的题项？您认为他们是否描述了企业管理者对于新技术所带来的实用价值的感知？
4. 哪些题项是您认为与“对于新技术所带来的实用价值的感知”相关的？为什么？
5. 哪些题项是比较模糊或表达不清的，需要进一步解释的？为什么？
6. 哪些题项您认为是可以合并的？
7. 哪些题项您认为是可以删除的？为什么？
8. 还有哪些题项您认为是作者忽略掉的，或者应该加入的？

F. 实际成本指在采纳新技术的过程中所付出的努力。实际成本是新技术采纳过程中感知成本的一部分。如果企业管理者认为新技术的采纳具有较高的实际成本，那么企业管理者对于新技术的感知价值或许会降低。

1. 您怎么看待新技术所带来的实际成本？ 会有哪些实际成本？
2. 您有什么例子或经验可以分享吗？
3. 您怎么看待以上所列出的题项？您认为他们是否描述了企业管理者对于采纳新技术所产生的实际成本的感知？
4. 哪些题项是您认为与“对于采纳新技术所产生的实际成本的感知”相关的？为什么？
5. 哪些题项是比较模糊或表达不清的，需要进一步解释的？为什么？
6. 哪些题项您认为是可以合并的？
7. 哪些题项您认为是可以删除的？为什么？
8. 还有哪些题项您认为是作者忽略掉的，或者应该加入的？

G. 机会成本指在因为采纳新技术而失去的从事其他活动的机会。机会成本是新技术采纳过程中感知成本的一部分。如果企业管理者认为新技术的采纳具有较高的机会成本，那么企业管理者对于新技术的感知价值或许会降低。

9. 您怎么看待新技术所带来的机会成本？ 会有哪些机会成本？
10. 您有什么例子或经验可以分享吗？
11. 您怎么看待以上所列出的题项？您认为他们是否描述了企业管理者对于采纳新技术所产生的机会成本的感知？
12. 哪些题项是您认为与“对于采纳新技术所产生的机会成本的感知”相关的？为什么？
13. 哪些题项是比较模糊或表达不清的，需要进一步解释的？为什么？
14. 哪些题项您认为是可以合并的？
15. 哪些题项您认为是可以删除的？为什么？
16. 还有哪些题项您认为是作者忽略掉的，或者应该加入的？

H. 心理成本指在采纳新技术的过程中所付出的心理努力或遭遇的伤害。心理成本是新技术采纳过程中感知成本的一部分。如果企业管理者认为新技术的采纳具有较高的心理成本，那么企业管理者对于新技术的感知价值或许会降低。

17. 您怎么看待新技术所带来的心理成本？ 会有哪些心理成本？
18. 您有什么例子或经验可以分享吗？
19. 您怎么看待以上所列出的题项？您认为他们是否描述了企业管理者对于采纳新技术所产生的心理成本的感知？
20. 哪些题项是您认为与“对于采纳新技术所产生的心理成本的感知”相关的？为什么？
21. 哪些题项是比较模糊或表达不清的，需要进一步解释的？为什么？
22. 哪些题项您认为是可以合并的？
23. 哪些题项您认为是可以删除的？为什么？
24. 还有哪些题项您认为是作者忽略掉的，或者应该加入的？

Comments and Suggestions for Expectancy Scale

Concept	Items	Action Taken
Efficacy Expectancy	1. My firm is good at using new technology. /我公司擅长使用这一新技术.	Reworded as "People in my firm would be good at using new technology. / 公司人员擅长使用（这一）新技术."
	2. My firm is good at using new technology compared to other technologies. /相比于其他技术，我公司更擅长于使用这一新技术.	Deleted. Experts reported confused to understand and redundant with item 1.
	3. My firm is good at using new technology compared to other firms. /相比于其他公司，我公司更擅长于使用这一新技术.	Deleted. Experts reported redundant with item 1.
	4. My firm has been doing well in using new technology this year. /我公司一直对这一新技术使用的很好	Deleted. Experts reported confused to understand-not sure what the word “technology” stands for, e.g., the technology they adopted before or just a general word for technology.
	5. Compared with other firms, my firm doesn't know very much about new technology. /相比于其他公司，我公司对这一新技术并不太了解	Experts reported these items have similar meaning. Suggested merge as two items "People in my firm could understand the knowledge of new technology. / 公司人员了解（这一）新技术所使用的知识." and "People in my firm could understand the method used in new technology. / 公司人员了解（这一）新技术所使用的方法."
	6. My firm understands the idea used in new technology. /我公司了解这一新技术所使用的方法与概念	
	7. My firm has limited understanding of the concept in new technology. /我公司对这一新技术的了解有限	
	8. My firm has a weak knowledge of new technology. /我公司对关于这一新技术的知识掌握有限	
	9. If my firm is to adopt a new technology, I am sure it would do well. /如果我公司要采纳这一新技术，我认为它能采纳地很好	Deleted. Experts reported redundant with item 1, less connection with ability of adopting new technology, and too general item.
	10. I believe my firm could learn how to use new technology. /我相信我公司能够学习怎么使用这一新技术	Reworded as "People in my firm could learn how to use the new technology. / 公司人员能够学习如何使用（这一）新技术."
	11. New technology would be difficult for my firm to learn. /学习使用这一新技术对我公司来说是困难的	Deleted. Experts reported redundant with item 10.
	12. My firm can use new technology if it wants to. /如果它想的话，我公司能够使用这一新技术	Experts reported item 12 and 13 have similar meaning and "ability" need to be further explained. Suggested items are 1) "My firm has money to adopt new technology. / 公司拥有采纳（这一）新技术的资金." 2) "My firm has time to learn how to use new technology. / 公司有时间去学习如何使用（这一）新技术." 3) "My firm has infrastructure to use new technology. / 公司拥有采纳（这一）新技术的设施.”
	13. My firm has above average ability to use new technology. /我公司具有超出行业平均水平的能力去使用这一新技术	
	14. Members in my firms have excellent skills of using new technology. /我公司的人员具有良好的技能去使用这一新技术	Reworded as "People in my firm have skills of using new technology. / 公司人员拥有使用（这一）新技术的技能."
	15. My firm is not effective in using new technology. /我公司不能有效地使用这一新技术	Deleted. Experts reported redundant with item 12.

Comments and Suggestions for Expectancy Scale Made by Content Experts (Continued)

Concept	Items	Action Taken
Efficacy Expectancy	16. Members in my firm can take on any challenge when adopt new technology. /我公司的人员能够承担采纳这一新技术所带来的的挑战	Reworded as "People in my firm could take on any challenge when adopt new technology. / 公司人员能够承担（这一）新技术采纳过程中的挑战."
	17. My firm can beat our competitors to adopt new technology. /我公司能够击败竞争公司来采纳这一新技术	Deleted. Experts reported less connection with ability of adopting new technology
	18. My firm is far more innovative than most firms. /我公司要比其他公司更有创新性	Reworded as "My firm is more innovative than most firms. / 我公司相比其他公司更有创新性."
	19. In my firm we coordinate our efforts to adopt new technology. /我公司人员能够整合各自的精力与体力去采纳这一新技术	Reworded as "People in my firm could coordinate their efforts to adopt new technology. / 公司人员能够协同合作去采纳（这一）新技术."
	20. Members in my firm can mobilize efforts to adopt new technology. /我公司人员能够动员起来去采纳这一新技术	Deleted. Experts reported redundant with item 20.
	21. In my firm, everyone works together very effectively in adopting new technology. /我公司人员能够有效地合作去采纳这一新技术	Reworded as "People in my firm could work unitedly to adopt new technology. / 公司人员能够团结一致地去采纳（这一）新技术."
	22. Members in my firm are competent enough to meet new technology's requirements. /对于这一新技术的要求，我公司人员是称职的	Reworded as "People in my firm would be competent to meet new technology's requirements. / 对于 (这一) 新技术的要求，我公司人员是称职的."
	23. Members in my firm have a sense of purpose to adopt new technology. /采纳这一新技术是我公司人员的目标	Deleted. Experts reported less connection with ability of adopting new technology. Suggested item to replace as "My firm has managers who have vision to adopt new technology. /公司管理层有足够的远见去采纳（这一）新技术."
	24. My firm has a strong vision of adopting new technology. /我公司有强烈的愿景去采纳这一新技术	
	25. My firm is confident about adopting new technology. /我公司有信心来采纳这一新技术	Deleted. Experts reported redundant with item 1.
	26. I would have no difficulty telling others about the results of using new technology. /对我而言，向其他人描述使用这一新技术所带来的结果是没有困难的	Deleted. Experts reported redundant with item 27.
	27. I believe I could communicate to others the consequences of using new technology. /我相信我能够向其他人描述使用这一新技术所带来的结果	Experts reported these items have similar meaning and more related to outcome expectancy rather than efficacy expectancy. Suggested merge as one item "I am sure about the results of using new technology in my firm. /我很明确使用（这一）新技术所带来的结果."
	28. The results of using new technology are apparent to me. /使用这一新技术所带来的结果对我来说是显而易见的	
	29. I would have difficulty explaining why using new technology may or may not be beneficial. / 对我而言，解释为什么使用这一新技术是有益的或有害的是困难的	Deleted. Experts reported redundant with item 27.
Outcome Expectancy	30. I am confident that new technology will do well in my firm in the near future. /我有信心这一新技术将在我公司运作的很好	Reworded as "I am confident that new technology would be effective in my firm. / 我相信 (这一) 新技术将在我公司起到效果."
	31. Compared to other firms, new technology would do well in my firm. /和其他公司相比，这一新技术将在我公司运作的很好	Deleted. Experts reported less connection with ability of adopting new technology

Comments and Suggestions for Expectancy Scale Made by Content Experts (Continued)

Concept	Items	Action Taken
	32. New technology is an effective way to meet my firm's need once we adopt it. /在我们采纳了这一新技术之后，这一新技术能够有效的满足我公司的需求	Reworded as "I am confident that adopting new technology would be an effective way to meet firm's need. / 我相信（这一）新技术能够有效的满足我公司的需求."
	33. If my firm is able to adopts new technology, it would be much harder for other firms to compete with us. /如果我公司采纳了这一新技术，其他公司将很难与我们竞争	Deleted. Experts reported less connection with ability of adopting new technology
	34. Using new technology is compatible with all aspects of my firm. /使用这一新技术与我公司的各个方面都兼容	Experts reported these items have similar meaning. Suggested merge as two items: "I am confident that new technology would be compatible with the existing technologies in my firm. /我相信 (这一) 新技术将会与我公司目前使用的技术（们）兼容." and "I am confident that new technology would be compatible with the existing working environment in my firm. / 我相信 (这一) 新技术将会与目前我公司的工作环境兼容."
	35. Using new technology is completely compatible with my firm's current situation. /使用这一新技术与我公司目前的状况兼容	
	36. I think that using new technology fits well with the way my firm likes to work. /我认为使用这一新技术符合我公司所喜欢的工作方式	
	37. Using new technology fits into my firm's work style. /使用这一新技术符合我公司的工作方式	

Comments and Suggestions for Perceived Benefit Scale

Concept	Items	Action Taken
Attainment Value	1. Using new technology would give my firm an enjoyable status. /使用这一新技术能够为我公司带来令人满意的地位.	Reworded as "Using new technology would give my firm an enjoyable business status. /使用这一新技术能够为我公司带来令人满意的市场地位."
	2. Adopting new technology would make my firm to be prestigious. /采纳这一新技术能够让我公司具有威望.	
	3. Being good at solving problems which involve using new technology is important to my firm. /能够使用这一新技术解决公司遇到的问题，对公司来说是十分重要的.	
	4. I feel that adopting new technology is a necessary part of making my firm to be good in the future. /我认为采纳这一新技术对我公司能够在未来变得更好是十分必要的.	Deleted "I fell that".
	5. I feel that adopting new technology could let my firm to prove something. /我认为通过采纳这一新技术能够让我公司证明一些事情.	Deleted. Experts reported too vague meaning of "something".
	6. I value the prestige that my firm could enjoy which comes with adopting new technology. /我很重视采纳这一新技术所带给我公司的威望.	Deleted. Experts reported redundant with item 2.
	7. New technology is important to my firm. /这一新技术对我公司是很重要的.	Deleted. Experts reported too general meaning.
	8. It is important to my firm to be good at utilizing new technology. /我公司能够擅长使用这一新技术是十分重要的.	Deleted. Experts reported redundant with item 7. Suggested item added: "Adopting new technology would fit with the government's suggestion or guidance. /采纳这一新技术符合政府的政策(或建议)."
	9. Using new technology would improve my firm's image in the industry. /使用这一新技术能够提升我公司在行业中的形象.	
	10. Firms adopt new technology would have more prestige than those who do not. /采纳这一新技术的公司会比那些没采纳的公司拥有更多的威望.	Deleted. Experts reported redundant with item 2.
	11. Using new technology would give my firm a high profile. /采纳这一新技术让我公司更加引人注目.	Deleted. Experts reported redundant with item 9.
	12. Using new technology is a status symbol for my firm. /使用这一新技术对我公司来说是一种身份的象征.	Deleted. Experts reported redundant with item 5.
Intrinsic Value	13. My firm is keen to learn a lot in new technology. /我公司渴望学习这一新技术.	Deleted. Experts reported less association with new technology adoption.
	14. I think working with new technology in my firm is very interesting. /我认为在我公司使用这一新技术进行工作是十分有趣的.	Added item “People in my firm would think working with new technology is very interesting. / 公司人员认为使用（这一）新技术工作是有趣的."
	15. I like working with new technology in my firm. /我喜欢我公司能够使用这一新技术.	Added item “People in my firm would like working with new technology. / 公司人员喜欢用（这一）新技术工作."
	16. I find the idea of being new technology user to be very appealing. /我发现成为这一新技术的使用者是十分吸引人的.	Reworded "I find" as "I think". Added item “People in my firm would think the idea of being new technology user to be very appealing. /公司人员认为成为（这一）新技术的使用者是十分吸引人的."

Comments and Suggestions for Perceived Benefit Scale Made by Content Experts (Continued)

Concept	Items	Action Taken
Intrinsic Value	17. It is exciting to think about the challenge of adopting new technology in my firm. /考虑采纳这一新技术所带来的挑战是一件令人激动的事情.	Deleted. Experts reported less association with new technology adoption.
	18. I am excited about the idea of adopting new technology in my firm. /对于我公司采纳这一新技术这一事情，我很激动.	Deleted. experts reported redundant with item 19.
	19. I am look forward that my firm can use new technology. /我渴望我公司能够使用这一新技术.	Added item “People in my firm are look forward that the firm can use new technology. / 公司人员渴望公司能够使用（这一）新技术."
	20. I would welcome the challenge of doing the work to successfully adopt new technology in my firm. /我会欢迎我公司采纳这一新技术所带来的挑战.	Deleted. Experts reported less association with real experience.
	21. I look forward to advancing my knowledge by exploring new and challenging ideas in new technology. 我期待能在探索这一新技术的过程中拓展我的知识.	Deleted. Experts reported redundant with item 26.
	22. I enjoy overcoming the challenges to adopt new technology in my firm. /我享受在我公司采纳这一新技术时克服困难的过程.	Deleted. Experts reported less association with real experience.
	23. Adopting new technology means more than just money to my firm. /采纳这一新技术对我公司而言将不仅仅只是金钱上的收获.	Deleted. Experts reported vague in meaning.
	24. I am satisfied if my firm can adopt new technology. / 我很满意如果我公司能够采纳这一新技术.	Deleted. Experts reported redundant with item 19.
	25. Working with new technology is enjoyable. /使用这一新技术是一件让人享受的事情.	Deleted. Experts reported redundant with item 15.
	26. Learning new technology is interesting. /学习这一新技术是令人感兴趣的事情.	Added item “People in my firm would think learning new technology is interesting. / 公司人员认为学习使用（这一）新技术是有趣的."
Utility Value	27. Using new technology is useful for what my firm wants to do. /使用（这一）新技术能都让我公司做它想做的事情.	
	28. Using new technology would make financial gains for my firm. /使用（这一）新技术能够为我公司带来经济收益.	
	29. Using new technology would give my firm more opportunities in business. /使用这一新技术能够让我公司获得更多的市场机会.	
	30. Current technologies used in my firm are useless. /目前我公司所使用的技术是无用的.	Deleted. Experts reported too absolute item.
	31. Using the new technology will make managers in my firm being able to spend less time on their work. /使用这一新技术能够让公司管理者减少工作时间.	Experts reported these items have similar meaning. Suggested merge as one item "Using the new technology would improve work efficiency. /使用这一新技术能够提高工作效率."
	32. Using the new technology will make employees in my firm being able to spend less time on their work task. /使用这一新技术能够让公司员工者减少工作时间.	
	33. Using the new technology would make members in my firm enjoying their work. /使用这一新技术能够让公司人员享受他们的工作.	Item was suggested to move to intrinsic value

Comments and Suggestions for Perceived Benefit Scale Made by Content Experts (Continued)

Concept	Items	Action Taken
Utility Value	34. Using the new technology would increase peoples' ability to control firm's operation. /使用这一新技术能够增强公司人员掌控公司运营的能力.	
	35. Using the new technology would enhance the relationship between my firm and its customers and suppliers. /使用这一新技术能够增进公司与消费者和供应商的关系.	Separated the item as two: "Using new technology would enhance the relationship between my firm and its customers. /使用这一新技术能够增进公司与消费者的关系." and "Using new technology would enhance the relationship between my firm and its business partners. / 使用这一新技术能够增进公司与商业伙伴的关系."
	36. Using the new technology would make my firm to be easy to survive a severe crisis. /使用这一新技术能够让公司在危机中更容易生存.	
	37. Using the new technology would make my firm to be easy to maintain the quality of products and services. /使用这一新技术能够让公司更容易保持产品与服务的质量.	Separated the item as two: "Using new technology would make my firm to be easy to maintain the quality of products. / 使用这一新技术能够让公司更容易保持产品的质量." and "Using new technology would make my firm to be easy to maintain the quality of services. /使用这一新技术能够让公司更容易保持服务的质量."
	38. Using the new technology would enable my firm to accomplish tasks more quickly. /使用这一新技术能够让公司更快的完成工作任务.	
	39. Using the new technology would improve the quality of work. /使用这一新技术能够提升工作质量.	
	40. Using the new technology would make jobs easy. /使用这一新技术能够让工作变得更容易.	
	41. Using the new technology would improve job performance. /使用这一新技术能够提升工作的表现.	
	42. Using the new technology is advantage in my firm. / 使用这一新技术是我公司的一项优势.	Deleted. Experts reported too general item.
	43. Using the new technology would enhance job effectiveness. /使用这一新技术能够增强工作的有效性.	
	44. Using the new technology would give great control over work. /使用这一新技术能够提高对工作的控制力.	
	45. Using the new technology would increase my firm's productivity. /使用这一新技术能够增强公司的生产力.	
	46. Using the new technology would help my firm catch up with major competitors. /使用这一新技术能够帮助公司追上主要的竞争者.	Added item "The other firms have used the same new technology successfully. / 其他公司已经成功使用了同一新技术."
	47. Using the new technology would be useful in my firm. /使用这一新技术能够帮助到我公司.	Deleted. Experts reported too general item. Suggested item added "Using new technology would reduce cost. / 使用这一新技术可以降低成本."

Comments and Suggestions for Perceived Cost Scale

Concept	Items	Action Taken
Effort Cost	1. I am not sure all the work required in adopting new technology would be worth it in the end. /我不确定为了接纳(这一)新技术所付出的努力会是值得的.	
	2. I am not sure if my firm has the energy to adopt new technology. /我不确定是否公司具有能量去采纳(这一)新技术.	Deleted. Experts reported vague in meaning.
	3. Adopting new technology would demand too much of time. /采纳(这一)新技术需要大量的时间.	
	4. My firm has to put too much energy into adopting new technology. /我公司不得不付出大量的能量在采纳(这一)新技术上.	Deleted. Experts reported vague in meaning.
	5. Adopting new technology would require too much of effort. /采纳(这一)新技术需要大量的体力与精力.	
	6. .Adopting new technology means too much of work. /采纳(这一)新技术意味着大量的工作.	
	7. New technology are cumbersome to use. /(这一)新技术难以使用.	Deleted. Experts reported redundant with item 5 and 6.
	8. It is easy to get new technologies to do what my firm wants it to do. /用(这一)新技术去实现公司的工作设想是一件很容易的事情.	Deleted. Experts reported redundant with item 5 and 6.
	9. Learning how to use new technology is easy for my firm. /学习使用(这一)新技术对我公司来说很容易.	Deleted. Experts reported redundant with item 5 and 6.
	10. New technology would require technical skills. /使用(这一)新技术要求专业技能.	
	11. The interaction with new technologies would be clear and understandable. /与(这一)新技术的交互是清晰并容易理解的.	Experts reported these items have similar meaning. Suggested merge as one item "The interaction between new technology and users are unfriendly. /这一技术与人员的交互不够友好.
	12. New technology is flexible to interact with. /与(这一)新技术的交互是灵活的.	
	13. Easy for the members in my firm to become skillful at using new technology. /熟练使用(这一)新技术对我公司人员来说很容易.	Deleted. Experts reported redundant with item 5 and 6.
		Suggested item added: “Adopting new technology would demand too much of money. /采纳这一新技术需要大量的资金投入."
		Suggested item added: “It is hard to see the return in a short time. /采纳这一新技术很难在短期内得到回报."
		Suggested item added: “New technology would demand a long-time investment. /使用这一新技术需要长期地投入."
Opportunity Cost	14. Adopting new technology would take time away from other activities my firm wants to pursue. /用在采纳(这一)新技术上的时间将会挤占公司花在其他必要事情上的时间.	
	15. My firm has to sacrifice too much to adopt new technology. /为了采纳(这一)新技术我公司不得不牺牲很多.	Deleted. Experts reported vague in meaning.

Comments and Suggestions for Perceived Cost Scale Made by Content Experts (Continued)

Concept	Items	Action Taken
	16. Adopting new technology would requires my firm to give up too many other valued activities. /为了采纳(这一)新技术我公司不得不放弃很多其他有价值的事情.	Deleted. Some experts reported redundant with item 14 and others reported vague in meaning.
Psychological Cost	17. I would be upset if my firm is not able to be good at new technology. /我会很伤心如果我公司不能擅长(这一)新技术.	Deleted. Experts reported less association with cost.
	18. I am concern that my firm is not good enough to do well with new technology. /我担心我公司不够好去采纳(这一)新技术.	
	19. I worry that my firm will waste a lot of time and money before we find that we don't want to continue using new technology. /我担心我公司将会浪费时间和金钱当公司并不想继续使用(这一)新技术的时候.	Separated and reworded the item as two: "I worry that my firm would waste time if new technology will be only used for a short time in my firm. /我担心公司浪费时间，如果（这一）新技术只在公司使用较短时间." and "I worry that my firm would waste money if new technology will be only used for a short time in my firm. /我担心公司浪费金钱，如果（这一）新技术只在公司使用较短时间."
	20. I would be embarrassed if my firm started to adopt new technology, but we could not do it as well as the other firms. /我会感到很难堪如果我公司采纳(这一)新技术但是我们不能像其他公司那样把它使用好.	reword to "如果公司采纳（这一）新技术却不能向其他公司那样使用好，我会觉得很难堪."
	21. My self-esteem would suffer if my firm started to adopt new technology but failed at the end. /我的自尊会受到伤害如果我公司开始采纳了(这一)新技术但是最后(这一)新技术的使用我在公司失败了.	Deleted. Experts reported redundant with item 20.
	22. It frightens me that using new technology will be harder than the current one used in my firm. /我害怕使用(这一)新技术会比使用目前的技术更加困难.	
	23. I am concerned that people in my firm would not be able to handle the stress that working with new technology. /我担心我公司不能够处理好使用(这一)新技术所带来的压力.	
	24. I worry too much about adopting new technology. /我非常担心采纳(这一)新技术.	Deleted. Experts reported redundant with item 26.
	25. Adopting new technology is too exhausting. /采纳(这一)新技术让人筋疲力尽.	Deleted. Experts reported less association with real experience.
	26. Adopting new technology is emotionally draining. /采纳(这一)新技术让人身心憔悴.	
	27. Adopting new technology is too frustrating. /采纳(这一)新技术让人觉得沮丧.	
	28. Adopting new technology makes me feel too anxious. /采纳(这一)新技术让人忧虑.	Deleted. Experts reported redundant with item 26.
	29. Using new technology requires a lot of mental effort. /使用(这一)新技术需要大量的精力.	Deleted. Experts reported redundant with item 26.

APPENDIX D

INFORMATION OF COGNITIVE INTERVIEW

Survey Instrument and Interview Questions Used in Cognitive Interview

English Version (The English version was translated from Chinese version by the researcher)

Dear Participant,

This research aims to study and explore the decision-making process of adopting new technology in Chinese textile and apparel firms, especially the firm managers' expectancy, perceived benefit and perceived cost of new technology.

Please answer each question based on your own understanding. Your rating of each item is categorized in four response options, from "Strongly Disagree" to "Strongly Agree."

After that, you will be asked to give feedback about your understanding or perception of the items and the survey. Your answer will be used for generating a more concise and relevant item bank of expectancy, perceived benefit and perceived cost of new technology. Your answer will be audio recorded in the interview.

Note: In this research, new technology refers to any technology that had not been previously used but your firm is going to use or is discussing to use in near future. It could be in the form of hardware or software, like technologies that be used in apparel product development, design, processing and manufacturing, product distribution and sales, after-sales service, enterprise management, and general office.

Q1 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe the probability to successfully adopt new technology in my firm would increase, if _________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. People in my firm would be good at using new technology.	○	○	○	○
2. People in my firm could understand the knowledge of new technology.	○	○	○	○
3. People in my firm could understand the method used in new technology.	○	○	○	○
4. People in my firm could learn how to use the new technology.	○	○	○	○
5. People in my firm have skills of using new technology.	○	○	○	○
6. People in my firm could take on any challenge when adopt new technology.	○	○	○	○
7. People in my firm could coordinate their efforts to adopt new technology.	○	○	○	○
8. People in my firm could work unitedly to adopt new technology.	○	○	○	○
9. People in my firm would be competent to meet new technology's requirements.	○	○	○	○
10. My firm has managers who have vision to adopt new technology.	○	○	○	○
11. My firm has money to adopt new technology.	○	○	○	○
12. My firm has time to learn how to use new technology.	○	○	○	○
13. My firm has infrastructure to use new technology.	○	○	○	○
14. My firm is more innovative than most firms.	○	○	○	○

Q2 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe the probability to successfully adopt new technology in my firm would increase, if _________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree

1. I am confident that new technology would be effective in my firm.	○	○	○	○
2. I am confident that adopting new technology would be an effective way to meet firm's need.	○	○	○	○
3. I am confident that new technology would be compatible with the existing working environment in my firm.	○	○	○	○
4. I am confident that new technology would be compatible with the existing technologies in my firm.	○	○	○	○
5. I am sure about the results of using new technology in my firm.	○	○	○	○

Q3 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe adopting new technology would generate desired status in my firm, if ______________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Using new technology would give my firm an enjoyable business status	○	○	○	○
2. Adopting the new technology would make my firm to be prestigious.	○	○	○	○
3. Being good at solving problems which involve using new technology is important to my firm.	○	○	○	○
4. Adopting new technology is a necessary part of making my firm to be good in the future.	○	○	○	○
5 Adopting new technology would fit with the government's suggestion or guidance.	○	○	○	○
6. Using new technology would improve my firm's image in the industry.	○	○	○	○

Q4 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe adopting new technology would generate desired status in my firm, if ______________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree

1. I think working with new technology in my firm is interesting.	○	○	○	○
2. I like working with new technology in my firm.	○	○	○	○
3. I think the idea of being new technology user to be appealing.	○	○	○	○
4. I am look forward that my firm can use new technology.	○	○	○	○
5. I think learning new technology is interesting.	○	○	○	○
6. People in my firm think working with new technology is interesting.	○	○	○	○
7. People in my firm like working with new technology.	○	○	○	○
8. People in my firm think the idea of being new technology users to be appealing.	○	○	○	○
9. People in my firm are look forward that the firm can use new technology.	○	○	○	○
10. People in my firm think learning new technology is interesting.	○	○	○	○
11. Using new technology would make people in my firm enjoying their work.	○	○	○	○

Q5 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe adopting new technology would generate desired status in my firm, if ______________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Using new technology is useful for what my firm wants to do.	○	○	○	○
2. Using new technology would make financial gains for my firm.	○	○	○	○
3. Using new technology would give my firm more opportunities in business.	○	○	○	○
4. Using new technology would improve work efficiency.	○	○	○	○
5. Using new technology would increase people's ability to control firm's operation.	○	○	○	○
6. Using new technology would enhance the relationship between my firm and its customers.	○	○	○	○

7. Using new technology would enhance the relationship between my firm and its business partners.	○	○	○	○
8. Using new technology would make my firm to be easy to survive a severe crisis.	○	○	○	○
9. Using new technology would make my firm to be easy to maintain the quality of products.	○	○	○	○
10. Using new technology would make my firm to be easy to maintain the quality of services.	○	○	○	○
11. Using new technology would enable my firm to accomplish tasks more quickly.	○	○	○	○
12. Using new technology would improve the quality of work.	○	○	○	○
13. Using new technology would make jobs easy.	○	○	○	○
14. Using new technology would improve job performance.	○	○	○	○
15. Using new technology would enhance job effectiveness.	○	○	○	○
16. Using new technology would give control over work.	○	○	○	○
17. Using new technology would increase my firm's productivity.	○	○	○	○
18. Using new technology would help my firm catch up with major competitors.	○	○	○	○
19. Using new technology would reduce cost.	○	○	○	○
20. The other firms have used the same new technology successfully.	○	○	○	○

Q6 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe adopting new technology would generate desired status in my firm, if ______________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I am not sure all the work required in adopting the new technology would be worth it in the end.	○	○	○	○
2. Adopting new technology would demand too much of time.	○	○	○	○
3. Adopting new technology would require too much of effort.	○	○	○	○
4. Adopting new technology means too much of work.	○	○	○	○

5. New technology would require technical skills.	○	○	○	○
6. The interaction between new technology and users are unfriendly.	○	○	○	○
7. Adopting new technology would demand too much of money.	○	○	○	○
8. It is hard to see the return in a short time.	○	○	○	○
9. New technology would demand a long-time investment.	○	○	○	○
10. Adopting new technology would take time away from other activities my firm wants to pursue.	○	○	○	○

Q7 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe adopting new technology would generate desired status in my firm, if ______________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I am concern that my firm is not good enough to do well with new technology.	○	○	○	○
2. I worry that my firm would waste time if new technology will be only used for a short time in my firm.	○	○	○	○
3. I worry that my firm would waste money if new technology will be only used for a short time in my firm.	○	○	○	○
4. I would be embarrassed if my firm started to adopt new technology, but we could not do it as well as the other firms	○	○	○	○
5. It frightens me that using new technology will be harder than the current one used in my firm.	○	○	○	○
6. I am concerned that people in my firm would not be able to handle the stress that working with new technology.	○	○	○	○
7. Adopting new technology is emotionally draining.	○	○	○	○
8. Adopting the new technology is too frustrating.	○	○	○	○

After you finish this survey, please answer the following questions.

1. What do you think about the survey-instructions? Are they clear enough?
2. Which item do you think is confusing or difficult to understand?
3. Which item do you think can be revised to be more concise? And how?
4. Which item do you think is hard to response? Why?
5. Which items do you think are repetitive in meaning? Why?
6. Which items do you think can be deleted from the item bank? Why?

Chinese Version

尊敬的受访者！

此问卷旨在研究探索中国服装企业在新技术的采纳过程中的决策过程，尤其是企业管理者对于新技术的期望，感知利益与感知成本。

首先，请您评价对各题项的同意程度。选项从 1 到 4 分别为非常不同意，不同意，同意，以及非常同意。在问卷完成后， 您将会被询问关于问卷作答中的感受。您的回答将会被用来校正各题项。您的回答将会被录音。

注意：新技术泛指任何之前未在您企业使用过的，但是您的企业正在考虑，或机会使用的技术。比如服装产品开发技术，设计技术，加工生产制造技术，产品流通销售技术，售后服务技术，企业管理技术，协同办公技术等，及相关的软硬件设备设施或平台。

Q1 请用以下题项填充完成给出的句子，并对此句子给出您的判断

如果_______________，我认为在我公司成功采纳新技术的可能性会提高.

题项	强烈不同意	不同意	同意	强烈同意
1.公司人员擅长使用（这一）新技术	o	o	o	o
2.公司人员了解（这一）新技术所使用的知识	o	o	o	o
3.公司人员了解（这一）新技术所使用的方法	o	o	o	o
4.公司人员能够学习如何使用（这一）新技术	o	o	o	o
5.公司人员拥有使用（这一）新技术的技能	o	o	o	o
6.公司人员能够承担采纳（这一）新技术所带来的的挑战	o	o	o	o
7.公司人员能够协同合作去采纳（这一）新技术	o	o	o	o
8.公司人员能够团结一致地去采纳（这一）新技术	o	o	o	o
9.对于(这一)新技术的要求，我公司人员是称职的	o	o	o	o
10.公司管理层有足够的远见去采纳（这一）新技术	o	o	o	o
11.公司拥有采纳（这一）新技术的资金	o	o	o	o
12.公司有时间去学习如何使用（这一）新技术	o	o	o	o
13. 公司拥有采纳（这一）新技术的设施	o	o	o	o
14. 我公司相比其他公司更有创新性	o	o	o	o

Q2 请用以下题项填充完成给出的句子，并对此句子给出您的判断

如果________________，我认为在我公司成功采纳新技术的可能性会提高.

题项	强烈不同意	不同意	同意	强烈同意
1. 我相信(这一)新技术将在我公司起到效果	○	○	○	○
2. 我相信（这一）新技术能够有效的满足我公司的需求	○	○	○	○
3. 我相信(这一)新技术将会与目前我公司的工作环境兼容	○	○	○	○
4. 我相信(这一)新技术将会与我公司目前使用的技术（们）兼容	○	○	○	○
5. 我很明确使用（这一）新技术所带来的结果	○	○	○	○

Q3 请用以下题项填充完成给出的句子，并对此句子给出您的判断。

如果________________，我认为采纳这一技术是有价值的.

题项	强烈不同意	不同意	同意	强烈同意
1. 使用（这一）新技术能够为我公司带来令人满意的市场地位	○	○	○	○
2. 采纳（这一）新技术能够让我公司具有威望	○	○	○	○
3. 能够使用（这一）新技术解决公司遇到的问题，对公司来说是十分重要的	○	○	○	○
4. 我认为采纳（这一）新技术对我公司能够在未来变得更好是十分必要的	○	○	○	○
5. 采纳（这一）新技术符合政府的政策或建议	○	○	○	○
6. 使用（这一）新技术能够提升我公司在行业中的形象	○	○	○	○

Q4 请用以下题项填充完成给出的句子，并对此句子给出您的判断

如果________________，我认为采纳这一技术是有价值的.

题项	强烈不同意	不同意	同意	强烈同意
1. 我认为在公司使用（这一）新技术进行工作是十分有趣的	○	○	○	○
2. 我喜欢使用（这一）新技术	○	○	○	○
3. 我发现成为（这一）新技术的使用者是十分吸引人的	○	○	○	○
4. 我渴望我公司能够使用（这一）新技术	○	○	○	○
5. 我认为学习（这一）新技术是十分有趣的	○	○	○	○
6. 公司人员认为使用（这一）新技术进行工作是十分有趣的	○	○	○	○
7. 公司人员喜欢使用（这一）新技术	○	○	○	○
8. 公司人员发现成为（这一）新技术的使用者是十分吸引人的	○	○	○	○
9. 公司人员渴望我公司能够使用（这一）新技术	○	○	○	○
10. 公司人员认为学习（这一）新技术是十分有趣的	○	○	○	○
11. 使用（这一）新技术将令公司人员享受他们的工作	○	○	○	○

Q5 请用以下题项填充完成给出的句子，并对此句子给出您的判断

如果________________，我认为采纳这一技术是有价值的.

题项	强烈 不同意	不同意	同意	强烈 同意
1. 采纳（这一）新技术能都让公司做它想做的事情	o	o	o	o
2. 采纳（这一）新技术能够为公司带来经济收益	o	o	o	o
3. 采纳（这一）新技术能够让公司获得更多的市场机会	o	o	o	o
4. 使用（这一）新技术能够提高工作效率	o	o	o	o
5. 使用（这一）新技术能够增强公司人员掌控公司运营的能力	o	o	o	o
6. 使用（这一）新技术能够增进公司与消费者的关系	o	o	o	o
7. 使用（这一）新技术能够增进公司与商业伙伴的关系	o	o	o	o
8. 使用（这一）新技术能够让公司在危机中更容易生存.	o	o	o	o
9. 使用（这一）新技术能够让公司更容易保持产品的质量.	o	o	o	o
10. 使用（这一）新技术能够让公司更容易保持服务的质量.	o	o	o	o
11. 使用（这一）新技术能够让公司更快的完成工作任务.	o	o	o	o
12. 使用（这一）新技术能够提升工作质量.	o	o	o	o
13. 使用（这一）新技术能够让工作变得更容易.	o	o	o	o
14. 使用（这一）新技术能够提升工作的表现.	o	o	o	o
15. 使用（这一）新技术能够增强工作的有效性.	o	o	o	o
16. 使用（这一）新技术能够提高对工作的控制力.	o	o	o	o
17. 使用（这一）新技术能够增强公司的生产力.	o	o	o	o
18. 使用（这一）新技术能够帮助公司追上主要的竞争者.	o	o	o	o
19. 使用（这一）新技术可以降低成本	o	o	o	o
20. 其他公司已经成功使用了在（这一）新技术	o	o	o	o

Q6 请用以下题项填充完成给出的句子，并对此句子给出您的判断

如果_______________，我认为采纳这一技术是有价值的.

题项	强烈 不同意	不同意	同意	强烈 同意
1. 我不确定为了采纳（这一）新技术所付出的努力会是值得的	o	o	o	o
2. 采纳（这一）新技术需要大量的时间	o	o	o	o
3. 采纳（这一）新技术需要大量的体力与精力	o	o	o	o
4. 采纳（这一）新技术意味着大量的工作	o	o	o	o
5. 使用（这一）新技术要求专业技能	o	o	o	o
6. （这一）新技术与人员的交互不够友好.	o	o	o	o
7. 采纳（这一）新技术需要大量的资金投入	o	o	o	o
8. 采纳（这一）新技术很难在短期内得到回报	o	o	o	o
9. （这一）新技术需要长期地投入	o	o	o	o
10. 用在采纳（这一）新技术上的时间将会挤占公司用在其他必要事情上的时间.	o	o	o	o

Q7 请用以下题项填充完成给出的句子，并对此句子给出您的判断

如果________________，我认为采纳这一技术是有价值的.

题项	强烈不同意	不同意	同意	强烈同意
1. 我担心我公司不够好去采纳（这一）新技术	o	o	o	o
2. 我担心公司浪费时间，当（这一）新技术只在公司使用较短时间	o	o	o	o
3. 我担心公司浪费金钱，当（这一）新技术只在公司使用较短时间	o	o	o	o
4. 公司采纳（这一）新技术却不能向其他公司那样使用好，我会觉得很难堪	o	o	o	o
5. 我害怕使用（这一）新技术会比使用目前的技术更加困难	o	o	o	o
6. 我担心公司人员不能够处理好使用 (这一) 新技术所带来的压力	o	o	o	o
7. 采纳这一新技术让人身心憔悴	o	o	o	o
8. 采纳这一新技术让人觉得沮丧	o	o	o	o

在您完成问卷的作答后，请回答以下问题：

1. 您怎么看待问卷的说明？它是否足够清楚呢？
2. 哪些题项让您感到迷糊或难以理解？
3. 哪些题项您认为还可以更简洁？如何修改呢？
4. 哪些题项您认为是难以回答的？为什么？
5. 哪些题项您认为是在意思上重复的？为什么？
6. 哪些题项您认为是可以删除的？为什么？

Initial Item Bank of Expectancy after Cognitive Interview

	Item (English)	Item (Chinese)
E1	People in my firm would be good at using new technology	公司人员擅长使用（这一）新技术
E2	People in my firm could understand the knowledge of new technology	公司人员了解（这一）新技术所使用的知识
E3	People in my firm could understand the method used in new technology	公司人员了解（这一）新技术所使用的方法
E4	People in my firm could learn how to use the new technology	公司人员能够学习如何使用（这一）新技术
E5	People in my firm have skills of using new technology	公司人员拥有使用（这一）新技术的技能
E6	People in my firm could take on any challenge when adopt new technology	公司人员能够承担采纳（这一）新技术所带来的的挑战
E7	People in my firm could coordinate their efforts to adopt new technology	公司人员能够协同合作去采纳（这一）新技术
E8	People in my firm could work unitedly to adopt new technology	公司人员能够团结一致地去采纳（这一）新技术
E9	People in my firm would be competent to meet new technology's requirements	对于(这一)新技术的要求，我公司人员是称职的
E10	My firm has managers who have vision to adopt new technology	公司管理层有足够的远见去采纳（这一）新技术
E11	My firm has money to adopt new technology	公司拥有采纳（这一）新技术的资金
E12	My firm has time to learn how to use new technology	公司有时间去学习如何使用（这一）新技术
E13	My firm has infrastructure to use new technology	公司拥有采纳（这一）新技术的设施
E14	My firm is more innovative than most firms	我公司相比其他公司更有创新性
E15	I am confident that new technology would be effective in my firm	我相信(这一)新技术将在我公司起到效果
E16	I am confident that adopting new technology would be an effective way to meet firm's need	我相信（这一）新技术能够有效的满足我公司的需求
E17	I am confident that new technology would be compatible with the existing working environment in my firm	我相信(这一)新技术将会与目前我公司的工作环境兼容
E18	I am confident that new technology would be compatible with the existing technologies in my firm	我相信(这一)新技术将会与我公司目前使用的技术（们）兼容
E19	I am sure about the results of using new technology in my firm	我很明确使用（这一）新技术所带来的结果

Initial Item Bank of Perceived Benefit after Cognitive Interview

	Item (English)	Item (Chinese)
B1	Using new technology would give my firm an enjoyable business status	使用（这一）新技术能够为我公司带来令人满意的市场地位
B2	Adopting the new technology would make my firm to be prestigious	采纳（这一）新技术能够让我公司具有威望
B3	Being good at solving problems which involve using new technology is important to my firm	能够使用（这一）新技术解决公司遇到的问题，对公司来说是十分重要的
B4	Adopting new technology is a necessary part of making my firm to be good in the future	我认为采纳（这一）新技术对我公司能够在未来变得更好是十分必要的
B5	Adopting new technology would fit with the government's suggestion or guidance	采纳（这一）新技术符合政府的政策或建议
B6	Using new technology would improve my firm's image in the industry	使用（这一）新技术能够提升我公司在行业中的形象
B7	I think working with new technology in my firm is interesting	我认为在公司使用（这一）新技术进行工作是十分有趣的
B8	I like working with new technology in my firm	我喜欢使用（这一）新技术
B9	I think the idea of being new technology user to be appealing	我发现成为（这一）新技术的使用者是十分吸引人的
B10	I am look forward that my firm can use new technology	我渴望我公司能够使用（这一）新技术
B11	I think learning new technology is interesting	我认为学习（这一）新技术是十分有趣的
B12	People in my firm think working with new technology is interesting	公司人员认为使用（这一）新技术进行工作是十分有趣的
B13	People in my firm like working with new technology	公司人员喜欢使用（这一）新技术
B14	People in my firm think the idea of being new technology users to be appealing	公司人员发现成为（这一）新技术的使用者是十分吸引人的
B15	People in my firm are look forward that the firm can use new technology	公司人员渴望我公司能够使用（这一）新技术
B16	People in my firm think learning new technology is interesting	公司人员认为学习（这一）新技术是十分有趣的
B17	Using new technology would make people in my firm enjoying their work	使用（这一）新技术将令公司人员享受他们的工作
B18	Using new technology is useful for what my firm wants to do	采纳（这一）新技术能都让公司做它想做的事情
B19	Using new technology would make financial gains for my firm	采纳（这一）新技术能够为公司带来经济收益
B20	Using new technology would give my firm more opportunities in business	采纳（这一）新技术能够让公司获得更多的市场机会
B21	Using new technology would improve work efficiency	使用（这一）新技术能够提高工作效率
B22	Using new technology would increase people's ability to control firm's operation	使用（这一）新技术能够增强公司人员掌控公司运营的能力
B23	Using new technology would enhance the relationship between my firm and its customers	使用（这一）新技术能够增进公司与消费者的关系

Initial Item Bank of Perceived Benefit of New Technology after Cognitive Interview (Continued)

	Item (English)	Item (Chinese)
B24	Using new technology would enhance the relationship between my firm and its business partners	使用（这一）新技术能够增进公司与商业伙伴的关系
B25	Using new technology would make my firm to be easy to survive a severe crisis	使用（这一）新技术能够让公司在危机中更容易生存.
B26	Using new technology would make my firm to be easy to maintain the quality of products	使用（这一）新技术能够让公司更容易保持产品的质量.
B27	Using new technology would make my firm to be easy to maintain the quality of services	使用（这一）新技术能够让公司更容易保持服务的质量.
B28	Using new technology would enable my firm to accomplish tasks more quickly	使用（这一）新技术能够让公司更快的完成工作任务.
B29	Using new technology would improve the quality of work	使用（这一）新技术能够提升工作质量.
B30	Using new technology would make jobs easy	使用（这一）新技术能够让工作变得更容易.
B31	Using new technology would improve job performance	使用（这一）新技术能够提升工作的表现.
B32	Using new technology would enhance job effectiveness	使用（这一）新技术能够增强工作的有效性.
B33	Using new technology would give control over work	使用（这一）新技术能够提高对工作的控制力.
B34	Using new technology would increase my firm's productivity	使用（这一）新技术能够增强公司的生产力.
B35	Using new technology would help my firm catch up with major competitors	使用（这一）新技术能够帮助公司追上主要的竞争者.
B36	Using new technology would reduce cost	使用（这一）新技术可以降低成本
B37	The other firms have used the same new technology successfully	其他公司已经成功使用了在（这一）新技术

Initial Item Bank of Perceived Cost after Cognitive Interview

	Item (English)	Item (Chinese)
C1	I am not sure all the work required in adopting the new technology would be worth it in the end	我不确定为了采纳（这一）新技术所付出的努力会是值得的
C2	Adopting new technology would demand too much of time	采纳（这一）新技术需要大量的时间
C3	Adopting new technology would require too much of effort	采纳（这一）新技术需要大量的体力与精力
C4	Adopting new technology means too much of work	采纳（这一）新技术意味着大量的工作
C5	New technology would require technical skills	使用（这一）新技术要求专业技能
C6	The interaction between new technology and users are unfriendly	(这一）新技术与人员的交互不够友好.
C7	Adopting new technology would demand too much of money	采纳（这一）新技术需要大量的资金投入
C8	It is hard to see the return in a short time	采纳（这一）新技术很难在短期内得到回报
C9	New technology would demand a long-time investment	(这一）新技术需要长期地投入
C10	Adopting new technology would take time away from other activities my firm wants to pursue	用在采纳（这一）新技术上的时间将会挤占公司用在其他必要事情上的时间.
C11	I am concern that my firm is not good enough to do well with new technology	我担心我公司不够好去采纳（这一）新技术
C12	I worry that my firm would waste time if new technology will be only used for a short time in my firm	我担心公司浪费时间，当（这一）新技术只在公司使用较短时间
C13	I worry that my firm would waste money if new technology will be only used for a short time in my firm	我担心公司浪费金钱，当（这一）新技术只在公司使用较短时间
C14	I would be embarrassed if my firm started to adopt new technology, but we could not do it as well as the other firms	公司采纳（这一）新技术却不能向其他公司那样使用好，我会觉得很难堪
C15	It frightens me that using new technology will be harder than the current one used in my firm	我害怕使用（这一）新技术会比使用目前的技术更加困难
C16	I am concerned that my firm would not be able to handle the stress that working with new technology	我担心公司人员不能够处理好使用 (这一) 新技术所带来的压力
C17	Adopting new technology is emotionally draining	采纳这一新技术让人身心憔悴
C18	Adopting the new technology is too frustrating	采纳这一新技术让人觉得沮丧

APPENDIX E

IRB APPROVAL FOR ONLINE SURVEY, RECRUITMENT SCRIPT, CONSENT FORM, SURVEY INSTRUMENT

IRB Approval

Institutional Review Board
University of Missouri-Columbia
FWA Number: 0002876
IRB Registration Numbers: 00000731, 00009014

482 McReynolds Hall
Columbia, MO 65211
573-882-3181
irb@missouri.edu

December 14, 2018

Principal Investigator: Baolu Wang
Department: Textile and Apparel Mgmt

Your IRB Application to project entitled Expectancy and Perceived Value of New Technology: Scale Development in the Context of Chinese Textile and Apparel Firm Managers was reviewed and approved by the MU Institutional Review Board according to the terms and conditions described below:

IRB Project Number	2013365
IRB Review Number	243699
Initial Application Approval Date	December 14, 2018
IRB Expiration Date	December 14, 2019
Level of Review	Exempt
Project Status	Active - Exempt
Exempt Categories	45 CFR 46.101b(2)
Risk Level	Minimal Risk

The principal investigator (PI) is responsible for all aspects and conduct of this study. The PI must comply with the following conditions of the approval:

1. No subjects may be involved in any study procedure prior to the IRB approval date or after the expiration date.
2. All changes must be IRB approved prior to implementation utilizing the Exempt Amendment Form.
3. The Annual Exempt Form must be submitted to the IRB for review and approval at least 30 days prior to the project expiration date to keep the study active or to close it.
4. Maintain all research records for a period of seven years from the project completion date.

If you have any questions, please contact the IRB at 573-882-3181 or irb@missouri.edu.

Thank you,
MU Institutional Review Board

Recruitment Script

Dear Participants,

This is Baolu Wang from the University of Missouri. I am sincerely inviting you to participate into one research conducted by myself. The primary goal of this research is to develop scales that are valid and reliable to successfully measure Chinese textile and apparel firm managers' expectancy and perceived value of new technology adoption. You will be asked to answer questions based on your perception of technology adoption behavior in your working experience. Your participation will help today's textile and apparel industry with better understanding of technology adoption behavior.

If you are working in management in Chinese textile and apparel firms, you are encouraged to participate. The survey will take approximately 15 minutes to complete. Participation in this study is completely voluntary. If you wish to participate, please sign the following consent form.
The research questionnaire will be provided after you sign the consent form.

If you have any questions about the study or questionnaire, please contact Baolu Wang at bwyvf@mail.missouri.edu

Thank you so much for your participation.

亲爱的的参与者，

我是王保鲁，来自美国密苏里大学。我诚挚地邀请您参加一项由我开展的研究。这一研究旨在生成中国纺织服装企业管理者对于新技术的期待与感知价值量表。您将会被问到有关您对于新技术接受的感知的相关问题。您的参与将会帮助目前的纺织服装行业更好的理解新技术接受的行为。

如果您在中国纺织服装企业的管理层工作，那么您是我们潜在的调查参与者。这一研究将会持续约15分钟。您的参与将是完全自愿的，没有报酬将会提供。如果您愿意参与，请您在同意书中签字。研究问卷将会在您确认参加本次研究后提供给您。

如果您对于这一研究或问卷还有疑问，请您联系王保鲁 bwyvf@mail.missouri.edu

十分感谢您的参与！

Consent Form

The primary goal of this research is to develop scales that are valid and reliable to successfully measure Chinese textile and apparel firm managers' expectancy and perceived value of new technology adoption. You will be asked to answer questions based on your perception of technology adoption behavior. Your participation will help today's textile and apparel industry with better understanding of technology adoption behavior.

Confidentiality:

Data for the survey will be saved anonymously. Throughout the survey, you may choose to not answer any question(s) and you may stop participating any time.

Risks:

There are no potential risks associated with participating in this study.

Compensation:

No compensation will be provided.

For more information about the study or to withdraw from the study, please contact: Baolu Wang at bwyvf@mail.missouri.edu.

If you have any questions regarding your rights as a participant of this research, please contact the University of Missouri Campus IRB at 573-882-9585.

By signing this form, you confirm you consent to participate in this research study.

Signature____________________ Date_________________________

研究同意书

这一研究旨在生成中国纺织服装企业管理者对于新技术的期待与感知价值量表。您将会被问到有关您对于新技术接受的感知的相关问题。您的参与将会帮助目前的纺织服装行业更好的理解新技术接受的行为。

保密性:
所有信息的收集与存储均为匿名。在研究中途，您可以选择在任何时候退出本次研究。

风险:

参与本次研究无任何风险。

报酬:

参与本次研究无任何报酬。

如果您对于这一研究或问卷还有疑问，请您联系王保鲁 bwyvf@mail.missouri.edu

如果您对于您在研究中的权力存有疑问， 请联系密苏里大学 IRB 573-882-9585。

通过签字，您确认同意参与本次研究。

署名___________________ 日期________________________

Survey Instrument

English Version (The English version was translated from Chinese version by the researcher)

Dear Participant,

This survey aims to study and explore the decision-making process of adopting new technology in Chinese textile and apparel firms, especially the firm managers' expectancy and perceived value of new technology.

Before starting the survey, please answer the following questions based on your working experience.

Q1 Do you work in the textile and apparel industry? (including jobs related to design, development, production, distributing, merchandising, retailing, sourcing, selling, and marketing of textile and/or apparel products in textile and/or apparel firms)

- ❍ Yes
- ❍ No

(If choose No: Sorry, but you are not eligible for this study. Thanks for participating.)

Q2 How many years of work experience do you have working in the textile and apparel industry?

- ❍ Less than a year
- ❍ A year or more

(If choose Less than a year: Sorry, but you are not eligible for this study. Thanks for participating.)

Q3 Which job position(s) do you work at in the textile and apparel industry?

- ❍ At the level or similar level of Firm Owner or President or Partner
- ❍ At the level or similar level of Department Director
- ❍ At the level or similar level of Department Manager
- ❍ No, I never work at the above-mentioned job positions

(If choose No: Sorry, but you are not eligible for this study. Thanks for participating.)

Q4 Do you have a role in the decision-making process when your firm or department would like to adopt new technology?

- ❍ Yes
- ❍ No

(If choose No: Sorry, but you are not eligible for this study. Thanks for participating.)

Congratulation! You are eligible for this survey. Now, in the following questionnaire, you will see a series of items asking for your opinions about new technology adoption. Here, new technology stands for any technologies that can work for practical purposes and have not been used in your firm before, including hardware (i.e., machinery and equipment) and software. When answering the survey, you could refer it as the new technology that your firm or department is considering to adopt now, or the new technology that your firm or department is going to adopt (or plan to adopt) in future.

Your rating of each item is categorized in four response options based on the extent of your agreement, from “Strongly Disagree” to “Strongly Agree.”

Q1 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe the probability to successfully adopt new technology in my firm would increase, if _________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. People in my firm would be good at using new technology.	○	○	○	○
2. People in my firm could understand the knowledge of new technology.	○	○	○	○
3. People in my firm could understand the method used in new technology.	○	○	○	○
4. People in my firm could learn how to use the new technology.	○	○	○	○
5. People in my firm have skills of using new technology.	○	○	○	○
6. People in my firm could take on any challenge when adopt new technology.	○	○	○	○
7. People in my firm could coordinate their efforts to adopt new technology.	○	○	○	○
8. People in my firm could work unitedly to adopt new technology.	○	○	○	○
9. People in my firm would be competent to meet new technology's requirements.	○	○	○	○
10. My firm has managers who have vision to adopt new technology.	○	○	○	○
11. My firm has money to adopt new technology.	○	○	○	○
12. My firm has time to learn how to use new technology.	○	○	○	○
13. My firm has infrastructure to use new technology.	○	○	○	○
14. My firm is more innovative than most firms.	○	○	○	○

Q2 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe the probability to successfully adopt new technology in my firm would increase, if ______________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I am confident that new technology would be effective in my firm.	○	○	○	○
2. I am confident that adopting new technology would be an effective way to meet firm's need.	○	○	○	○
3. I am confident that new technology would be compatible with the existing working environment in my firm.	○	○	○	○
4. I am confident that new technology would be compatible with the existing technologies in my firm.	○	○	○	○
5. I am sure about the results of using new technology in my firm.	○	○	○	○

Q3 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe adopting new technology would generate desired status in my firm, if ______________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Using new technology would give my firm an enjoyable business status	○	○	○	○
2. Adopting the new technology would make my firm to be prestigious.	○	○	○	○
3. Being good at solving problems which involve using new technology is important to my firm.	○	○	○	○
4. Adopting new technology is a necessary part of making my firm to be good in the future.	○	○	○	○
5 Adopting new technology would fit with the government's suggestion or guidance.	○	○	○	○
6. Using new technology would improve my firm's image in the industry.	○	○	○	○

Q4 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe adopting new technology would generate desired status in my firm, if ______________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I think working with new technology in my firm is interesting.	○	○	○	○
2. I like working with new technology in my firm.	○	○	○	○
3. I think the idea of being new technology user to be appealing.	○	○	○	○
4. I am look forward that my firm can use new technology.	○	○	○	○
5. I think learning new technology is interesting.	○	○	○	○
6. People in my firm think working with new technology is interesting.	○	○	○	○
7. People in my firm like working with new technology.	○	○	○	○
8. People in my firm think the idea of being new technology users to be appealing.	○	○	○	○
9. People in my firm are look forward that the firm can use new technology.	○	○	○	○
10. People in my firm think learning new technology is interesting.	○	○	○	○
11. Using new technology would make people in my firm enjoying their work.	○	○	○	○

Q5 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe adopting new technology would generate desired status in my firm, if __________________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Using new technology is useful for what my firm wants to do.	○	○	○	○
2. Using new technology would make financial gains for my firm.	○	○	○	○
3. Using new technology would give my firm more opportunities in business.	○	○	○	○
4. Using new technology would improve work efficiency.	○	○	○	○
5. Using new technology would increase people's ability to control firm's operation.	○	○	○	○
6. Using new technology would enhance the relationship between my firm and its customers.	○	○	○	○
7. Using new technology would enhance the relationship between my firm and its business partners.	○	○	○	○

8. Using new technology would make my firm to be easy to survive a severe crisis.	○	○	○	○
9. Using new technology would make my firm to be easy to maintain the quality of products.	○	○	○	○
10. Using new technology would make my firm to be easy to maintain the quality of services.	○	○	○	○
11. Using new technology would enable my firm to accomplish tasks more quickly.	○	○	○	○
12. Using new technology would improve the quality of work.	○	○	○	○
13. Using new technology would make jobs easy.	○	○	○	○
14. Using new technology would improve job performance.	○	○	○	○
15. Using new technology would enhance job effectiveness.	○	○	○	○
16. Using new technology would give control over work.	○	○	○	○
17. Using new technology would increase my firm's productivity.	○	○	○	○
18. Using new technology would help my firm catch up with major competitors.	○	○	○	○
19. Using new technology would reduce cost.	○	○	○	○
20. The other firms have used the same new technology successfully.	○	○	○	○

Q6 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe adopting new technology would generate desired status in my firm, if ______________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I am not sure all the work required in adopting the new technology would be worth it in the end.	○	○	○	○
2. Adopting new technology would demand too much of time.	○	○	○	○
3. Adopting new technology means too much of work.	○	○	○	○
4. Adopting new technology would require too much of effort.	○	○	○	○
5. New technology would require technical skills.	○	○	○	○
6. The interaction between new technology and users are unfriendly.	○	○	○	○
7. Adopting new technology would demand too much of money.	○	○	○	○
8. It is hard to see the return in a short time.	○	○	○	○

9. New technology would demand a long-time investment.	○	○	○	○
10. Adopting new technology would take time away from other activities my firm wants to pursue.	○	○	○	○

Q7 Please fulfil the statement with each item, and then read and indicate your response choices.

I believe adopting new technology would generate desired status in my firm, if ______________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I am concern that my firm is not good enough to do well with new technology.	○	○	○	○
2. I worry that my firm would waste time if new technology will be only used for a short time in my firm.	○	○	○	○
3. I worry that my firm would waste money if new technology will be only used for a short time in my firm.	○	○	○	○
4. I would be embarrassed if my firm started to adopt new technology, but we could not do it as well as the other firms	○	○	○	○
5. It frightens me that using new technology will be harder than the current one used in my firm.	○	○	○	○
6. I am concerned that my firm would not be able to handle the stress that working with new technology.	○	○	○	○
7. Adopting new technology is emotionally draining.	○	○	○	○
8. Adopting the new technology is too frustrating.	○	○	○	○

Q8 Thank you for answering the above questions. Please read the below questions carefully and indicate your response choices.

If I believe my firm has a high probability to successfully adopt new technology, _________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I intend to support adopting new technology in my firm	○	○	○	○
2. I will recommend other managers to support adopting new technology in my firm	○	○	○	○
3. I will continually support adopt new technology in my firm	○	○	○	○

Q9 Please read the below questions carefully and indicate your response choices.

If I believe adopting new technology would generate desired status in my firm, ________________.

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I will try hard to support my firm adopting new technology.	○	○	○	○
2. I feel my firm need adopting new technology.	○	○	○	○
3. I intend to support my firm adopting new technology.	○	○	○	○
4. I will recommend other managers in my firm to support adopting new technology.	○	○	○	○
5. I will frequently support my firm adopt new technology.	○	○	○	○

Q10 The researcher would like to know a little bit about you and your firm. Please answer the following questions.

Which of the following best describes your age in years?

❍ 20 and below
❍ 21-30
❍ 31-40
❍ 41-50
❍ 51-60
❍ 61 and Over

Q11 Please indicate your gender identity.

❍ Male
❍ Female

Q12 Please indicate the type of your firm

❍ Apparel firm
❍ Textile firm
❍ Others____________

Q13 Please indicate the ownership of your firm

❍ Private owned firm
❍ State owned frim
❍ Sino-foreign Joint Venture frim
❍ Others ________

Q14 Please indicate the size of your firm

- micro firm (less than 10 employees or 1 million RMB annual revenue)
- small-size firm (10-50 employees or annual revenue of 1-5 million RMB)
- middle-size firm (51-300 employees or annual revenue of 5-40 million RMB)
- big-size firm (more than 300 employees or annual revenue of more than 40 million RMB)

Chinese Version

尊敬的受访者！

此问卷旨在研究探索中国服装企业在新技术的采纳过程中的决策过程，尤其是企业管理者对于新技术的期望与感知价值。

在本次调研中，新技术泛指任何之前未在企业使用过的技术，比如服装产品开发技术，设计技术，加工生产制造技术，产品流通销售技术，售后服务技术，企业管理技术，协同办公技术等，及相关的软硬件设备设施或平台。

请您先根据您的实际情况回答如下问题：

Q1 您是否在纺织服装行业内工作过？（包含任何有关纺织品或服装产品的设计开发，生产制造，市场营销，商品企划，跟单外贸，零售批发等工作）

- 是
- 否

（如果回答否：对不起，您不符合本次研究的样本要求。谢谢您的参与）

Q2 您在纺织服装行业内所从事的工作岗位？

- 公司的拥有者/合伙人/最高领导者或者其他相似的岗位
- 公司部门总监或者其他相似的岗位
- 公司部门经理或者其他相似的岗位
- 我没有在以上岗位工作过

（如果回答没有在以上岗位工作过：对不起，您不符合本次研究的样本要求。谢谢您的参与）

Q3 您在以上工作岗位中的工作时间是？（如果多个岗位，请把各岗位工作时间相加）

- 少于一年
- 一年或多于一年

（如果回答少于一年：对不起，您不符合本次研究的样本要求。谢谢您的参与）

Q4 在纺织服装行业内工作期间，您是否有过作为公司决策者参与决定在公司采纳一项新技术的经历？（无论最终公司采纳或没有采纳这一新技术）

- 是
- 否

（如果回答否：对不起，您不符合本次研究的样本要求。谢谢您的参与）

谢谢您的配合！现在问卷调研正式开始。

在本次调研中，请先回想您所处的纺织服装企业上一次采纳新技术时的情景。请用此项技术作为例子，并评价您对各题项的同意程度。选项从 1 到 4 分别为非常不同意，不同意，同意，以及非常同意。

Q1 请用以下题项填充完成给出的句子，并对此句子给出您的判断。

如果________________，我认为在我公司成功采纳新技术的可能性会提高.

题项	强烈 不同意	不同意	同意	强烈 同意
1. 公司人员擅长使用（这一）新技术	○	○	○	○
2. 公司人员了解（这一）新技术所使用的知识	○	○	○	○
3. 公司人员了解（这一）新技术所使用的方法	○	○	○	○
4. 公司人员能够学习如何使用（这一）新技术	○	○	○	○
5. 公司人员拥有使用（这一）新技术的技能	○	○	○	○
6. 公司人员能够承担采纳（这一）新技术所带来的的挑战	○	○	○	○
7. 公司人员能够协同合作去采纳（这一）新技术	○	○	○	○
8. 公司人员能够团结一致地去采纳（这一）新技术	○	○	○	○
9. 对于(这一)新技术的要求，我公司人员是称职的	○	○	○	○
10. 公司管理层有足够的远见去采纳（这一）新技术	○	○	○	○
11. 公司拥有采纳（这一）新技术的资金	○	○	○	○
12. 公司有时间去学习如何使用（这一）新技术	○	○	○	○
13. 公司拥有采纳（这一）新技术的设施	○	○	○	○
14. 我公司相比其他公司更有创新性	○	○	○	○

Q2 请用以下题项填充完成给出的句子，并对此句子给出您的判断。

如果________________，我认为在我公司成功采纳新技术的可能性会提高.

题项	强烈 不同意	不同意	同意	强烈 同意
1. 我相信(这一)新技术将在我公司起到效果	○	○	○	○
2. 我相信（这一）新技术能够有效的满足我公司的需求	○	○	○	○
3. 我相信(这一)新技术将会与目前我公司的工作环境兼容	○	○	○	○
4. 我相信(这一)新技术将会与我公司目前使用的技术（们）兼容	○	○	○	○
5. 我很明确使用（这一）新技术所带来的结果	○	○	○	○

Q3 请用以下题项填充完成给出的句子，并对此句子给出您的判断。

如果________________，我认为采纳这一技术是有价值的.

题项	强烈 不同意	不同意	同意	强烈 同意
1. 使用（这一）新技术能够为我公司带来令人满意的市场地位	○	○	○	○
2. 采纳（这一）新技术能够让我公司具有威望	○	○	○	○

3. 能够使用（这一）新技术解决公司遇到的问题，对公司来说是十分重要的	o	o	o	o
4. 我认为采纳（这一）新技术对我公司能够在未来变得更好是十分必要的	o	o	o	o
5. 采纳（这一）新技术符合政府的政策或建议	o	o	o	o
6. 使用（这一）新技术能够提升我公司在行业中的形象	o	o	o	o

Q4 请用以下题项填充完成给出的句子，并对此句子给出您的判断。

如果________________，我认为采纳这一技术是有价值的.

题项	强烈不同意	不同意	同意	强烈同意
1. 我认为在公司使用（这一）新技术进行工作是十分有趣的	o	o	o	o
2. 我喜欢使用（这一）新技术	o	o	o	o
3. 我发现成为（这一）新技术的使用者是十分吸引人的	o	o	o	o
4. 我渴望我公司能够使用（这一）新技术	o	o	o	o
5. 我认为学习（这一）新技术是十分有趣的	o	o	o	o
6. 公司人员认为使用（这一）新技术进行工作是十分有趣的	o	o	o	o
7. 公司人员喜欢使用（这一）新技术	o	o	o	o
8. 公司人员发现成为（这一）新技术的使用者是十分吸引人的	o	o	o	o
9. 公司人员渴望我公司能够使用（这一）新技术	o	o	o	o
10. 公司人员认为学习（这一）新技术是十分有趣的	o	o	o	o
11. 使用（这一）新技术将令公司人员享受他们的工作	o	o	o	o

Q5 请用以下题项填充完成给出的句子，并对此句子给出您的判断。

如果________________，我认为采纳这一技术是有价值的.

题项	强烈不同意	不同意	同意	强烈同意
1. 采纳（这一）新技术能都让公司做它想做的事情	o	o	o	o
2. 采纳（这一）新技术能够为公司带来经济收益	o	o	o	o
3. 采纳（这一）新技术能够让公司获得更多的市场机会	o	o	o	o
4. 使用（这一）新技术能够提高工作效率	o	o	o	o
5. 使用（这一）新技术能够增强公司人员掌控公司运营的能力	o	o	o	o
6. 使用（这一）新技术能够增进公司与消费者的关系	o	o	o	o
7. 使用（这一）新技术能够增进公司与商业伙伴的关系	o	o	o	o
8. 使用（这一）新技术能够让公司在危机中更容易生存.	o	o	o	o
9. 使用（这一）新技术能够让公司更容易保持产品的质量.	o	o	o	o
10. 使用（这一）新技术能够让公司更容易保持服务的质量.	o	o	o	o
11. 使用（这一）新技术能够让公司更快的完成工作任务.	o	o	o	o
12. 使用（这一）新技术能够提升工作质量.	o	o	o	o
13. 使用（这一）新技术能够让工作变得更容易.	o	o	o	o
14. 使用（这一）新技术能够提升工作的表现.	o	o	o	o
15. 使用（这一）新技术能够增强工作的有效性.	o	o	o	o

16. 使用（这一）新技术能够提高对工作的控制力.	○	○	○	○
17. 使用（这一）新技术能够增强公司的生产力.	○	○	○	○
18. 使用（这一）新技术能够帮助公司追上主要的竞争者.	○	○	○	○
19. 使用（这一）新技术可以降低成本	○	○	○	○
20. 其他公司已经成功使用了在（这一）新技术	○	○	○	○

Q6 请用以下题项填充完成给出的句子，并对此句子给出您的判断。

如果________________，我认为采纳这一技术是有价值的.

题项	强烈 不同意	不同意	同意	强烈 同意
1. 我不确定为了采纳（这一）新技术所付出的努力会是值得的	○	○	○	○
2. 采纳（这一）新技术需要大量的时间	○	○	○	○
3. 采纳（这一）新技术意味着大量的工作	○	○	○	○
4. 采纳（这一）新技术需要大量的体力与精力	○	○	○	○
5. 使用（这一）新技术要求专业技能	○	○	○	○
6. （这一）新技术与人员的交互不够友好.	○	○	○	○
7. 采纳（这一）新技术需要大量的资金投入	○	○	○	○
8. 采纳（这一）新技术很难在短期内得到回报	○	○	○	○
9. （这一）新技术需要长期地投入	○	○	○	○
10. 用在采纳（这一）新技术上的时间将会挤占公司用在其他必要事情上的时间.	○	○	○	○

Q7 请用以下题项填充完成给出的句子，并对此句子给出您的判断。

如果________________，我认为采纳这一技术是有价值的.

题项	强烈 不同意	不同意	同意	强烈 同意
1. 我担心我公司不够好去采纳（这一）新技术	○	○	○	○
2. 我担心公司浪费时间，当（这一）新技术只在公司使用较短时间	○	○	○	○
3. 我担心公司浪费金钱，当（这一）新技术只在公司使用较短时间	○	○	○	○
4. 公司采纳（这一）新技术却不能向其他公司那样使用好，我会觉得很难堪	○	○	○	○
5. 我害怕使用（这一）新技术会比使用目前的技术更加困难	○	○	○	○
6. 我担心公司人员不能够处理好使用 (这一) 新技术所带来的压力	○	○	○	○
7. 采纳（这一）新技术让人身心憔悴	○	○	○	○
8. 采纳（这一）新技术让人觉得沮丧	○	○	○	○

Q8 请用以下题项填充完成给出的句子，并对此句子给出您的判断。

如果我认为在我公司成功采纳新技术的可能性比较高，__________________.

题项	强烈 不同意	不同意	同意	强烈 同意

1. 我倾向于支持公司采纳（这一）新技术	○	○	○	○
2. 我会建议其他管理者支持公司采纳（这一）新技术	○	○	○	○
3. 我会长期支持公司采纳（这一）新技术	○	○	○	○

Q9 请用以下题项填充完成给出的句子，并对此句子给出您的判断。

如果我认为采纳这一技术是有价值的，_________________.

题项	强烈不同意	不同意	同意	强烈同意
1. 我倾向于支持公司采纳（这一）新技术	○	○	○	○
2. 我会建议其他管理者支持公司采纳（这一）新技术	○	○	○	○
3. 我会长期支持公司采纳（这一）新技术	○	○	○	○

Q10 您的年龄是?

- ❍ 20 及以下
- ❍ 21-30
- ❍ 31-40
- ❍ 41-50
- ❍ 51-60
- ❍ 61 及以上

Q11 您的性别是？

- ❍ 男
- ❍ 女
- ❍ 不便告知

Q12 您的公司类别是？

- ❍ 服装公司
- ❍ 纺织公司
- ❍ 其他____________

Q13 您公司的类型是

- ❍ 私营企业
- ❍ 国有企业
- ❍ 外资合资企业
- ❍ 其他_________

Q14 您的公司规模是？

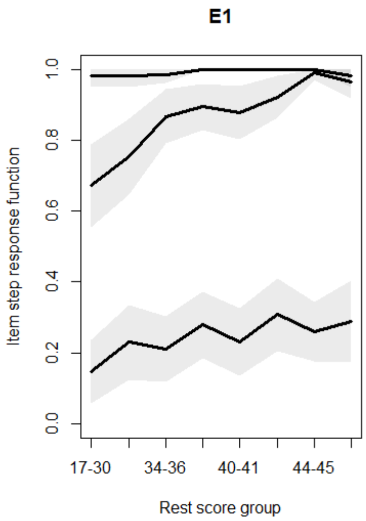
- 微型企业 （低于 20 名雇员或 300 万人民币年营业额）
- 小型企业 （20-300 名雇员且 300-2000 万人民币年营业额；如只能满足其中一条，请选择微型企业）
- 中型企业 （300-1000 名雇员且 2000 万-4 亿人民币年营业额；如只能满足其中一条，请选择小型企业）
- 大型企业 （高于 1000 名雇员且 4 亿人民币年营业额；如只能满足其中一条，请选择中型企业）

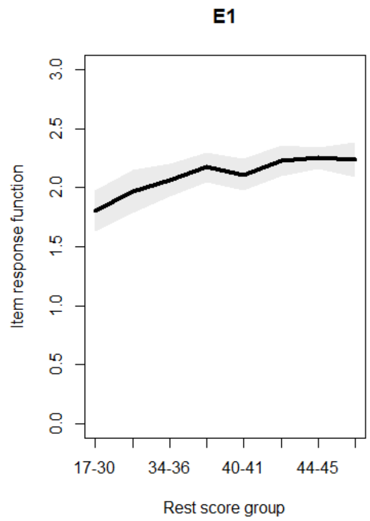
APPENDIX F

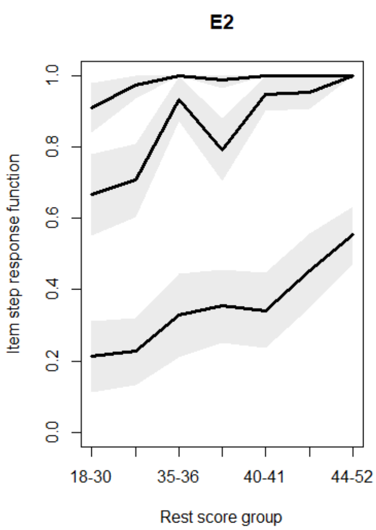
MOKKEN SCALE ANALYSIS PLOTS, LD X^2 INDEX TABLE, AND ITEM INFORMATION FUNCTIONS OF INITIAL ITEM BANK

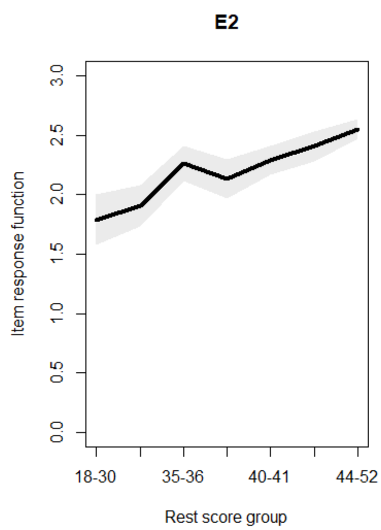
Initial Item Bank Analysis of Expectancy

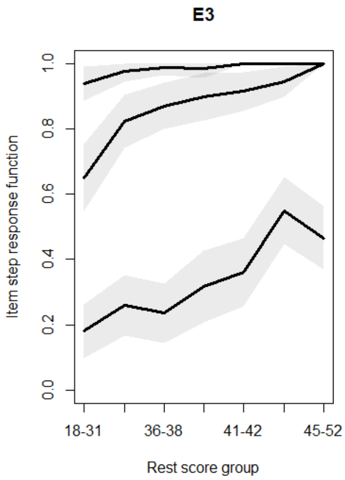
Mokken Scale Analysis for Initial Item Bank

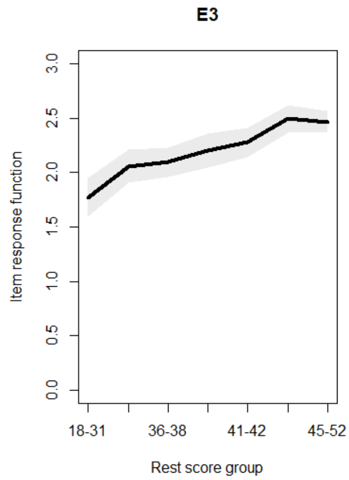


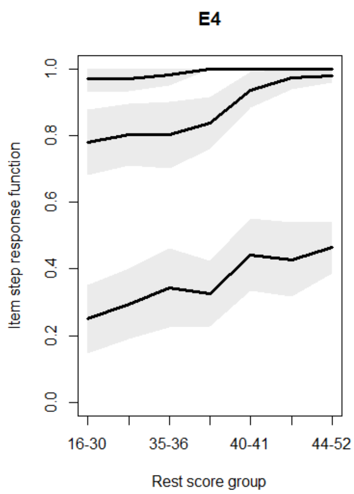


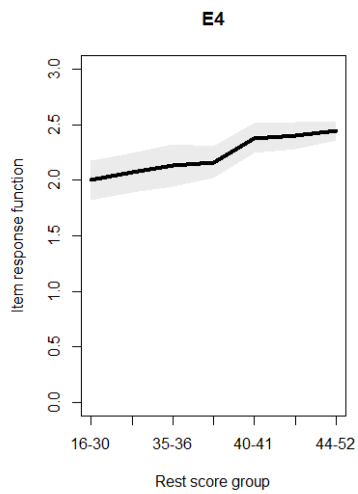


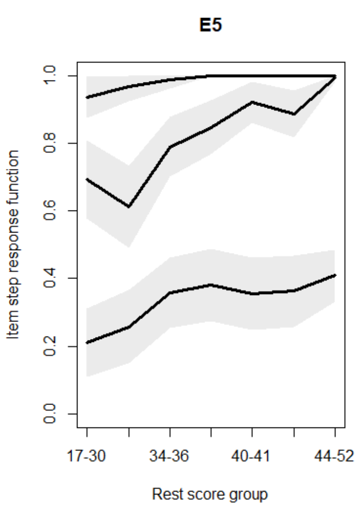


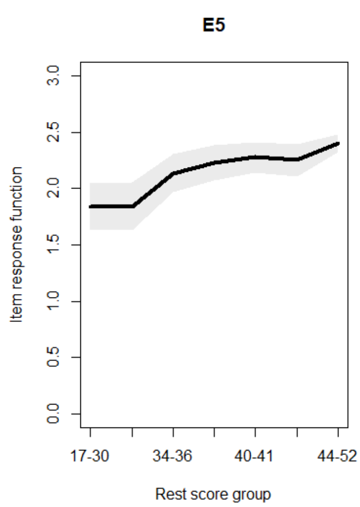

E3
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
18-31
36-38
41-42
45-52
Rest score group

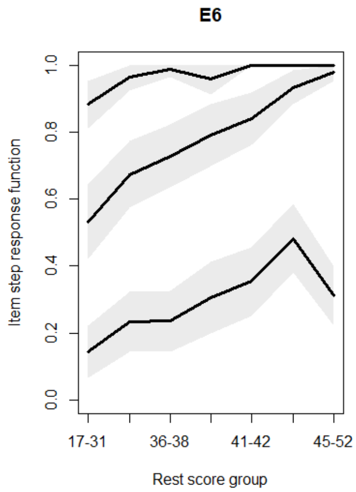

E3
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
18-31
36-38
41-42
45-52
Rest score group

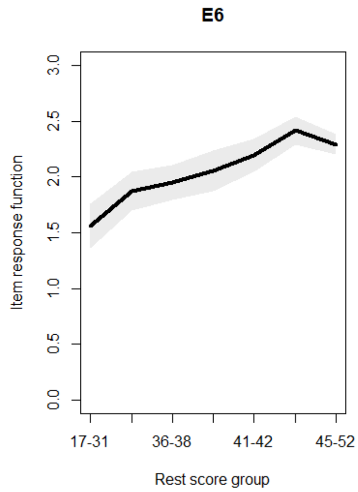

E4
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
16-30
35-36
40-41
44-52
Rest score group

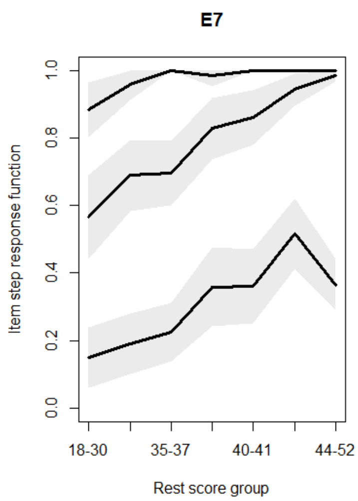

E4
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
16-30
35-36
40-41
44-52
Rest score group

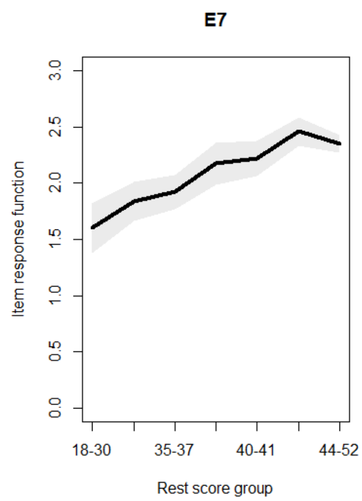

E5
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
17-30
34-36
40-41
44-52
Rest score group

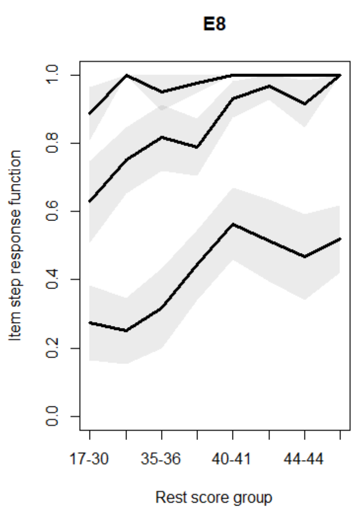

E5
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
17-30
34-36
40-41
44-52
Rest score group

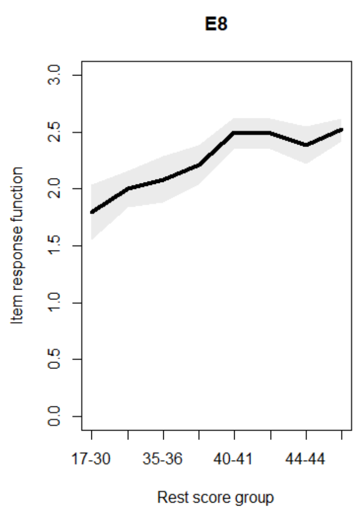

E6
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
17-31
36-38
41-42
45-52
Rest score group

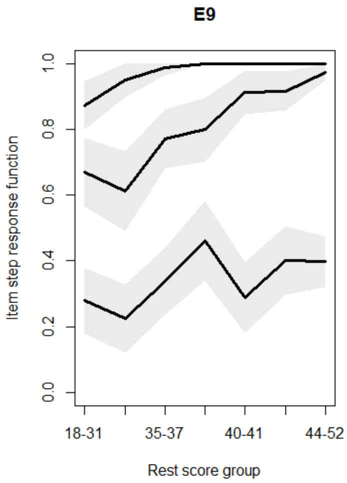

E6
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
17-31
36-38
41-42
45-52
Rest score group

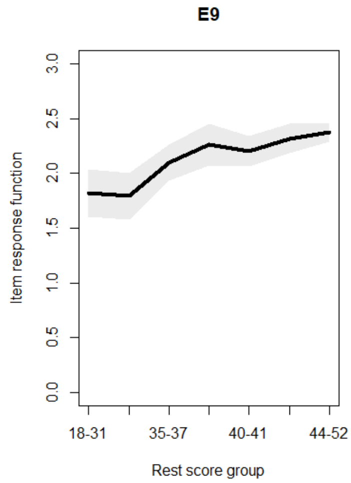

E7
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
18-30
35-37
40-41
44-52
Rest score group

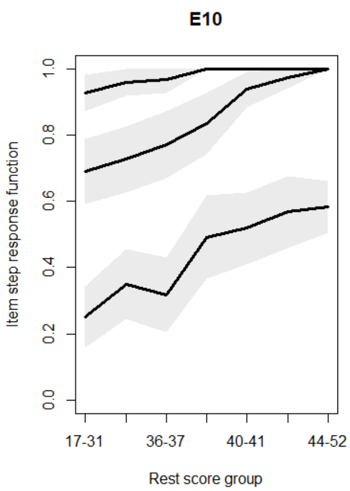

E7
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
18-30
35-37
40-41
44-52
Rest score group

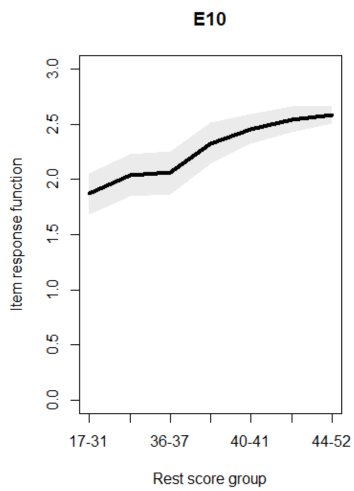

E8
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
17-30
35-36
40-41
44-44
Rest score group

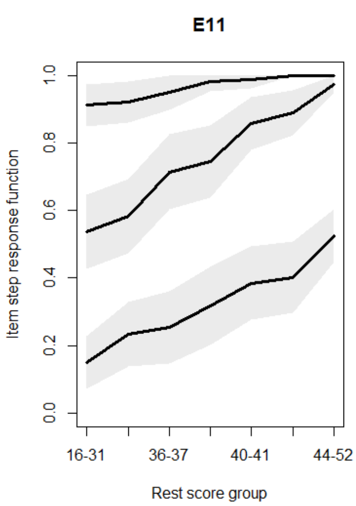

E8
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
17-30
35-36
40-41
44-44
Rest score group

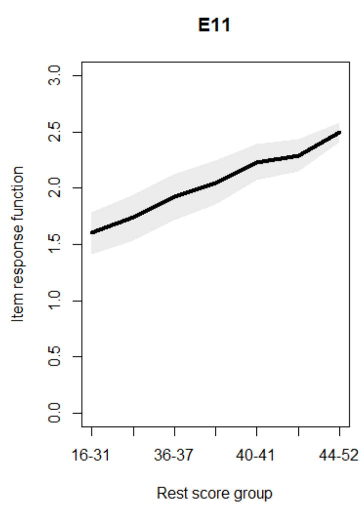

E9
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
18-31
35-37
40-41
44-52
Rest score group

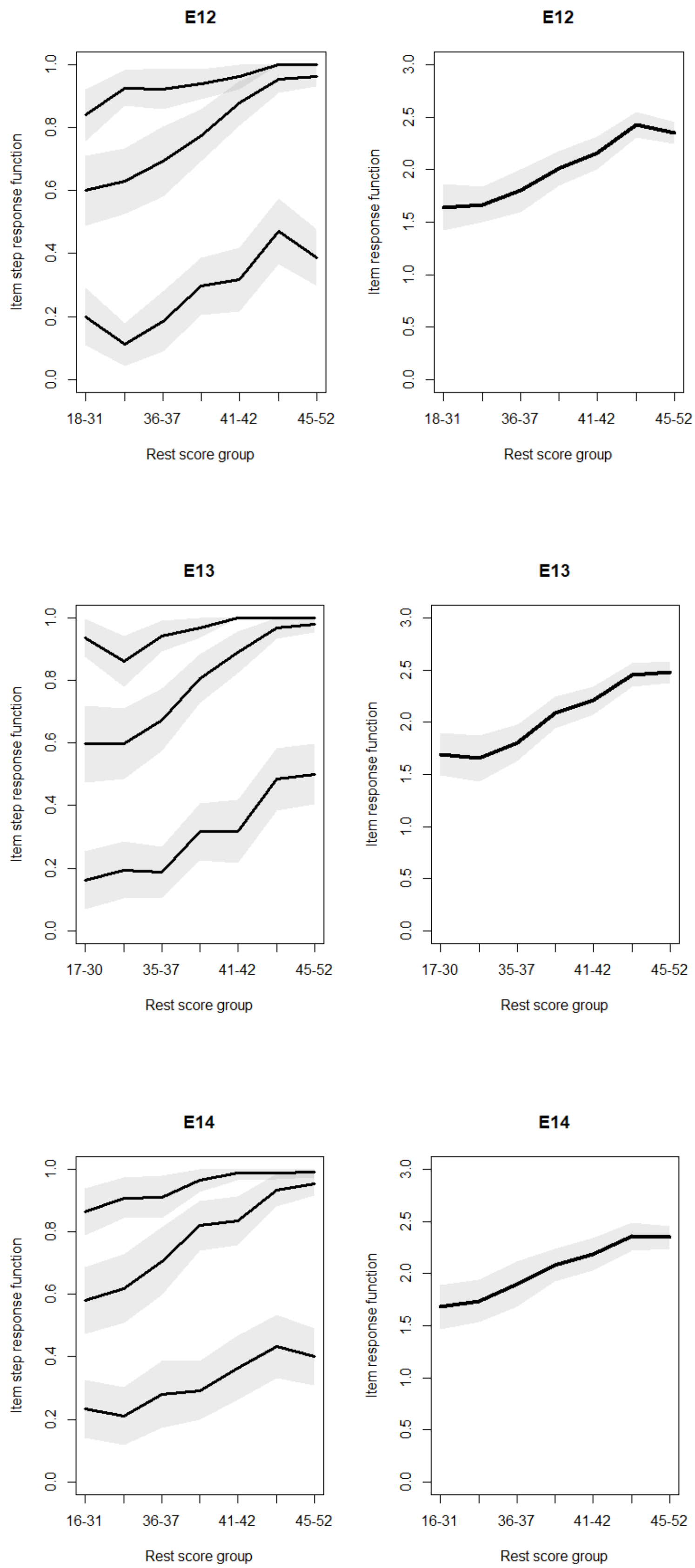

E9
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
18-31
35-37
40-41
44-52
Rest score group

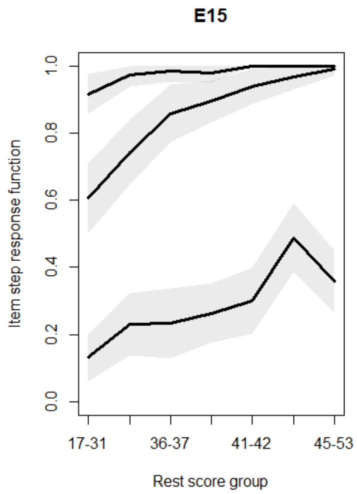

E10
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
17-31
36-37
40-41
44-52
Rest score group

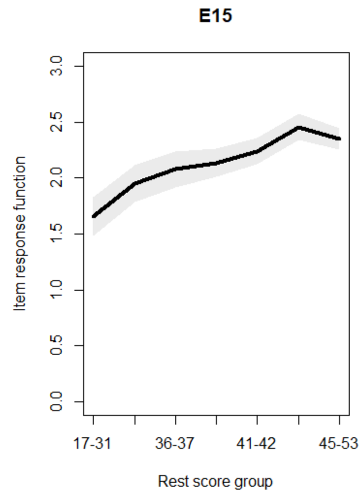

E10
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
17-31
36-37
40-41
44-52
Rest score group

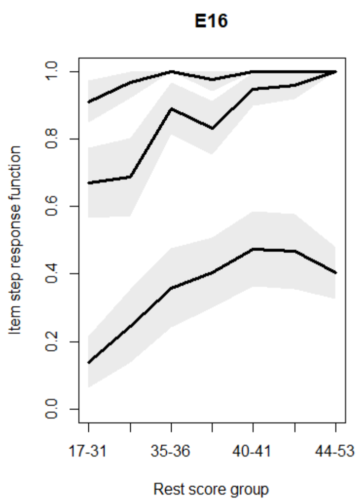

E11
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
16-31
36-37
40-41
44-52
Rest score group

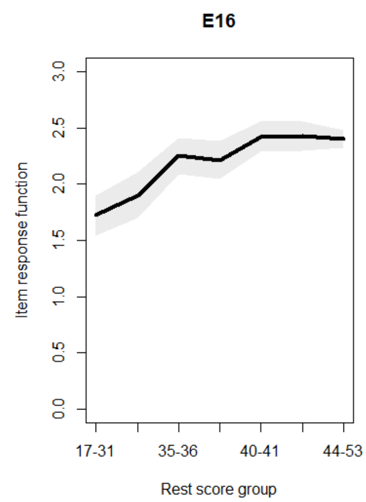

E11
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
16-31
36-37
40-41
44-52
Rest score group

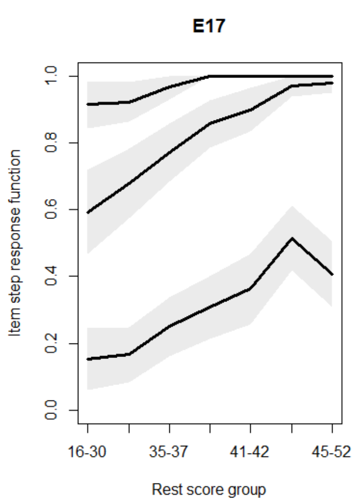

E12
Item step response function
Item response function
18-31
36-37
41-42
45-52
Rest score group
E13
Item step response function
Item response function
17-30
35-37
41-42
45-52
Rest score group
E14
Item step response function
Item response function
16-31
36-37
41-42
45-52
Rest score group

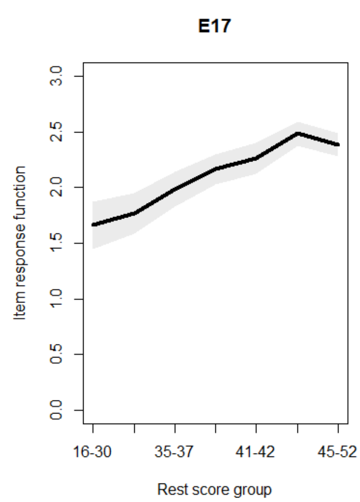

E15
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
17-31
36-37
41-42
45-53
Rest score group

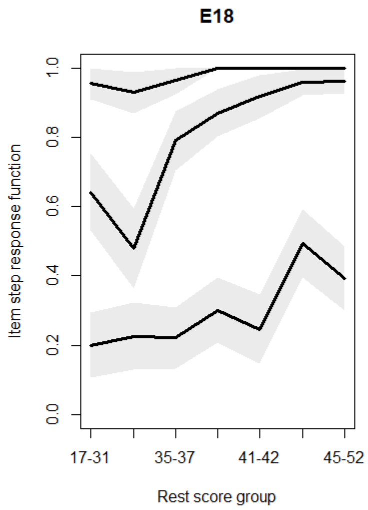

E15
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
17-31
36-37
41-42
45-53
Rest score group

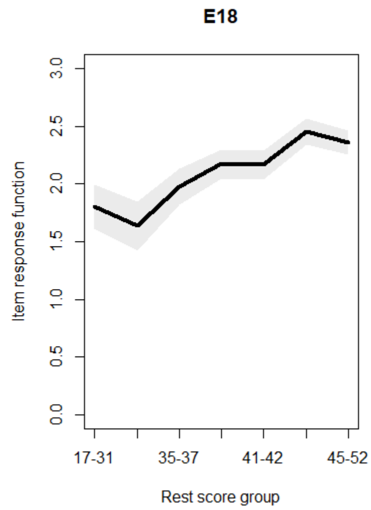

E16
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
17-31
35-36
40-41
44-53
Rest score group

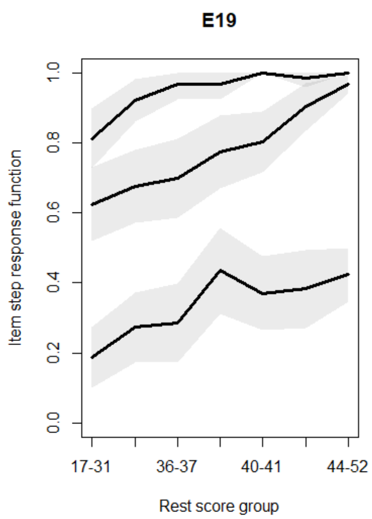

E16
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
17-31
35-36
40-41
44-53
Rest score group

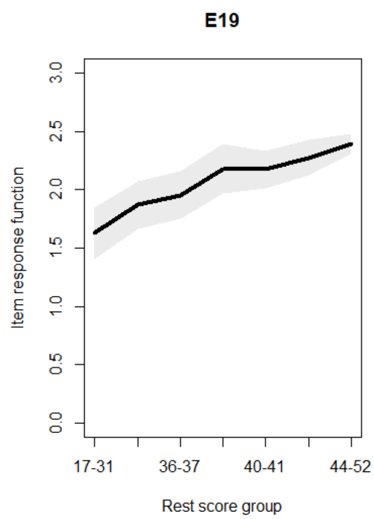

E17
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
16-30
35-37
41-42
45-52
Rest score group


E17
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
16-30
35-37
41-42
45-52
Rest score group


E18
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
17-31
35-37
41-42
45-52
Rest score group


E18
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
17-31
35-37
41-42
45-52
Rest score group


E19
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
17-31
36-37
40-41
44-52
Rest score group


E19
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
17-31
36-37
40-41
44-52
Rest score group

LD X^2 Index for the Initial Item Bank

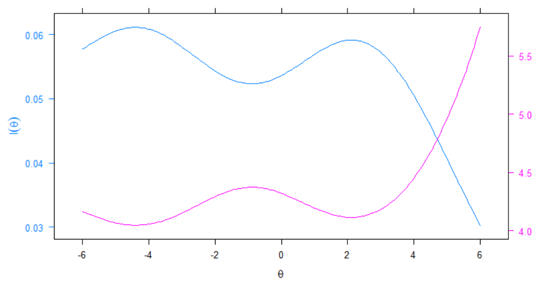
	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
E1	NA									
E2	65.80	NA								
E3	32.33	-34.89	NA							
E4	-10.38	21.95	-31.90	NA						
E5	63.99	12.61	-24.95	-27.95	NA					
E6	24.57	-24.35	-21.20	26.87	-46.80	NA				
E7	14.63	20.76	19.02	16.75	-26.57	55.11	NA			
E8	-17.54	-11.68	-16.48	10.78	9.10	-18.19	-22.74	NA		
E9	37.99	-61.52	10.11	-35.45	35.21	-15.50	-31.37	-57.46	NA	
E10	-5.70	-9.13	-8.50	17.78	-21.06	8.06	-11.39	13.47	-74.69	NA
E11	14.21	-13.47	-11.25	2.38	-20.97	-8.30	-26.94	21.94	-14.53	31.93
E12	-12.51	-8.00	-16.77	-18.53	20.42	23.69	-15.74	14.86	-14.17	-19.36
E13	-14.43	-16.15	24.58	-15.10	10.02	-11.72	11.24	-29.63	18.85	12.89
E14	7.55	-12.70	4.18	-10.70	-21.82	17.54	-27.79	-10.21	17.50	12.03
E15	-25.08	-19.57	17.80	17.08	-15.06	-15.84	-15.81	-21.82	-10.94	12.89
E16	-9.47	-68.93	-19.61	16.76	14.56	-16.79	-33.04	-18.50	20.48	-12.46
E17	20.78	-8.83	-7.53	-13.45	-38.73	17.86	-8.47	19.07	14.41	21.25
E18	-16.47	15.84	-6.73	-21.21	-22.68	-15.48	-32.26	11.36	-13.89	16.79
E19	-19.44	-10.14	-13.52	-20.15	40.92	-16.00	8.53	-29.96	21.90	-25.93

LD X^2 Index for the Initial Item Bank (Continued)

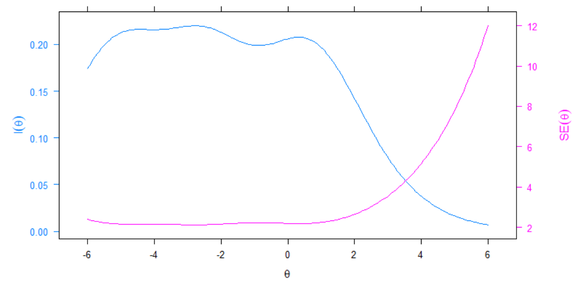
	E11	E12	E13	E14	E15	E16	E17	E18	E19
E11	NA								
E12	-34.30	NA							
E13	8.33	-38.24	NA						
E14	20.89	-23.48	-43.83	NA					
E15	-28.61	16.93	-16.88	12.55	NA				
E16	23.90	9.38	12.55	-8.84	-87.45	NA			
E17	-4.76	11.67	33.37	-8.43	-22.54	-50.78	NA		
E18	13.27	32.22	-9.87	-13.69	-18.46	-38.17	22.48	NA	
E19	-28.22	30.58	12.99	20.91	21.57	27.25	-27.03	-34.15	NA

Item Information Function for Each Item

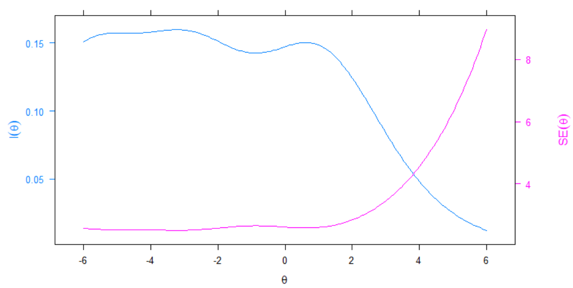
Item information and standard errors for item 1



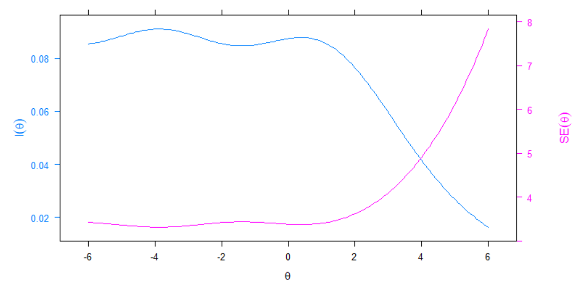
Item information and standard errors for item 2



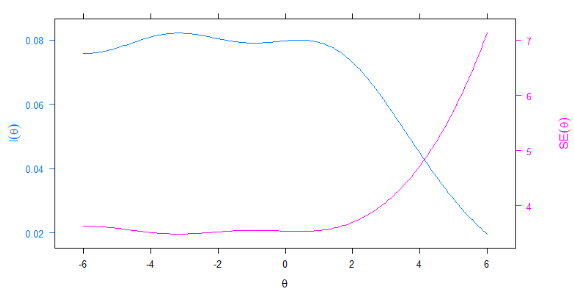
Item information and standard errors for item 3



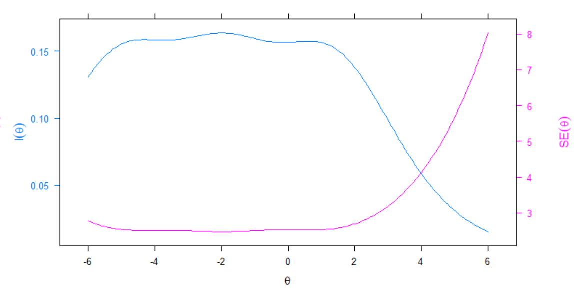
Item information and standard errors for item 4



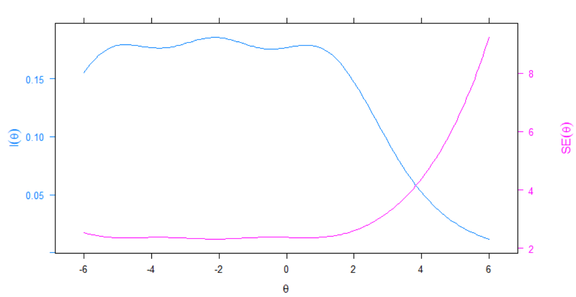
Item information and standard errors for item 5



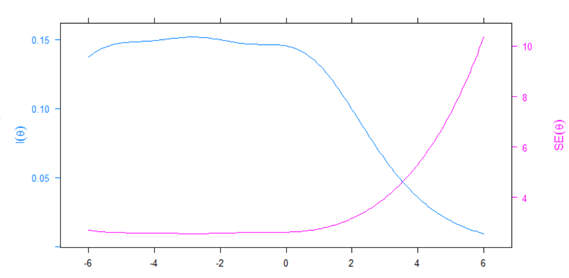
Item information and standard errors for item 6



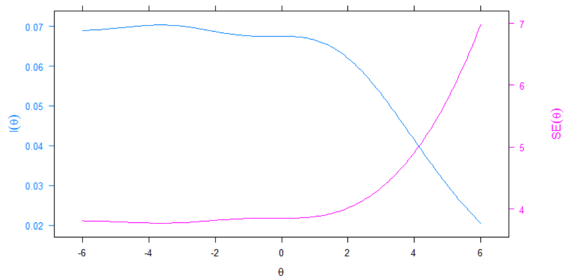
Item information and standard errors for item 7



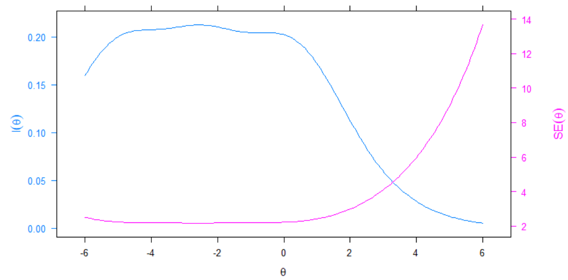
Item information and standard errors for item 8



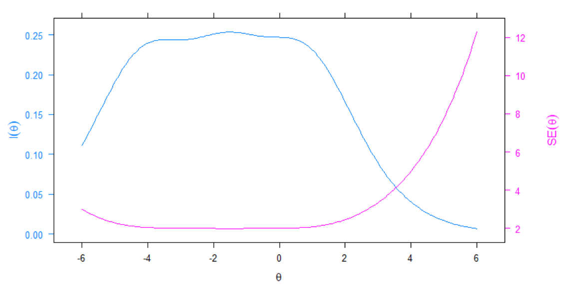
Item information and standard errors for item 9



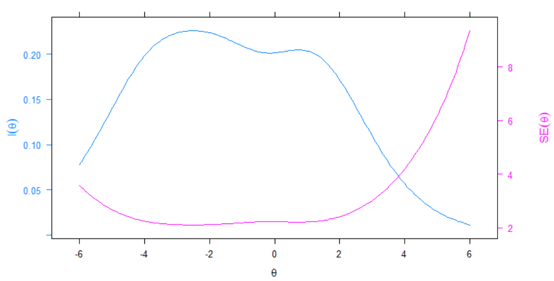
Item information and standard errors for item 10



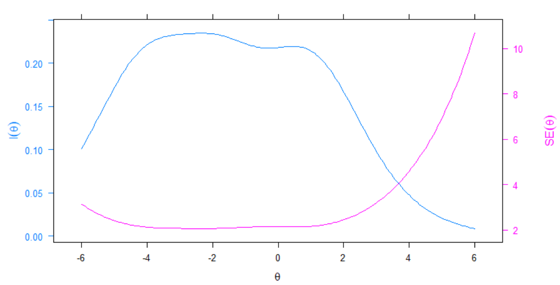
Item information and standard errors for item 11



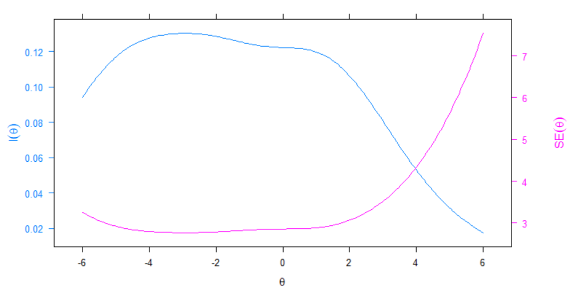
Item information and standard errors for item 12



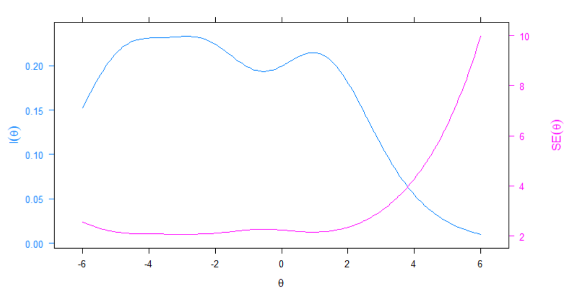
Item information and standard errors for item 13



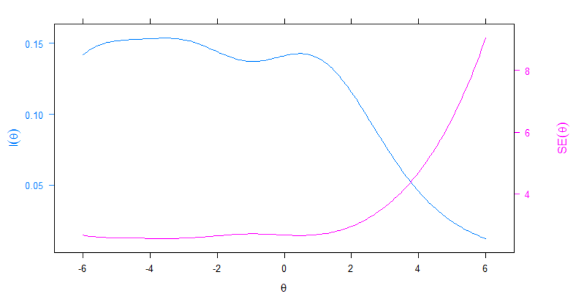
Item information and standard errors for item 14



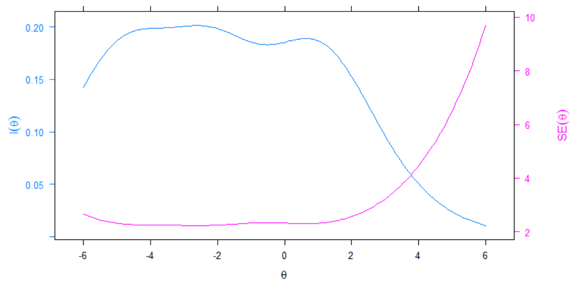
Item information and standard errors for item 15



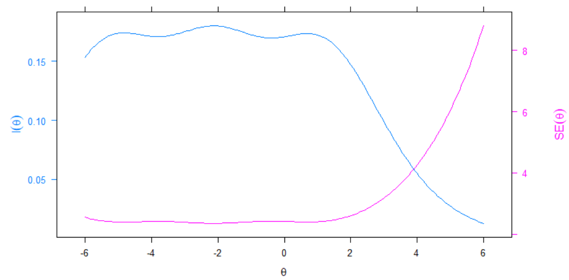
Item information and standard errors for item 16



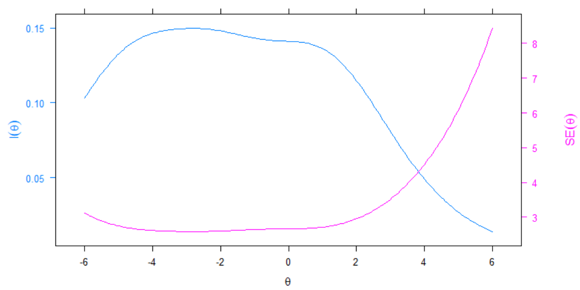
Item information and standard errors for item 17



Item information and standard errors for item 18

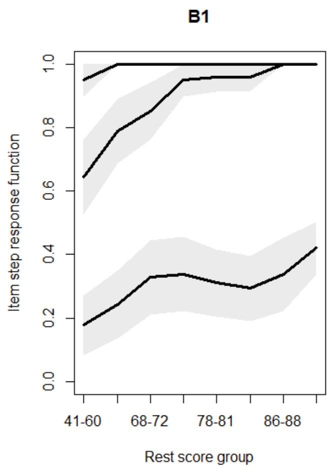


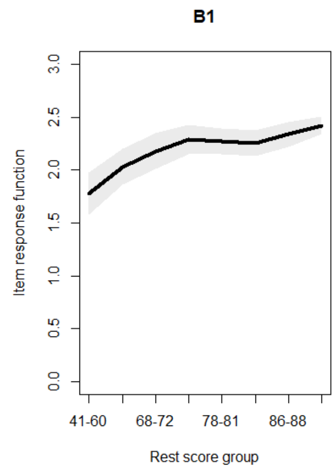
Item information and standard errors for item 19

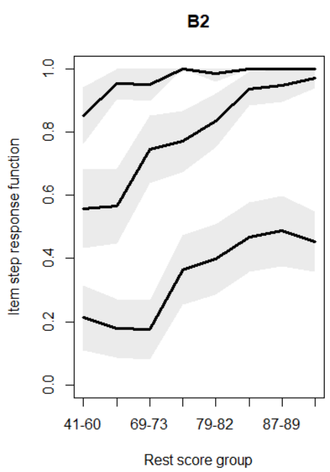


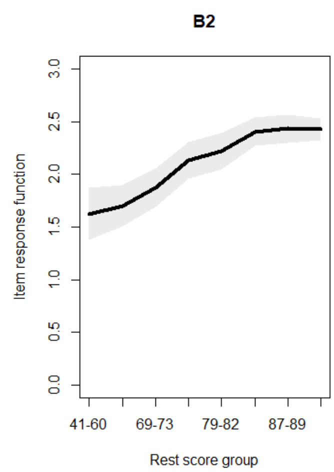
Initial Item Bank Analysis of Perceived Benefit

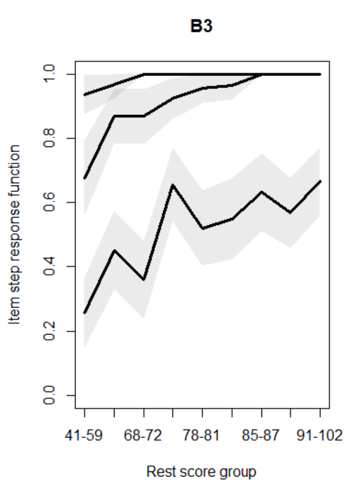
Mokken Scale Analysis for Initial Item Bank

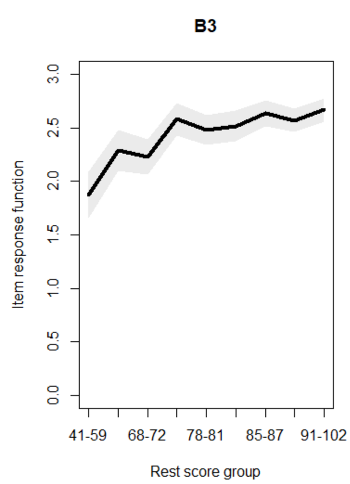


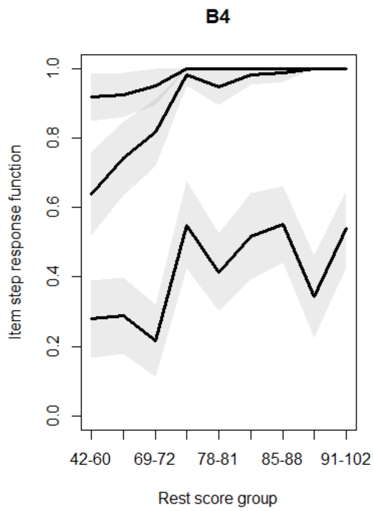


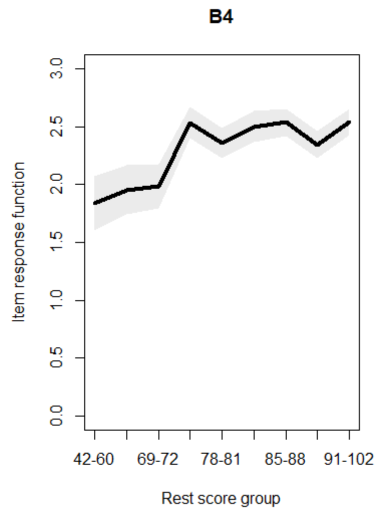









B4
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
42-60
69-72
78-81
85-88
91-102
Rest score group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Item response function
0.0
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2.5
3.0
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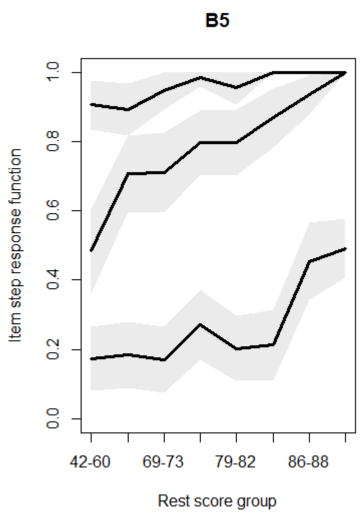
69-72
78-81
85-88
91-102
Rest score group


B5
Item step response function
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0.8
1.0
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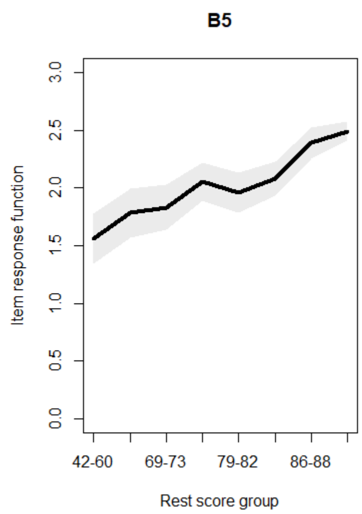
79-82
86-88
Rest score group


B5
Item response function
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2.5
3.0
42-60
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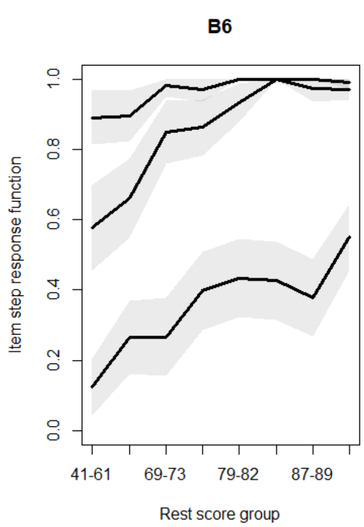
79-82
86-88
Rest score group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Item step response function
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1.0
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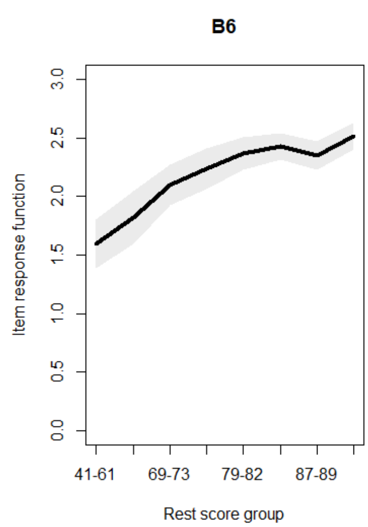
79-82
87-89
Rest score group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Item response function
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2.5
3.0
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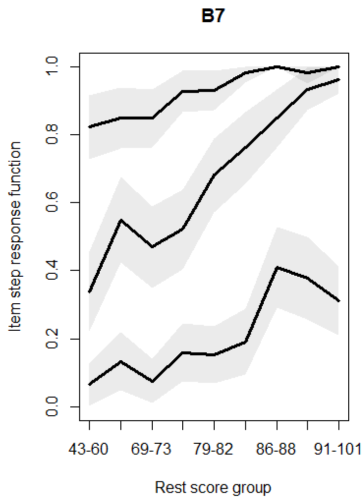
79-82
87-89
Rest score group


B7
Item step response function
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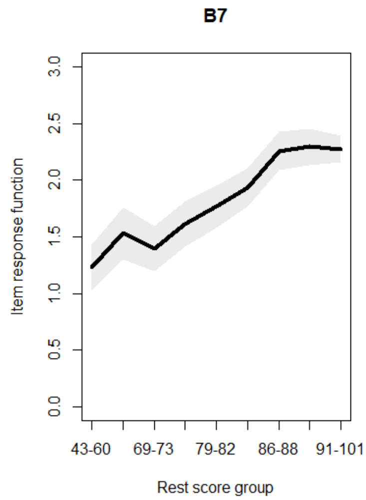
69-73
79-82
86-88
91-101
Rest score group


B7
Item response function
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69-73
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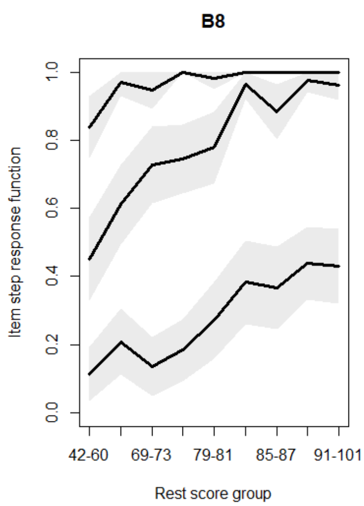
86-88
91-101
Rest score group


B8
Item step response function
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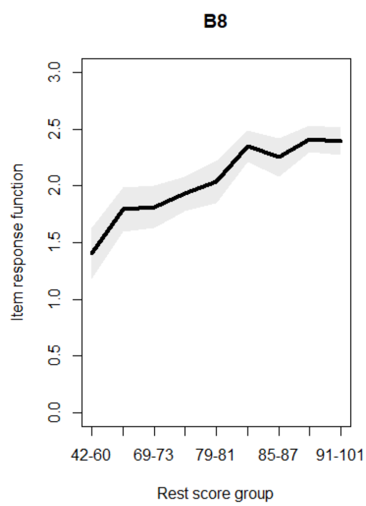
79-81
85-87
91-101
Rest score group


B8
Item response function
0.0
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2.0
2.5
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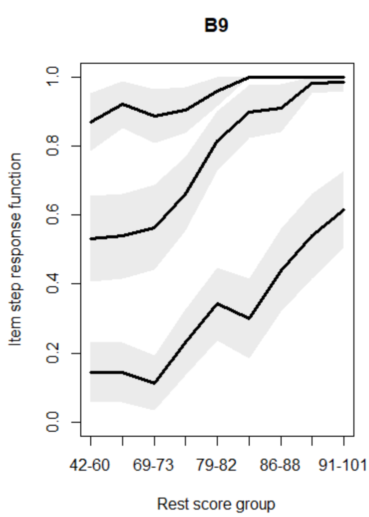
85-87
91-101
Rest score group


B9
Item step response function
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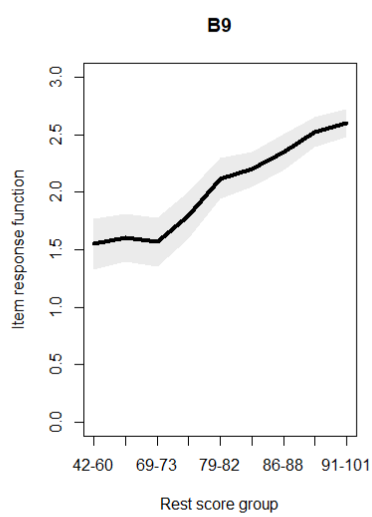
79-82
86-88
91-101
Rest score group


B9
Item response function
0.0
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2.5
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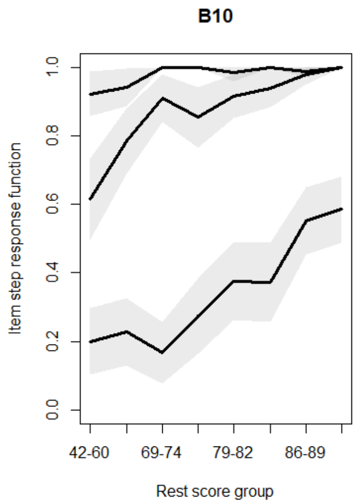
86-88
91-101
Rest score group


B10
Item step response function
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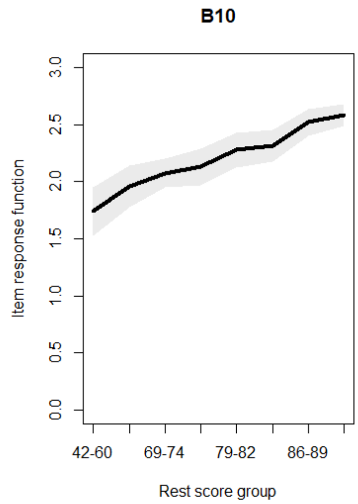
79-82
86-89
Rest score group


B10
Item response function
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1.5
2.0
2.5
3.0
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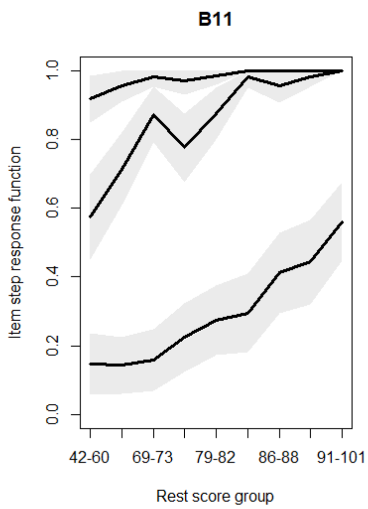
69-74
79-82
86-89
Rest score group


B11
Item step response function
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0.8
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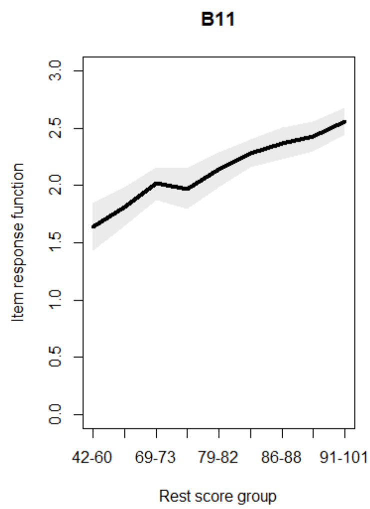
69-73
79-82
86-88
91-101
Rest score group


B11
Item response function
0.0
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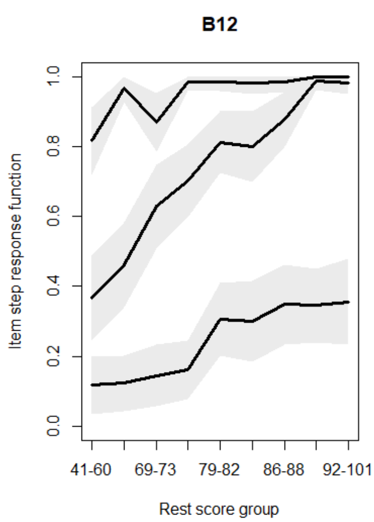
1.5
2.0
2.5
3.0
42-60
69-73
79-82
86-88
91-101
Rest score group


B12
Item step response function
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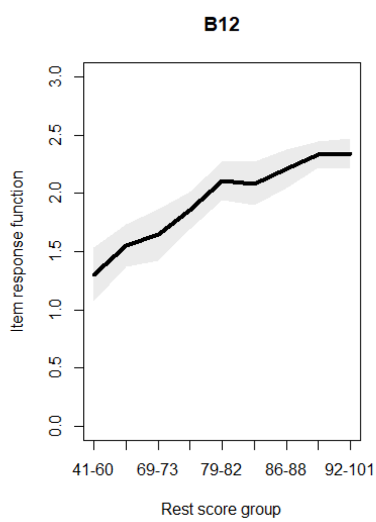
79-82
86-88
92-101
Rest score group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Item response function
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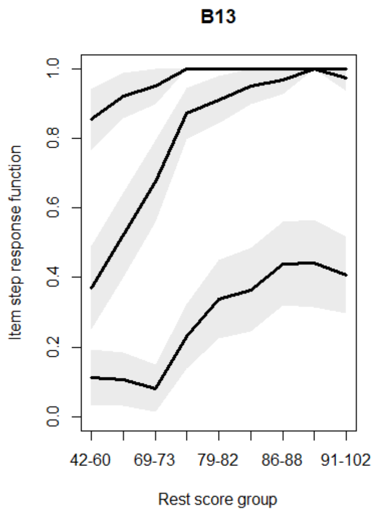
86-88
92-101
Rest score group


B13
Item step response function
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1.0
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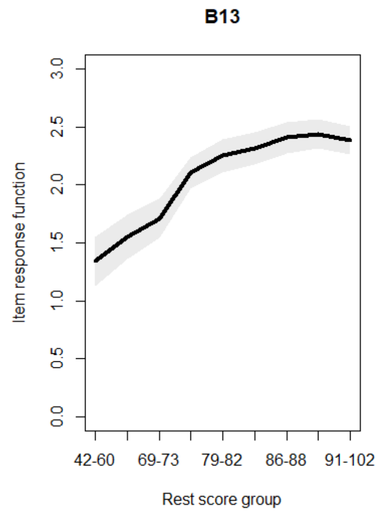
69-73
79-82
86-88
91-102
Rest score group


B13
Item response function
0.0
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1.5
2.0
2.5
3.0
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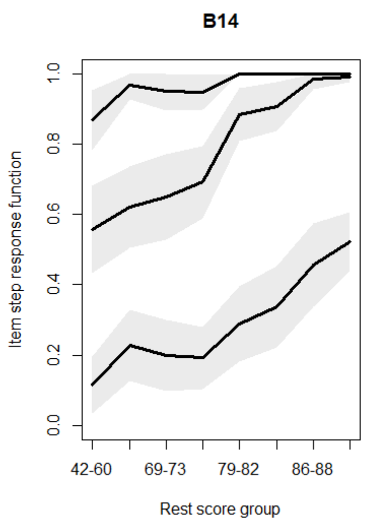
69-73
79-82
86-88
91-102
Rest score group


B14
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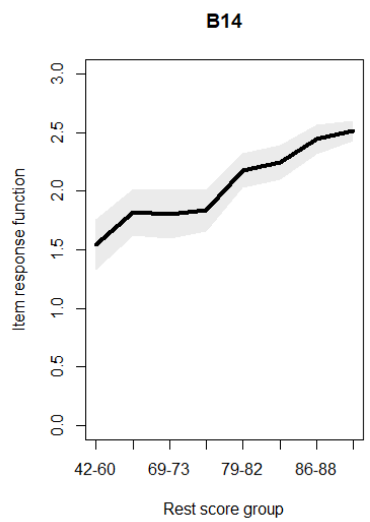
79-82
86-88
Rest score group


B14
Item response function
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2.5
3.0
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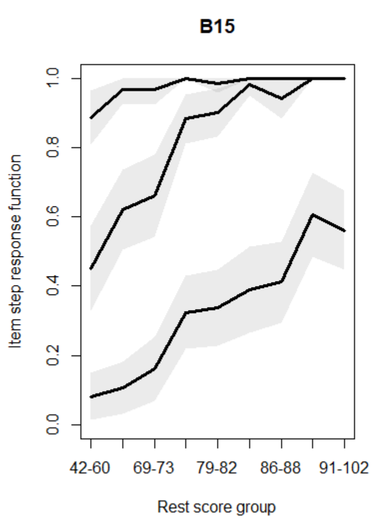
69-73
79-82
86-88
Rest score group


B15
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0.8
1.0
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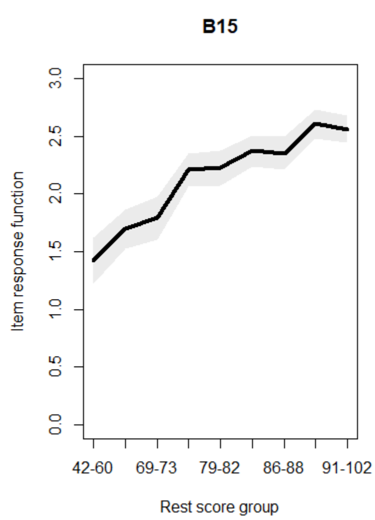
69-73
79-82
86-88
91-102
Rest score group


B15
Item response function
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2.0
2.5
3.0
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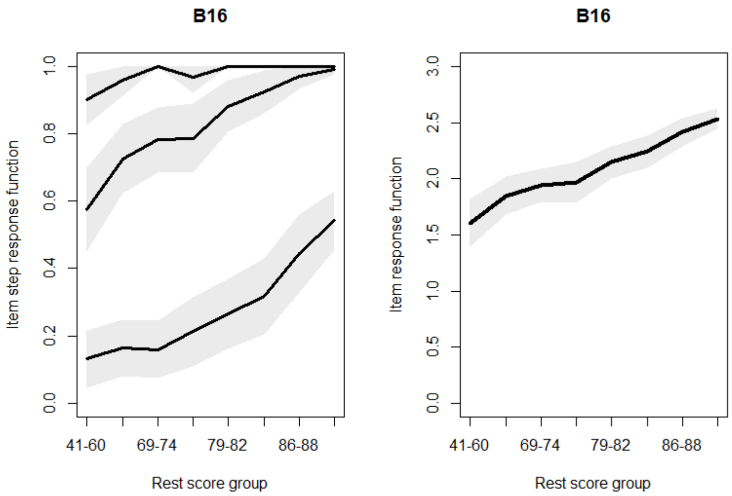
69-73
79-82
86-88
91-102
Rest score group


B16
B16
Item step response function
Item response function
Rest score group
Rest score group
41-60
69-74
79-82
86-88
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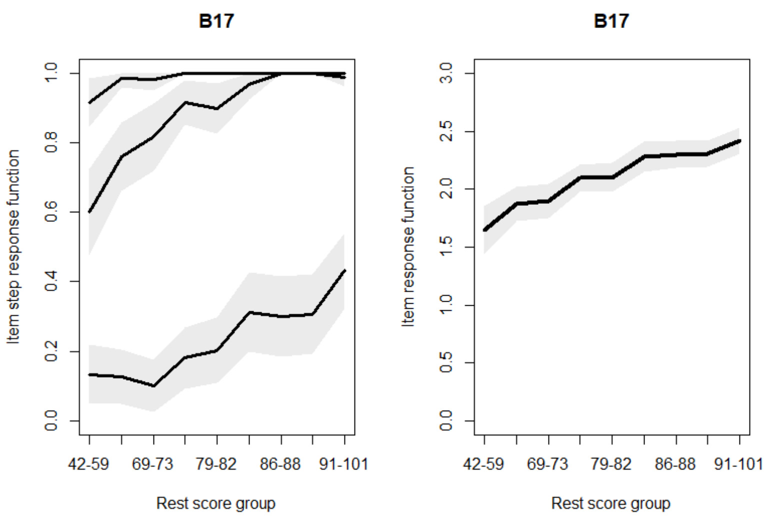
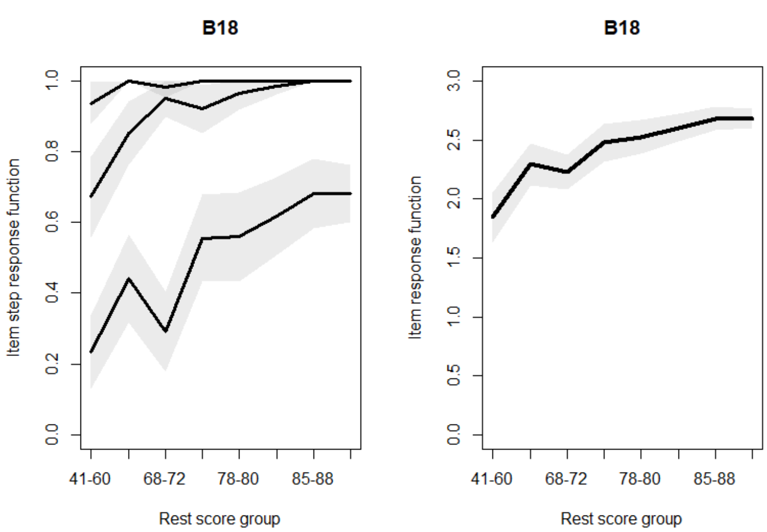
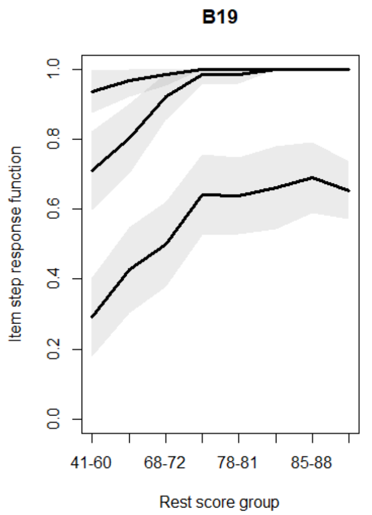
0.8
1.0
0.5
1.5
2.0
2.5
3.0


B17
B17
Item step response function
Item response function
Rest score group
Rest score group
42-59
69-73
79-82
86-88
91-101


B18
B18
Item step response function
Item response function
Rest score group
Rest score group
41-60
68-72
78-80
85-88


B19
Item step response function
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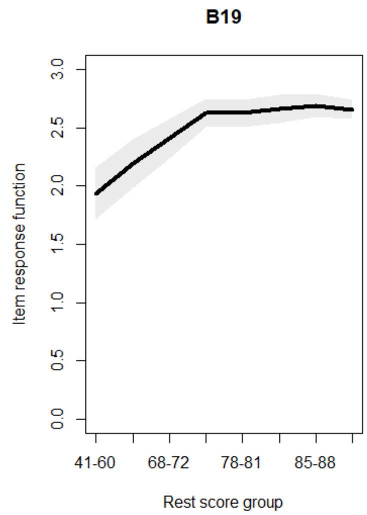
68-72
78-81
85-88
Rest score group


B19
Item response function
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2.5
3.0
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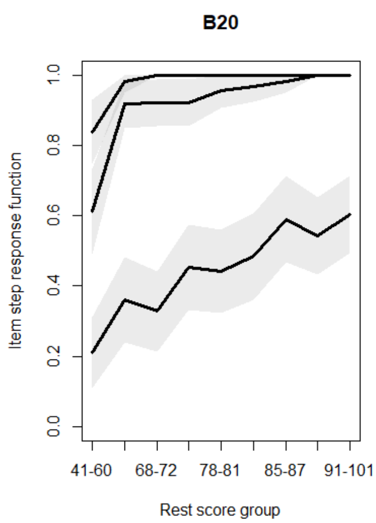
78-81
85-88
Rest score group


B20
Item step response function
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78-81
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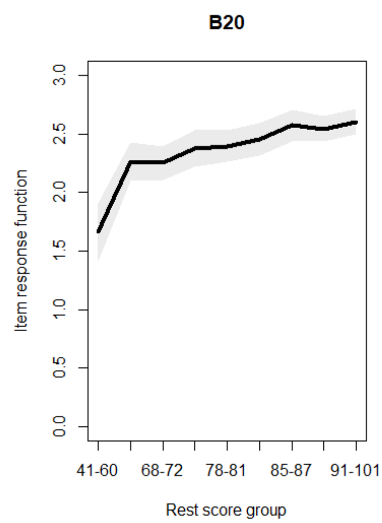
91-101
Rest score group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Item response function
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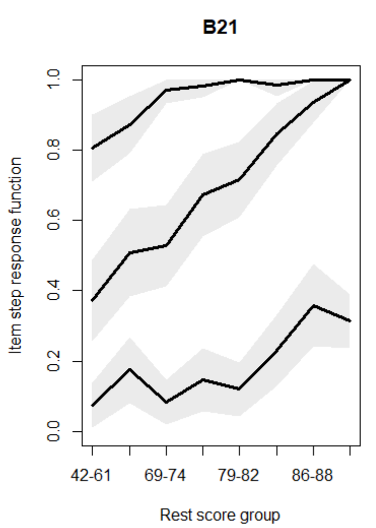
91-101
Rest score group


B21
Item step response function
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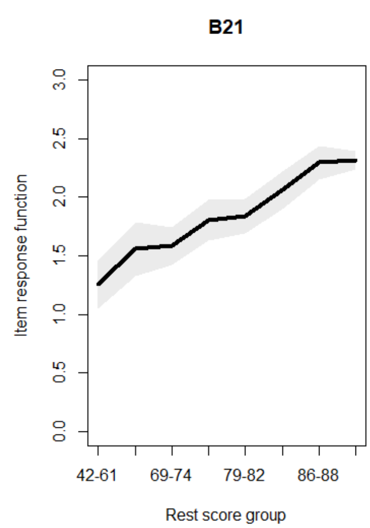
79-82
86-88
Rest score group


B21
Item response function
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2.5
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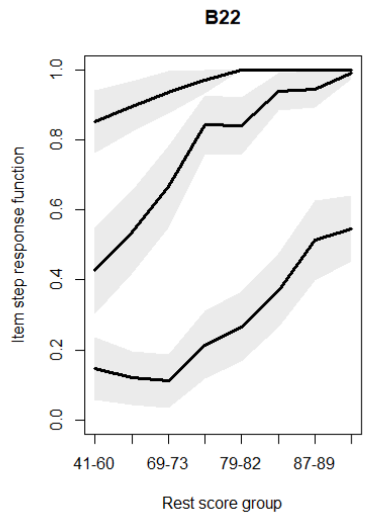
69-74
79-82
86-88
Rest score group


B22
Item step response function
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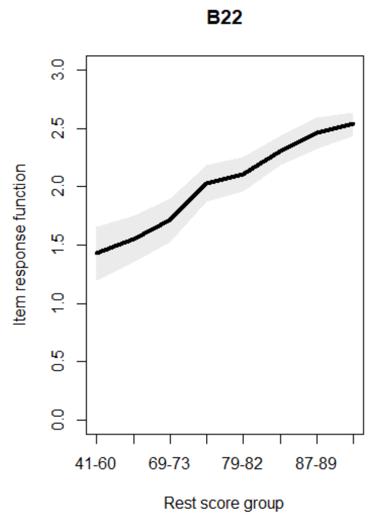
69-73
79-82
87-89
Rest score group


B22
Item response function
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2.5
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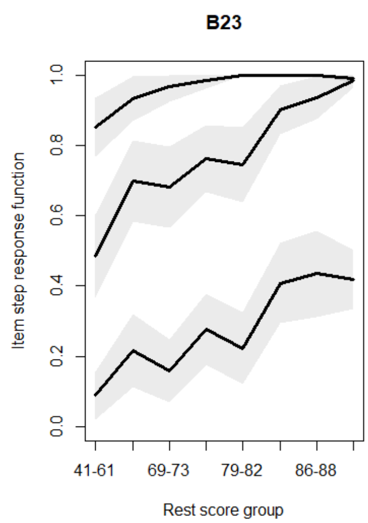
79-82
87-89
Rest score group


B23
Item step response function
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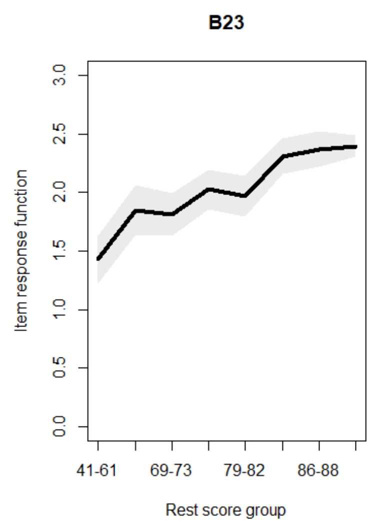
69-73
79-82
86-88
Rest score group


B23
Item response function
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2.5
3.0
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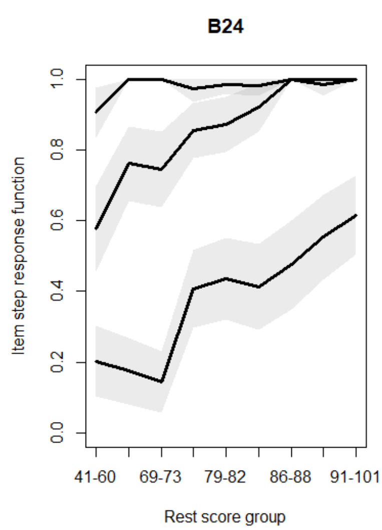
79-82
86-88
Rest score group


B24
Item step response function
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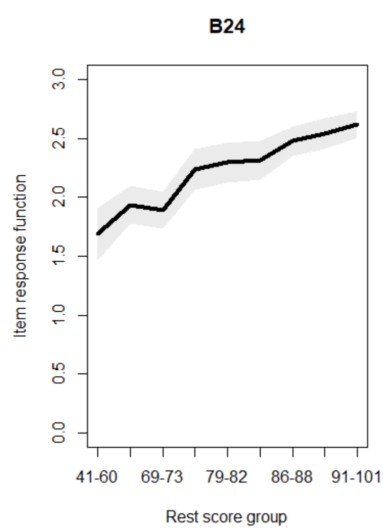
79-82
86-88
91-101
Rest score group


B24
Item response function
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2.0
2.5
3.0
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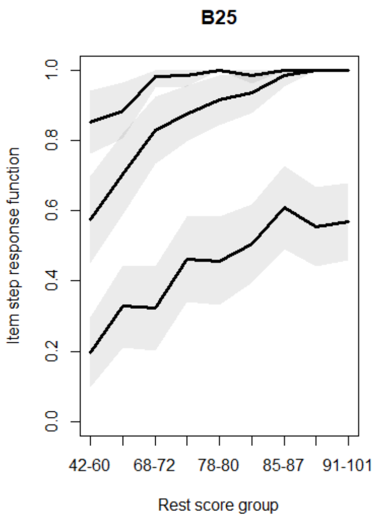
86-88
91-101
Rest score group


B25
Item step response function
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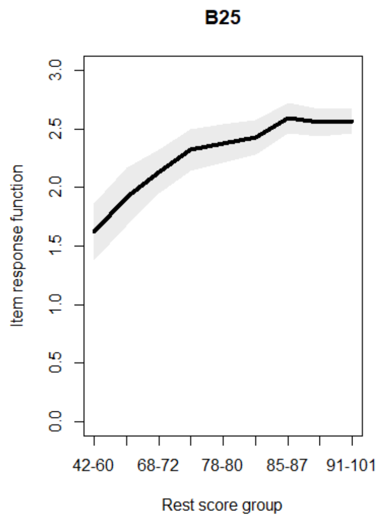
85-87
91-101
Rest score group


B25
Item response function
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2.0
2.5
3.0
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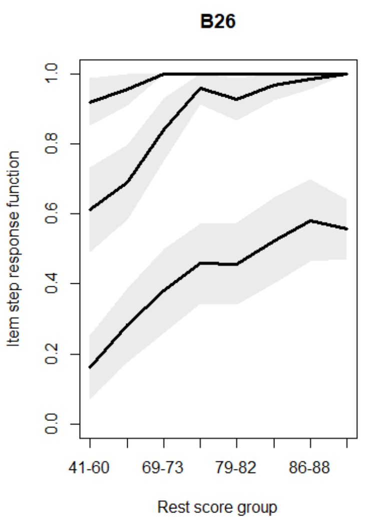
68-72
78-80
85-87
91-101
Rest score group


B26
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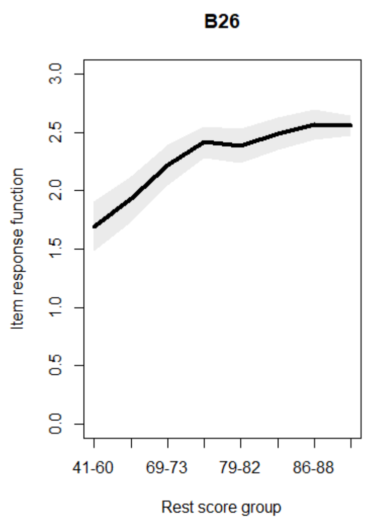
79-82
86-88
Rest score group


B26
Item response function
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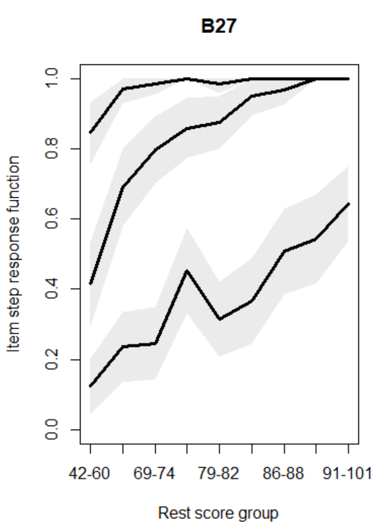
86-88
Rest score group


B27
Item step response function
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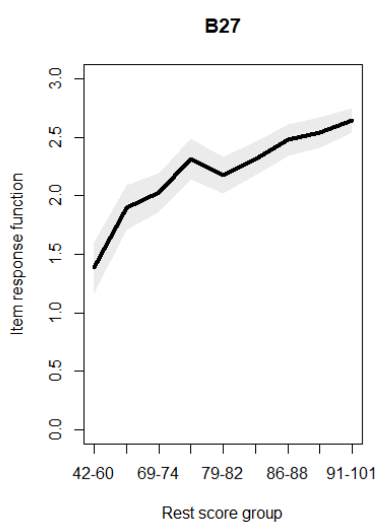
86-88
91-101
Rest score group


B27
Item response function
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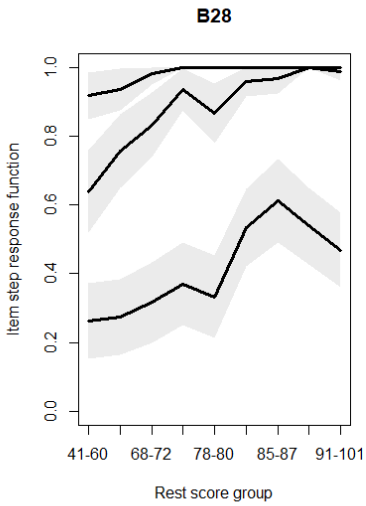
86-88
91-101
Rest score group


B28
Item step response function
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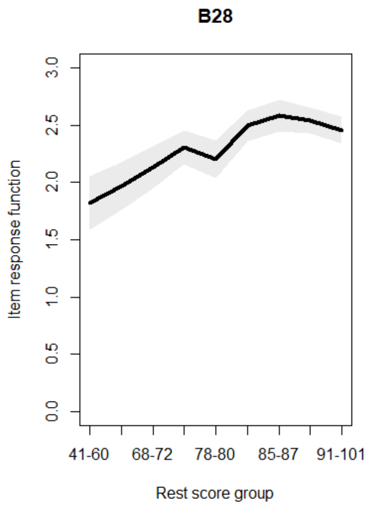
91-101
Rest score group


B28
Item response function
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2.5
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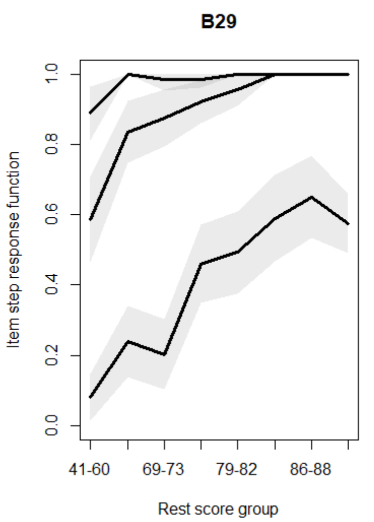
91-101
Rest score group


B29
Item step response function
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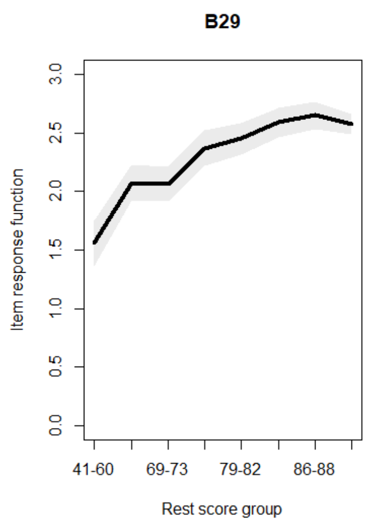
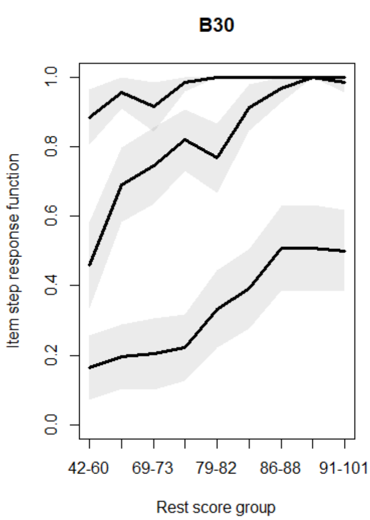
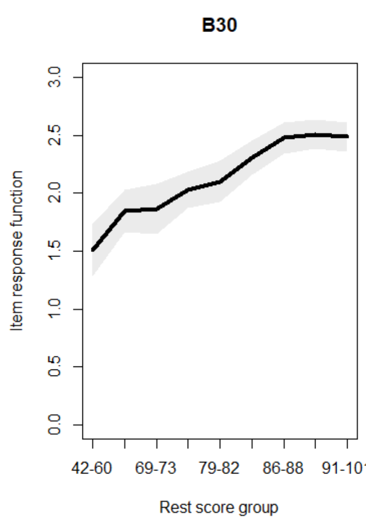
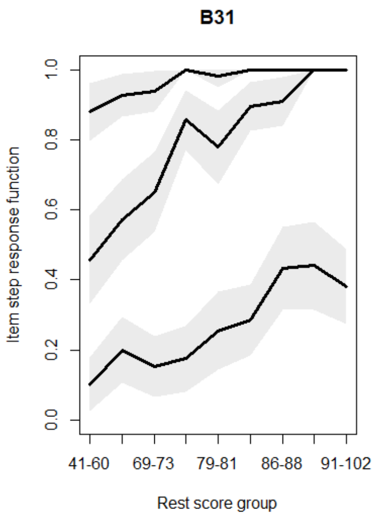
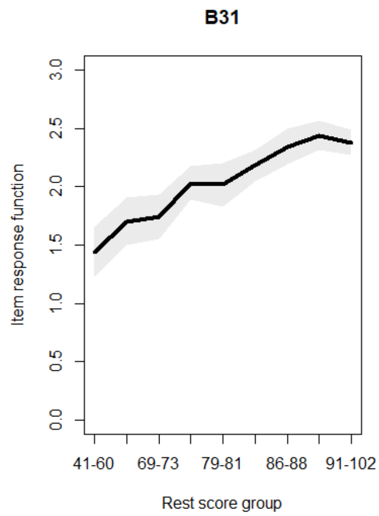
79-82
86-88
Rest score group

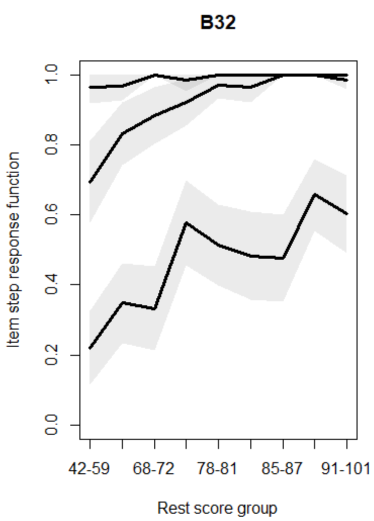

B29
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
41-60
69-73
79-82
86-88
Rest score group

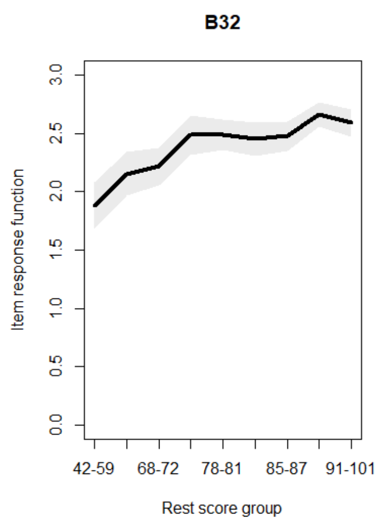

B30
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
42-60
69-73
79-82
86-88
91-101
Rest score group

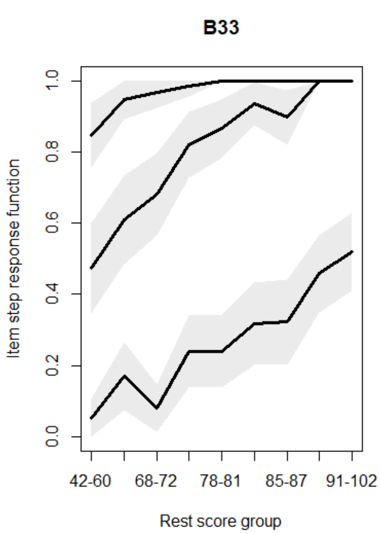

B30
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
42-60
69-73
79-82
86-88
91-101
Rest score group

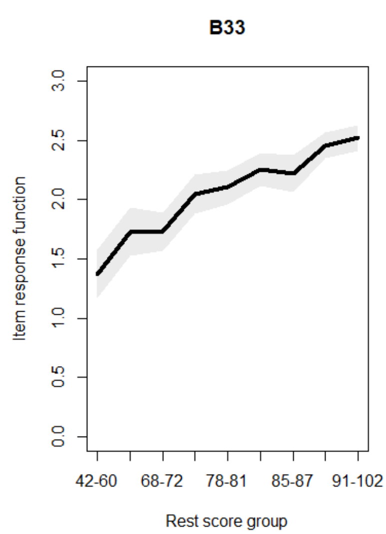

B31
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
41-60
69-73
79-81
86-88
91-102
Rest score group

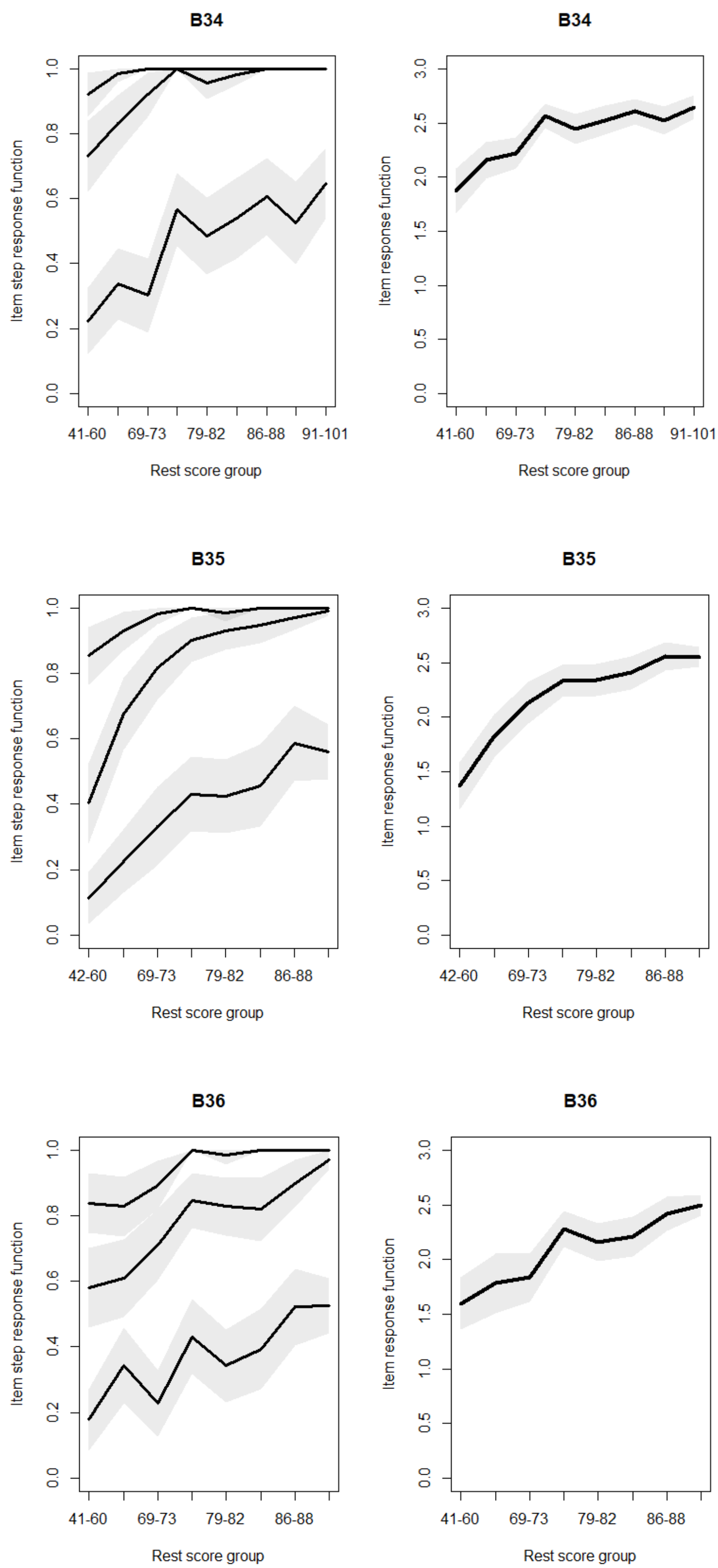

B31
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
41-60
69-73
79-81
86-88
91-102
Rest score group


B32
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
42-59
68-72
78-81
85-87
91-101
Rest score group

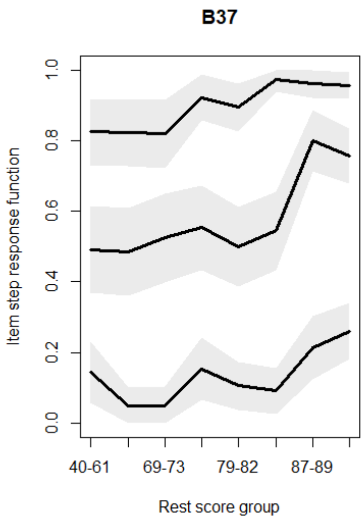

B32
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
42-59
68-72
78-81
85-87
91-101
Rest score group

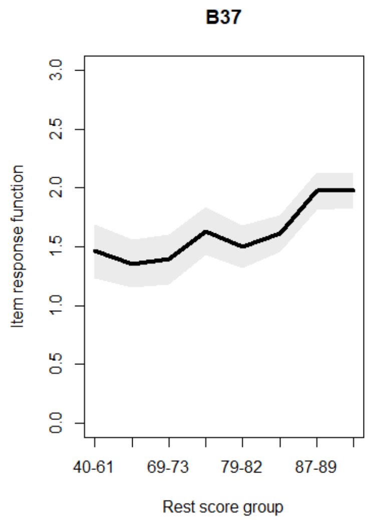

B33
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
42-60
68-72
78-81
85-87
91-102
Rest score group


B33
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
42-60
68-72
78-81
85-87
91-102
Rest score group



B34
Item step response function
Rest score group
41-60
69-73
79-82
86-88
91-101
B34
Item response function
Rest score group
B35
Item step response function
Rest score group
42-60
69-73
79-82
86-88
B35
Item response function
Rest score group
B36
Item step response function
Rest score group
41-60
69-73
79-82
86-88
B36
Item response function
Rest score group


B37
Item step response function
1.0
0.8
0.6
0.4
0.2
0.0
40-61
69-73
79-82
87-89
Rest score group


B37
Item response function
3.0
2.5
2.0
1.5
1.0
0.5
0.0
40-61
69-73
79-82
87-89
Rest score group

LD X^2 Index for the Initial Item Bank

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
B1	NA									
B2	-73.10	NA								
B3	-16.43	-54.10	NA							
B4	13.28	-35.04	-29.81	NA						
B5	-14.68	23.60	-25.75	-66.60	NA					
B6	-21.43	45.07	16.21	34.51	-53.28	NA				
B7	-33.78	14.75	-10.49	-32.76	28.33	-15.77	NA			
B8	-26.77	-13.21	11.09	-44.51	19.52	21.85	103.4	NA		
B9	-13.59	15.51	13.02	-23.16	9.42	14.29	41.59	56.30	NA	
B10	-21.82	8.59	13.84	-26.96	16.03	10.07	49.10	49.00	7.93	NA
B11	-27.53	14.20	-14.03	-18.61	12.17	18.76	31.18	74.32	25.69	33.27
B12	-36.84	-17.55	-27.45	-26.61	-29.54	-21.02	40.00	35.16	23.49	-17.27
B13	-24.77	-21.34	-14.48	29.88	-29.86	24.91	-20.45	34.18	-13.36	-14.88
B14	-26.95	13.71	-23.78	-22.67	10.61	24.86	16.34	23.35	40.32	-14.91
B15	-41.47	10.38	-26.80	22.21	-22.09	13.87	-7.44	15.01	12.61	19.99
B16	-16.44	-11.68	-18.24	28.40	15.18	6.84	18.02	36.45	19.21	-27.56
B17	67.56	-32.97	-24.38	13.84	-18.51	-26.96	-13.13	-25.55	-14.28	-21.43
B18	16.51	17.41	126.0	14.49	-18.17	15.80	-51.32	-16.91	-8.36	-14.88
B19	35.19	-18.14	55.18	35.26	-16.81	18.44	-22.25	-21.85	-11.95	13.08
B20	14.92	-9.76	36.14	7.53	-28.49	20.55	-9.00	-19.38	-14.55	-14.06
B21	-19.31	28.02	-14.95	-33.38	19.16	-27.55	20.06	-14.05	9.03	-9.62
B22	19.79	-18.43	-14.28	30.38	-12.98	-29.57	13.50	-13.39	-8.23	-17.50
B23	-24.74	26.68	5.52	-10.68	-13.33	27.73	-10.37	-33.04	-24.75	-23.90
B24	26.76	15.86	16.39	10.40	-23.03	8.33	7.51	-11.59	-6.58	-11.14
B25	9.89	19.98	31.26	19.49	-21.34	-26.09	-19.00	-10.97	24.16	13.83
B26	74.71	-7.46	20.45	12.8	-11.8	-16.2	-27.16	-10.51	-22.87	-17.29
B27	-17.07	-16.33	38.41	-49.84	-15.75	-27.98	-27.01	-32.17	-7.78	-33.42
B28	-20.04	-25.77	21.65	-20.98	20	-32.04	-15.44	19.6	11.37	15.17
B29	61.38	-23.14	34.28	34.53	-15.52	-12.62	-10.99	-16.86	-27.57	-5.72
B30	-11.16	-26.67	-30.31	19.52	25.94	-18.58	25.96	11.8	-9.42	11.57
B31	-33.15	20.91	12.18	-23.58	15.3	10.75	16.76	11.73	9.15	-14.6
B32	42.33	-13.25	28.55	41.62	-27.33	24.5	-12.45	-13.8	-17.68	-12.55
B33	17.85	-27.31	29.2	-26.89	-12.98	15.9	-11.82	-14.44	5	-21.98
B34	32.09	10.38	18.97	14.21	-19.76	-26.75	-23.05	-18.31	-44.02	-11.1
B35	21.6	29.57	-16.71	51.12	29.36	-27.34	-24.39	-23.4	-11.63	16.42
B36	13.07	-15.03	23.93	-14.62	-22.34	-12.44	-48.13	-23.23	-16.98	-13.65
B37	-9.1	-5.63	-8.73	34.87	27.1	-12	15.34	-5.2	11.91	-14.48

LD X^2 Index for the Initial Item Bank (Continued)

	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
B11	NA									
B12	40.55	NA								
B13	-24.88	56.28	NA							
B14	9.82	52.28	33.2	NA						
B15	-11.36	-21.42	52.55	22.89	NA					
B16	38.49	40.45	29.63	25	22.06	NA				
B17	-40.13	-24.64	-10.36	-7.63	-16.01	-14.3	NA			
B18	-29.45	-40.2	-14.15	42.74	11.48	-10.67	-76.82	NA		
B19	-14.61	-31.93	12.79	-10.13	-43.21	-17.14	-26.3	-21.33	NA	
B20	7.76	-28.01	-32.71	-12.94	-31.39	-15.4	7.37	-24.06	-50.23	NA
B21	-20.03	47.74	32.6	23.06	-27.25	25.88	18.53	-20.84	-43.85	-64.35
B22	-13.97	-17.43	29.99	-24.39	17.65	19.92	-20.05	-16.36	-10.67	-11.61
B23	-17.87	-22.87	16.99	-16.36	-24.52	-34.37	-16.93	12.06	14	-36.96
B24	-6.4	-28.61	17.71	-18.02	10.28	18.91	-2.98	7.6	-14.68	-16.97
B25	-11.35	-24.43	-18.65	-16.25	-24.43	-10.72	-18.7	15.36	48.98	41.65
B26	-11.57	-24.71	-17.99	-17.36	-24.73	-13.31	9.02	13.72	-28.71	27.79
B27	-16.26	19.15	-23.31	39.93	-25.79	-18.42	12.73	51.35	-29.65	-13.57
B28	-22.72	-18.05	16.21	-9.14	-20.52	-32.95	-19.24	16.52	54.69	32.61
B29	-40.6	-21.43	-20.7	-26.64	-33.56	-31.67	35.97	21.38	27.94	36.48
B30	-4.44	-9.79	-14.9	5.06	16.63	3.86	20.8	-8.06	-53.41	20.84
B31	-7.32	-20.73	-22.96	-18.26	-26.25	-19.85	23.17	9.81	-24.83	-33.62
B32	-28.05	-15.11	-23.62	-18.53	28.76	-5.15	-9.05	19.4	41.05	34.94
B33	10.4	-17.89	-27.95	18.24	-15.57	-18.76	22.68	21.85	-29.95	-22.95
B34	-13.63	-12.02	-18.16	-18.35	16.45	-11.88	4.69	34.32	22	62.87
B35	-24.83	-21.16	-10.71	-13.69	-27.26	-9.97	23.33	-7.14	29.62	-19.72
B36	-15.81	-25.39	-36.59	-36.61	-27.11	-17.79	12.89	27.58	23.82	24.83
B37	-8.17	21.26	-12.44	-8.67	-30.25	-15.34	5.93	-23.11	-17.62	-7.57

LD X^2 Index for the Initial Item Bank (Continued)

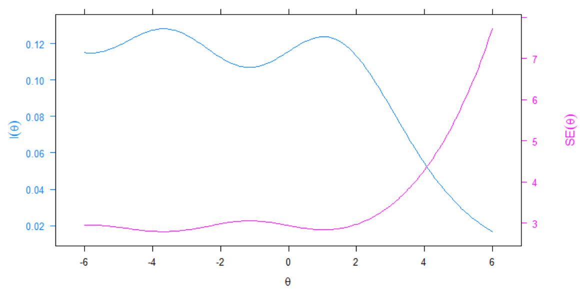
	B21	B22	B23	B24	B25	B26	B27	B28	B29	B30
B21	NA									
B22	-36.01	NA								
B23	26.69	-72.85	NA							
B24	21.6	11.3	33.8	NA						
B25	-26.99	-17.87	11.33	-33.6	NA					
B26	-20.71	-22.17	11.77	-13.87	43.73	NA				
B27	-23.64	-26.31	23.69	8	-25.91	27.43	NA			
B28	-36.26	11.73	-23.73	10.34	-30.27	-17.54	-40.53	NA		
B29	-29.33	-14.35	14.15	-23.95	27.88	25.3	20.74	-28.19	NA	
B30	37.01	19.8	16.26	18.51	-33.67	-14.33	-18.5	-22.06	-55.43	NA
B31	46.44	-17.36	23.97	-3.62	-24.1	21.93	-31.7	23.49	-19	-32.57
B32	-16.23	-12.65	-12.16	12.45	-19.91	31.38	8.47	52.64	26.77	-22.45
B33	25.75	19.56	10.96	7.99	36.51	15.49	44.01	-21	35.2	-11.96
B34	-21.65	-21.9	-49.32	16.92	41.93	31.09	-15.63	23.96	20.98	-6.7
B35	30.94	16.68	33.75	12.95	42.77	-11.27	30.55	41.07	16.79	-46.83
B36	-12.07	25.39	21.53	-15.86	16.04	33.82	32.03	22.74	14.51	24.36
B37	25.72	17.54	-11.45	12.02	-25.94	-13.18	13.94	-14.59	-11.49	10.69

LD X^2 Index for the Initial Item Bank (Continued)

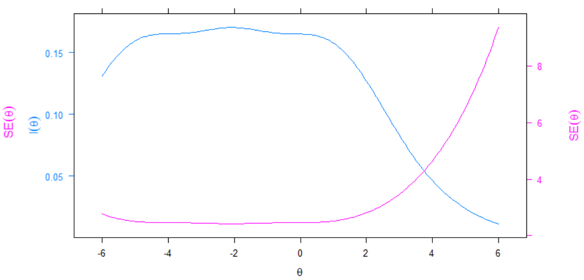
	B31	B32	B33	B34	B35	B36	B37
B31	NA						
B32	-43.29	NA					
B33	-26.89	-28.97	NA				
B34	-11.52	18.73	-32.43	NA			
B35	-39.49	21.75	-22.91	-60.82	NA		
B36	10.2	15.81	21.97	18.44	-29.37	NA	
B37	15.23	-24.5	28.21	-10.6	-10.97	25.75	NA

Item Information Function for Each Item

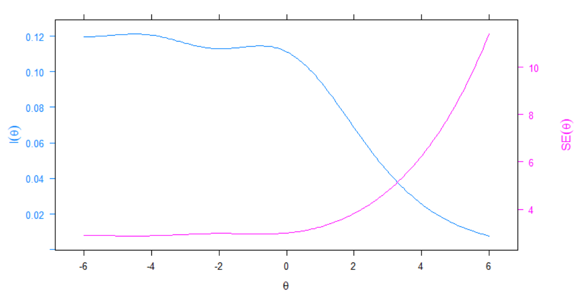
Item information and standard errors for item 1



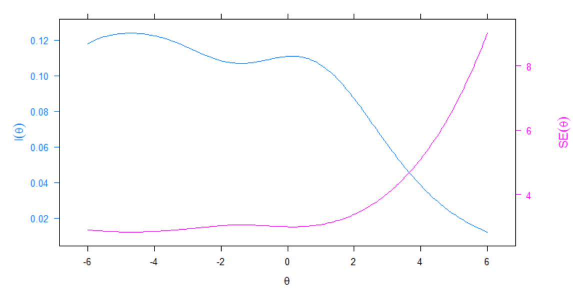
Item information and standard errors for item 2



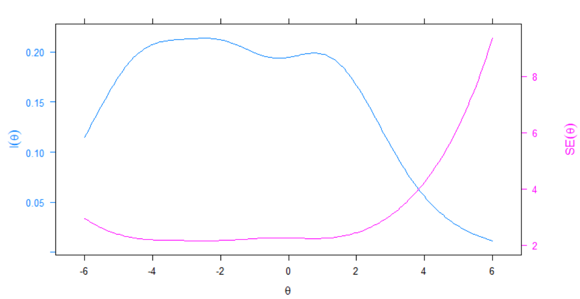
Item information and standard errors for item 3



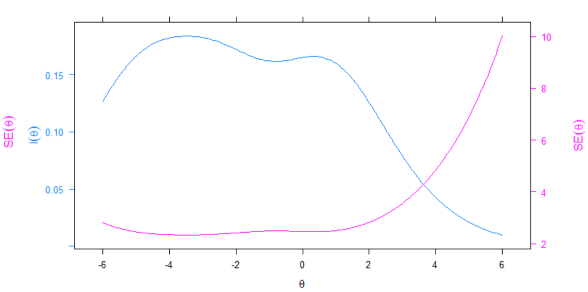
Item information and standard errors for item 4



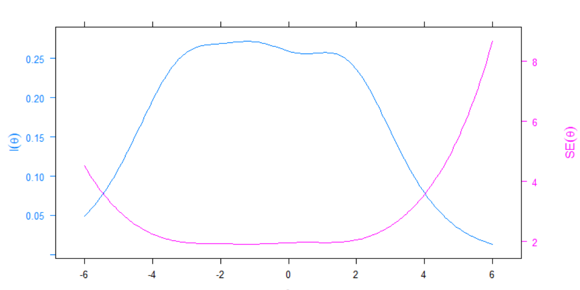
Item information and standard errors for item 5



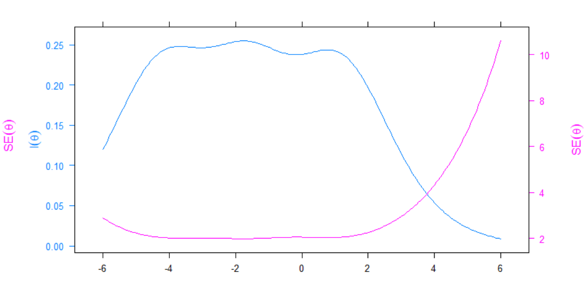
Item information and standard errors for item 6



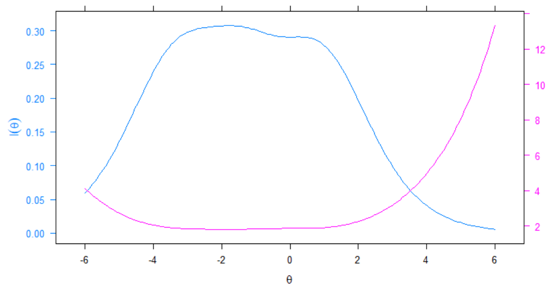
Item information and standard errors for item 7



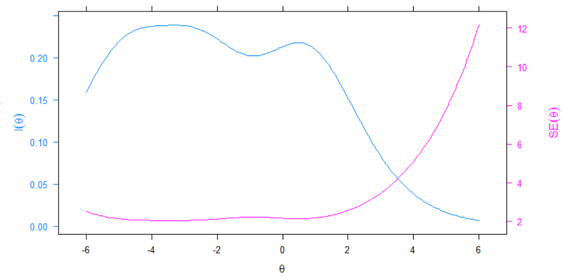
Item information and standard errors for item 8



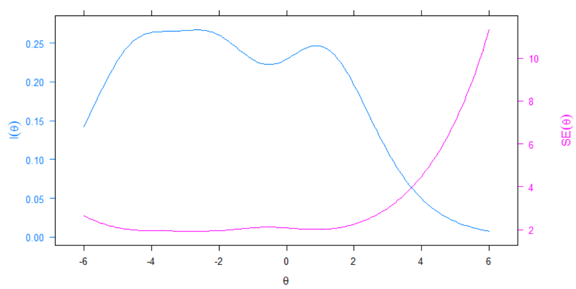
Item information and standard errors for item 9



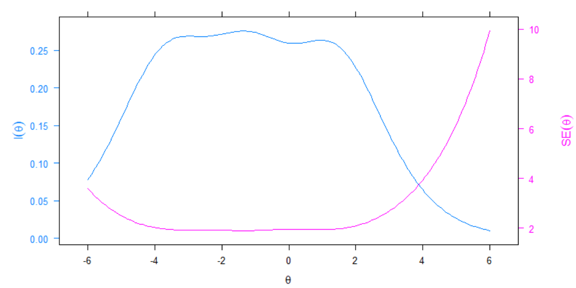
Item information and standard errors for item 10



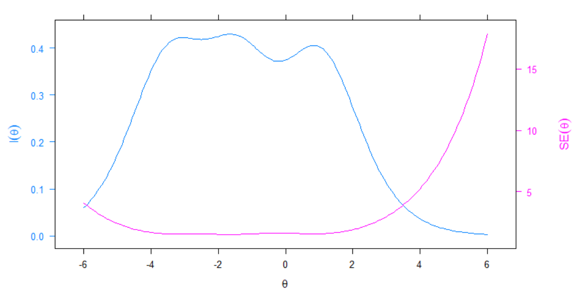
Item information and standard errors for item 11



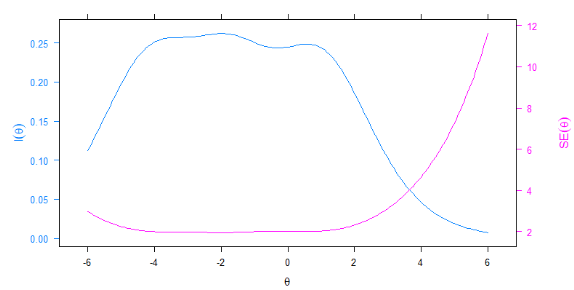
Item information and standard errors for item 12



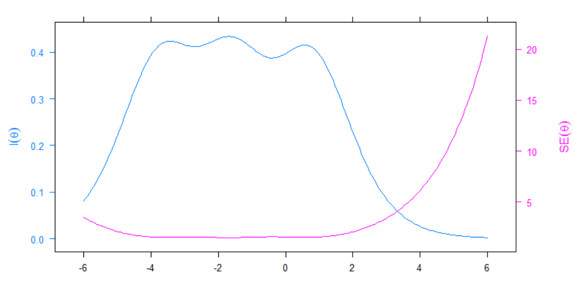
Item information and standard errors for item 13



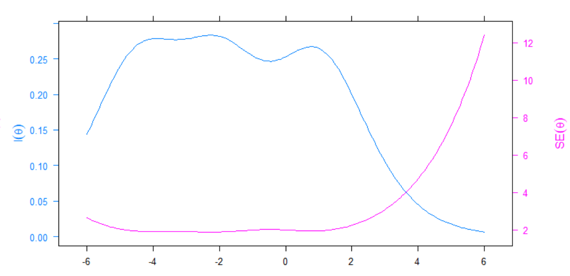
Item information and standard errors for item 14



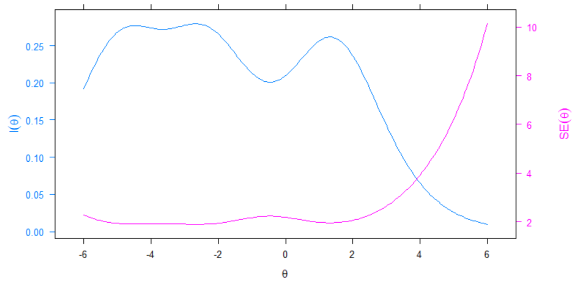
Item information and standard errors for item 15



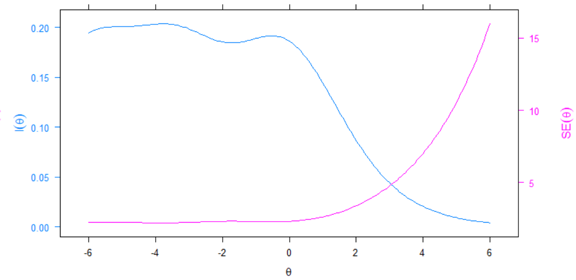
Item information and standard errors for item 16



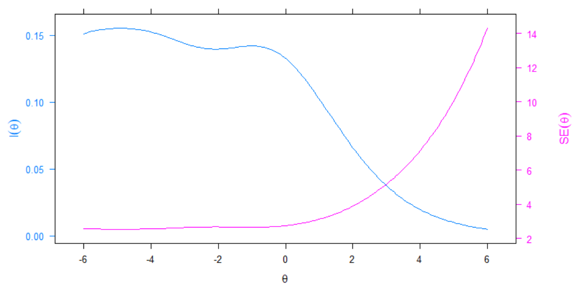
Item information and standard errors for item 17



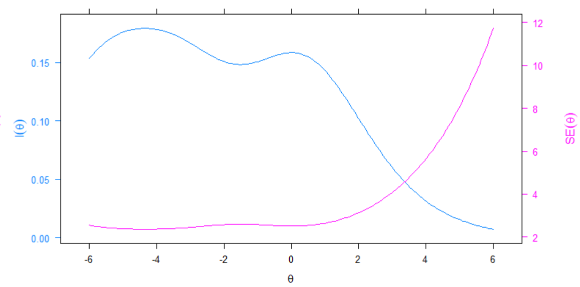
Item information and standard errors for item 18



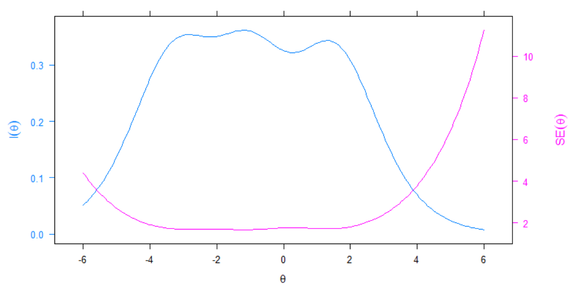
Item information and standard errors for item 19



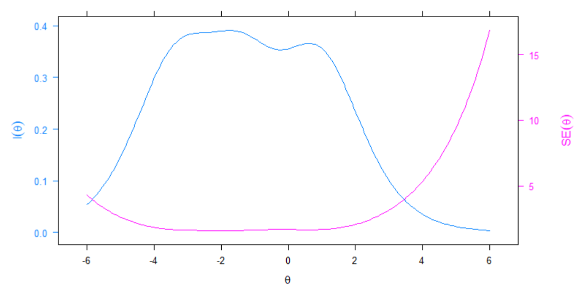
Item information and standard errors for item 20



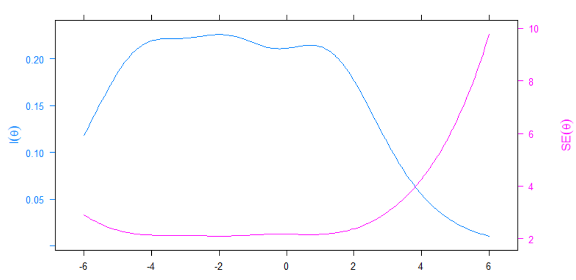
Item information and standard errors for item 21



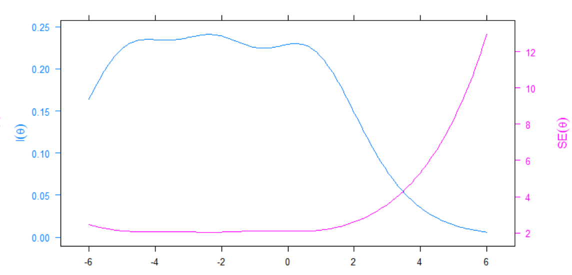
Item information and standard errors for item 22

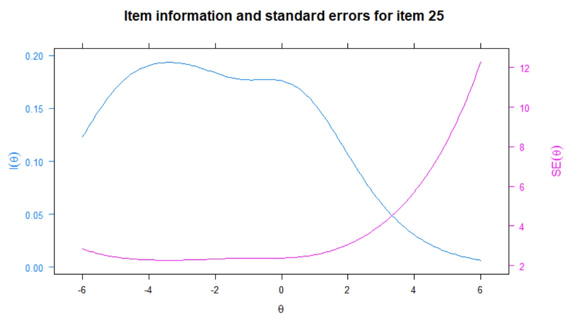


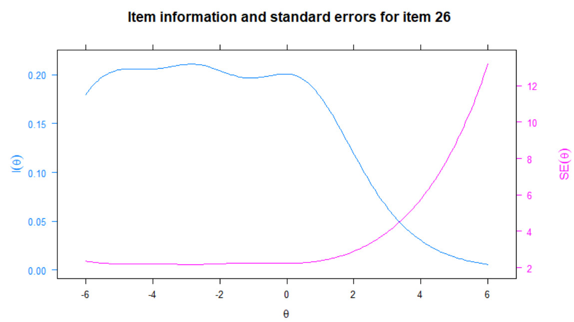
Item information and standard errors for item 23

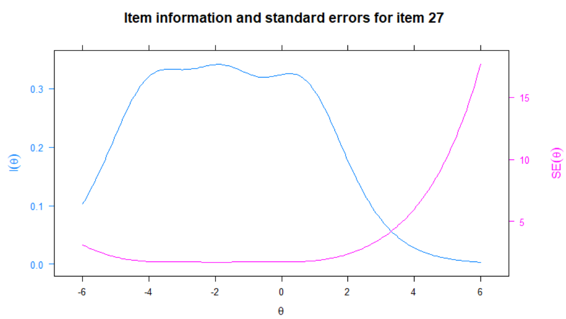


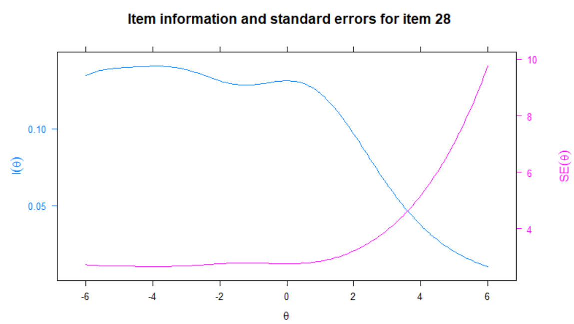
Item information and standard errors for item 24

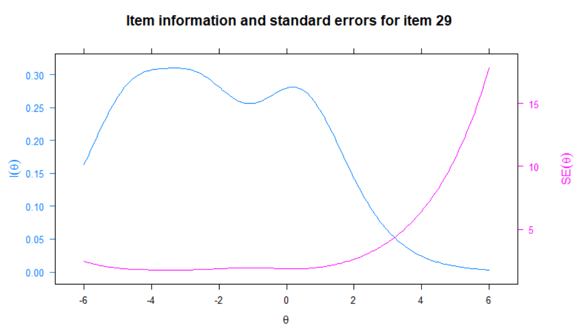


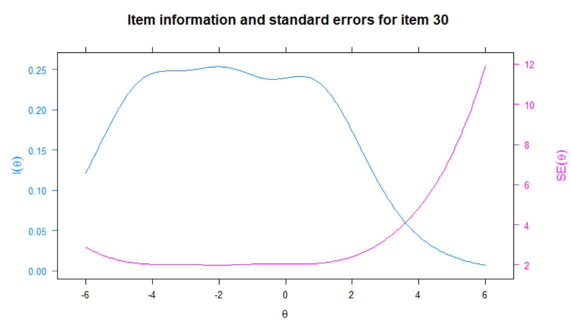

Item information and standard errors for item 25
I(θ)
SE(θ)
θ

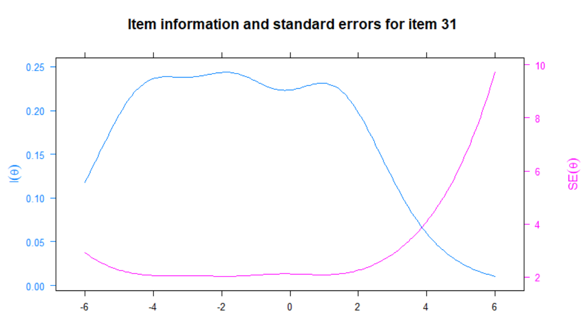

Item information and standard errors for item 26
I(θ)
SE(θ)
θ

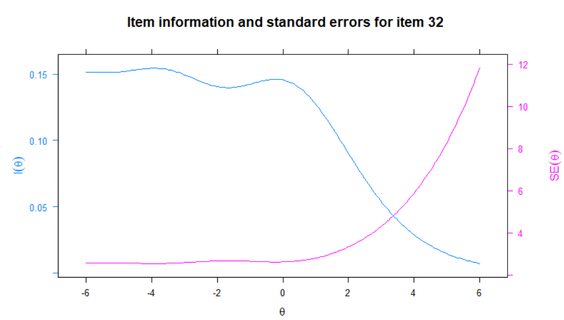

Item information and standard errors for item 27
I(θ)
SE(θ)
θ


Item information and standard errors for item 28
I(θ)
SE(θ)
θ

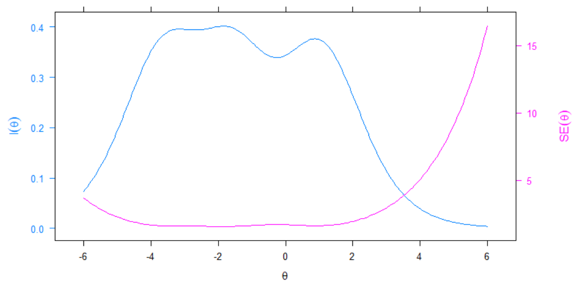

Item information and standard errors for item 29
I(θ)
SE(θ)
θ


Item information and standard errors for item 30
I(θ)
SE(θ)
θ

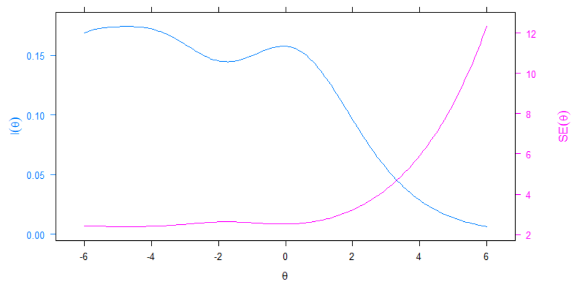

Item information and standard errors for item 31
I(θ)
SE(θ)
θ


Item information and standard errors for item 32
I(θ)
SE(θ)
θ

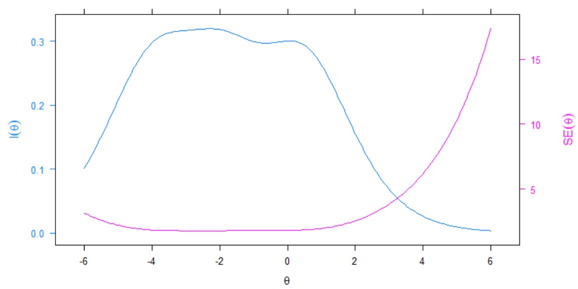
Item information and standard errors for item 33



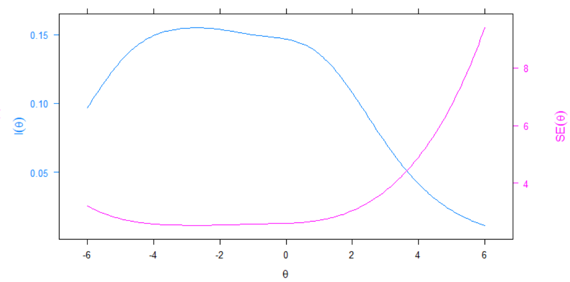
Item information and standard errors for item 34



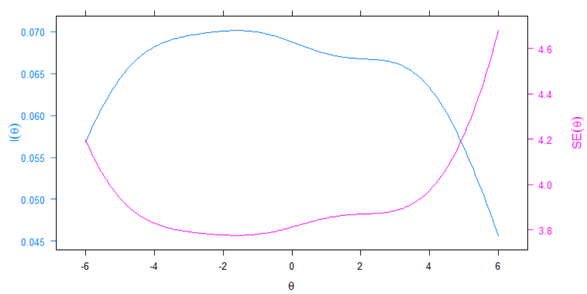
Item information and standard errors for item 35



Item information and standard errors for item 36

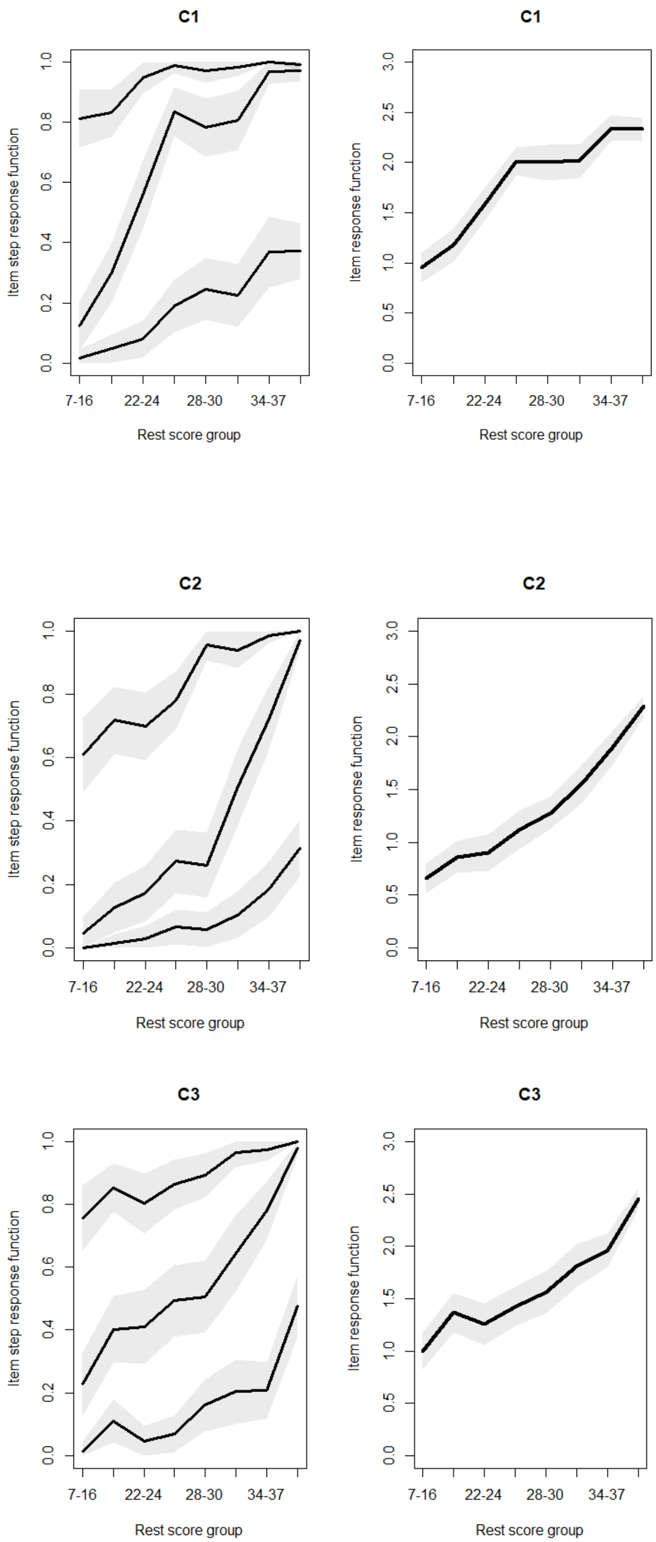


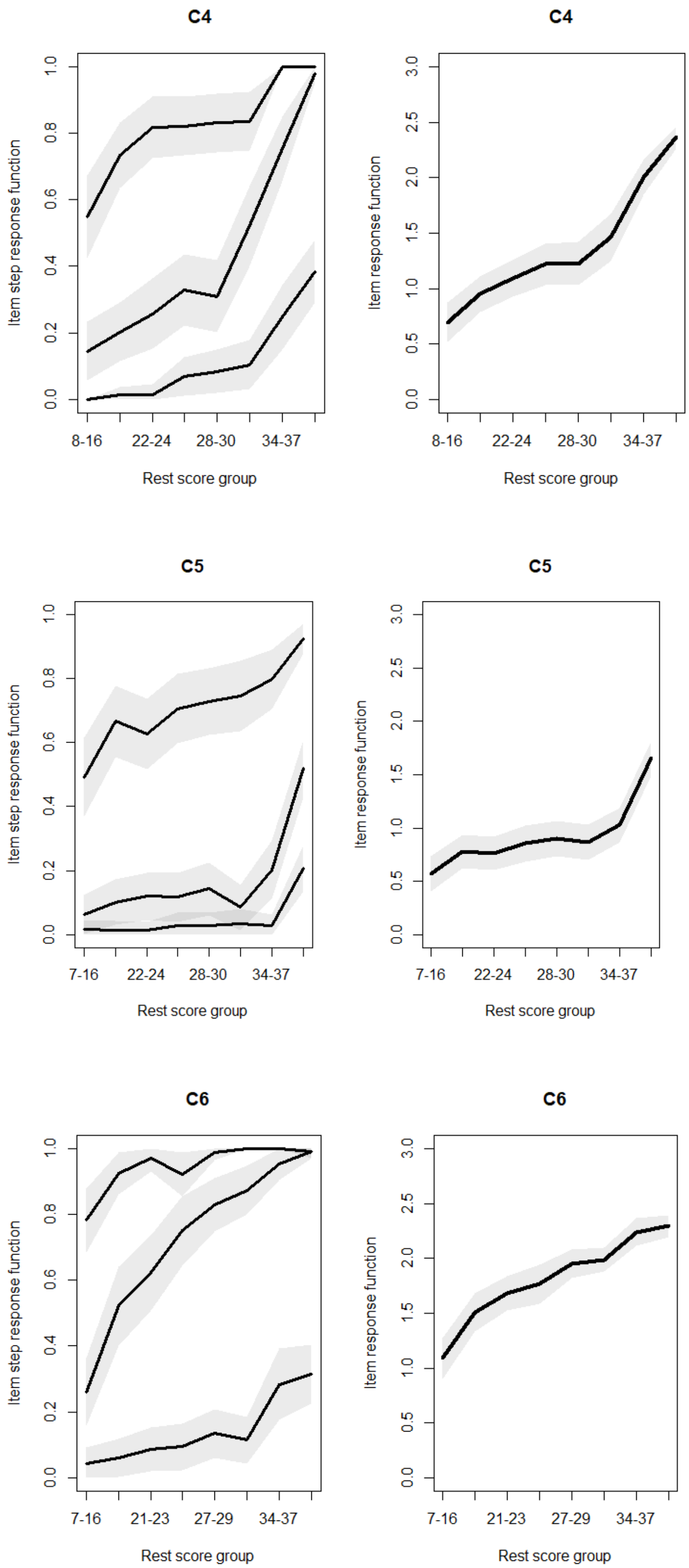
Item information and standard errors for item 37

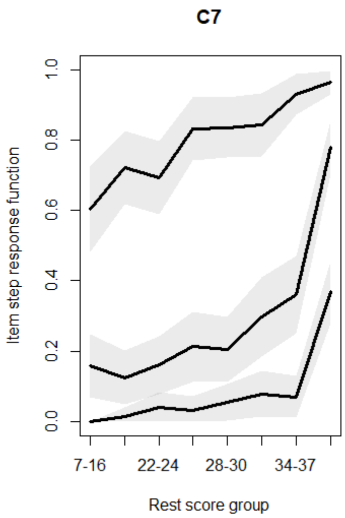


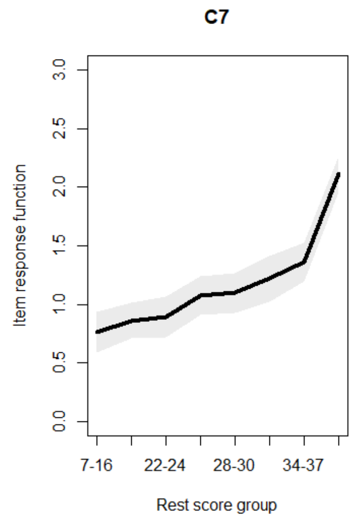
Initial Item Bank Analysis of Perceived Cost

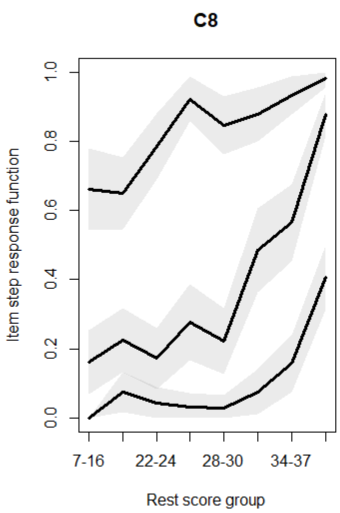
Mokken Scale Analysis for Initial Item Bank

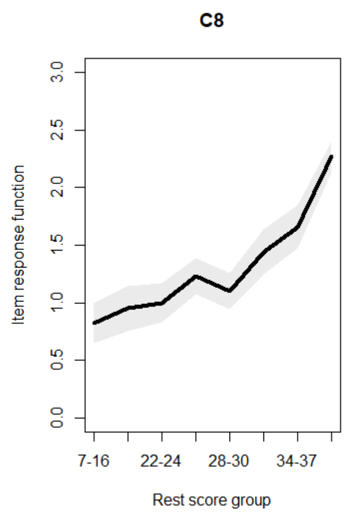


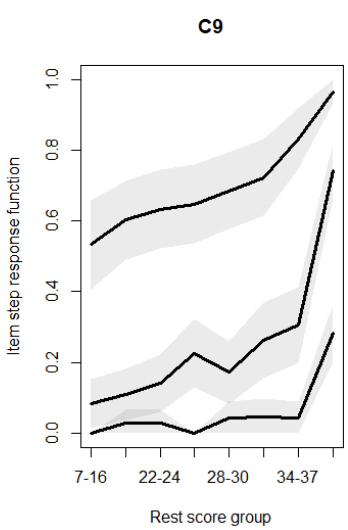

C4
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
8-16
22-24
28-30
34-37
Rest score group
C4
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
8-16
22-24
28-30
34-37
Rest score group
C5
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-16
22-24
28-30
34-37
Rest score group
C5
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-16
22-24
28-30
34-37
Rest score group
C6
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-16
21-23
27-29
34-37
Rest score group
C6
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-16
21-23
27-29
34-37
Rest score group

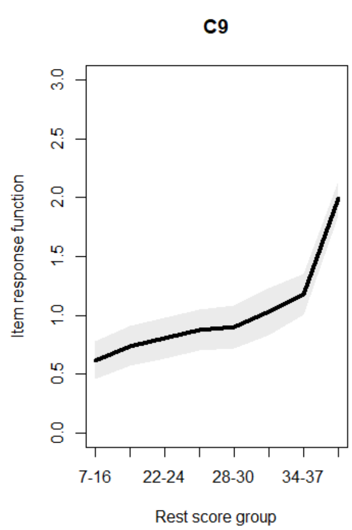

C7
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-16
22-24
28-30
34-37
Rest score group

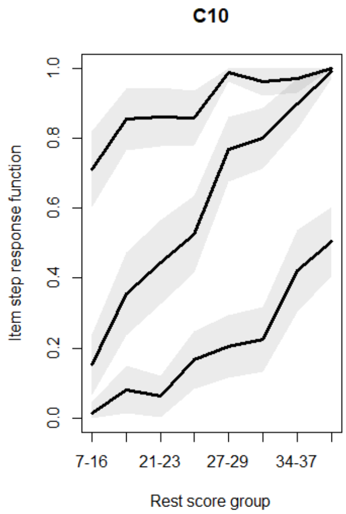

C7
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-16
22-24
28-30
34-37
Rest score group

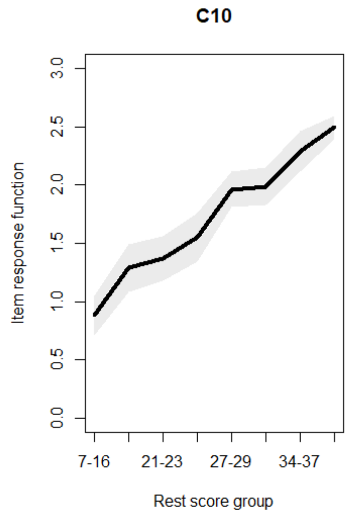

C8
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-16
22-24
28-30
34-37
Rest score group

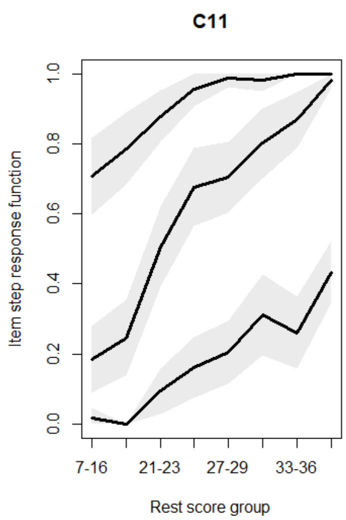

C8
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-16
22-24
28-30
34-37
Rest score group

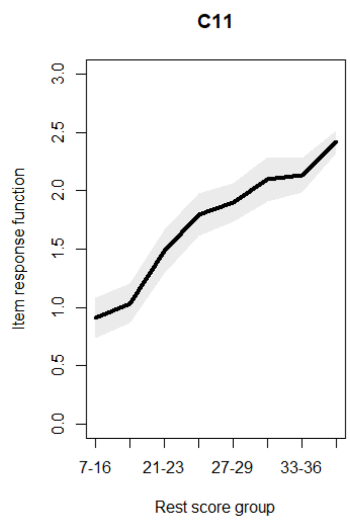

C9
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-16
22-24
28-30
34-37
Rest score group

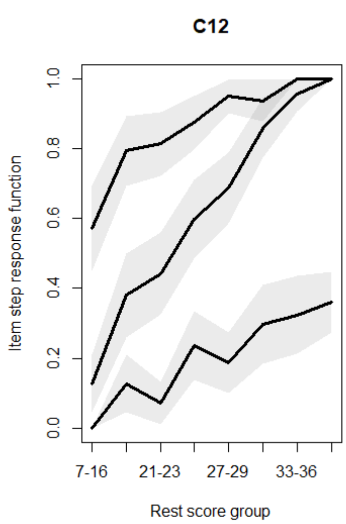

C9
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-16
22-24
28-30
34-37
Rest score group

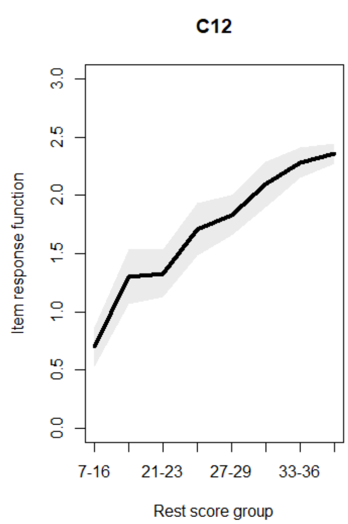

C10
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-16
21-23
27-29
34-37
Rest score group

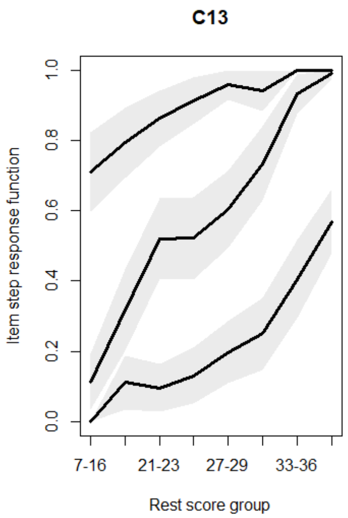

C10
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-16
21-23
27-29
34-37
Rest score group

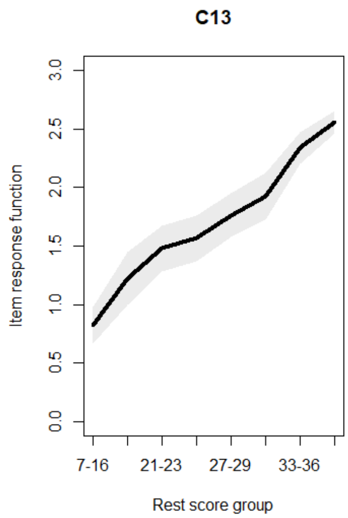

C11
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-16
21-23
27-29
33-36
Rest score group

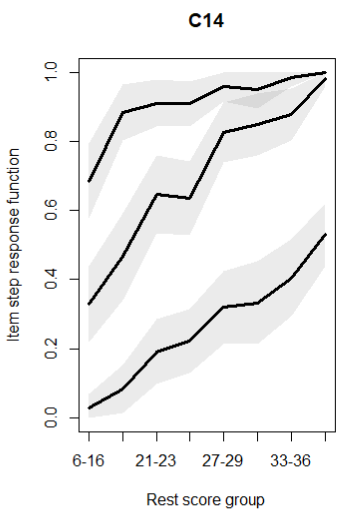

C11
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-16
21-23
27-29
33-36
Rest score group

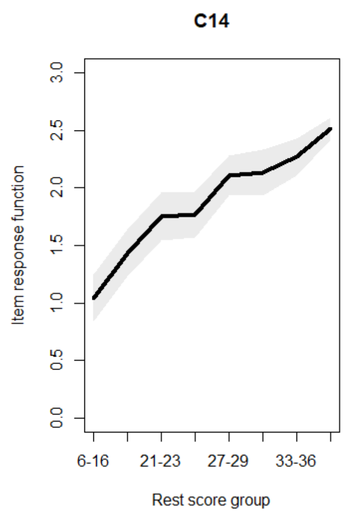

C12
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-16
21-23
27-29
33-36
Rest score group

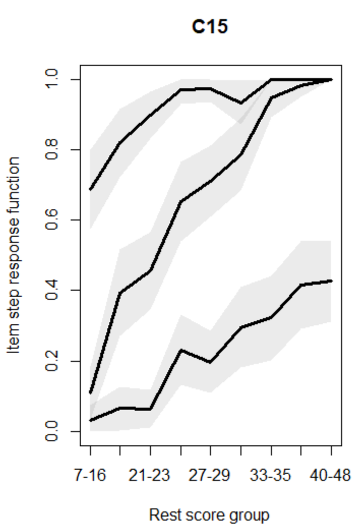

C12
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-16
21-23
27-29
33-36
Rest score group

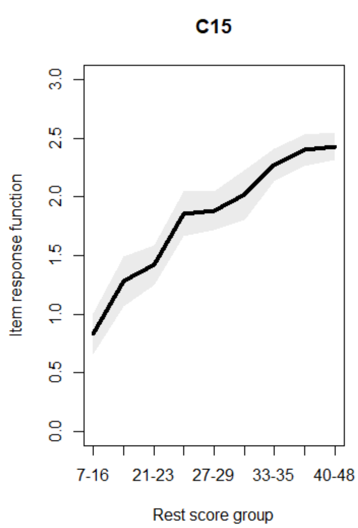

C13
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-16
21-23
27-29
33-36
Rest score group

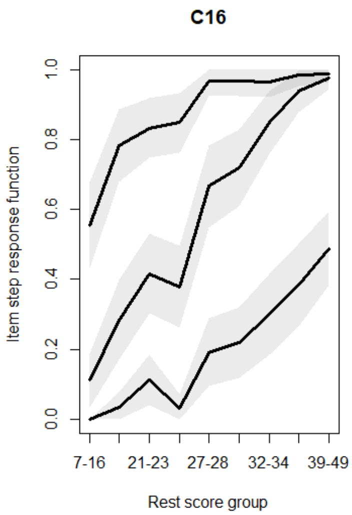

C13
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-16
21-23
27-29
33-36
Rest score group

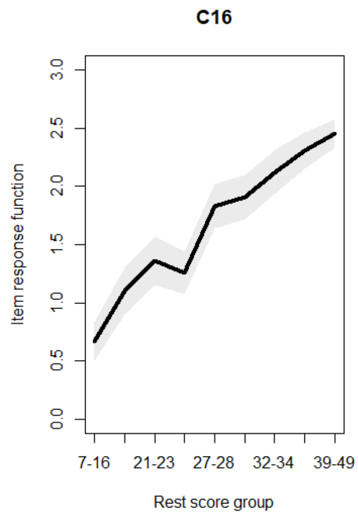

C14
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
6-16
21-23
27-29
33-36
Rest score group

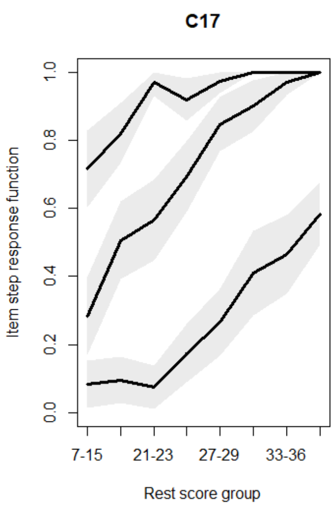

C14
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
6-16
21-23
27-29
33-36
Rest score group

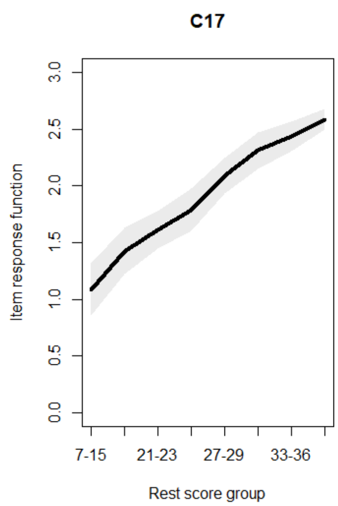

C15
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-16
21-23
27-29
33-35
40-48
Rest score group

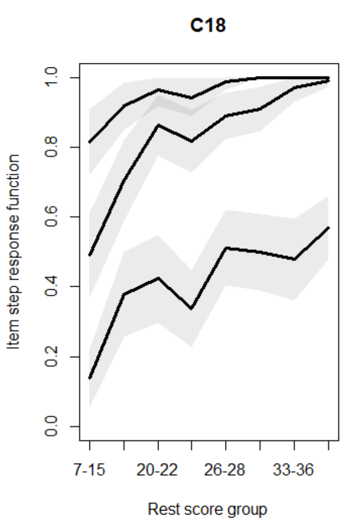

C15
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-16
21-23
27-29
33-35
40-48
Rest score group

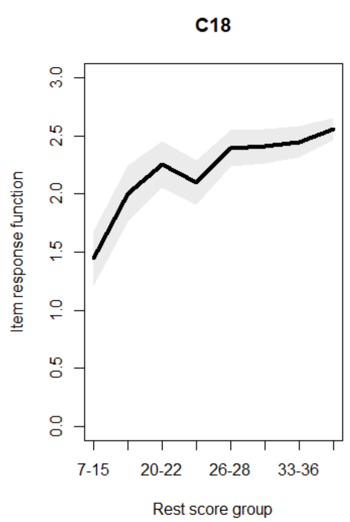

C16
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-16
21-23
27-28
32-34
39-49
Rest score group


C16
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-16
21-23
27-28
32-34
39-49
Rest score group


C17
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-15
21-23
27-29
33-36
Rest score group


C17
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-15
21-23
27-29
33-36
Rest score group


C18
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-15
20-22
26-28
33-36
Rest score group


C18
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-15
20-22
26-28
33-36
Rest score group

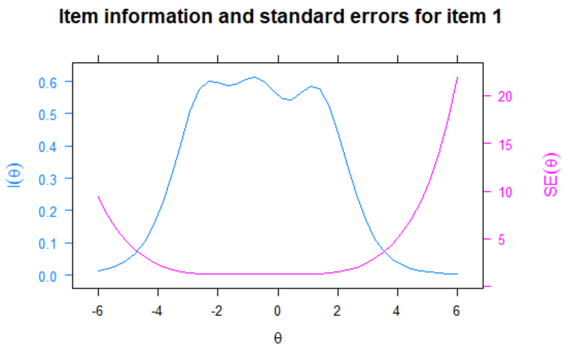
LD X^2 Index for the Initial Item Bank

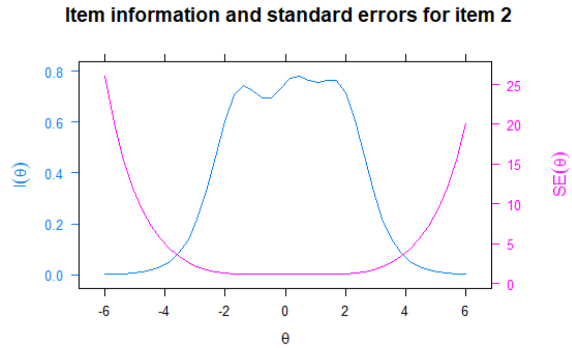
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	NA									
C2	-17.79	NA								
C3	-19.77	43.94	NA							
C4	-17.69	53.03	76.77	NA						
C5	-13.84	25.51	28.46	18.93	NA					
C6	24.13	20.77	27.70	-7.10	-13.81	NA				
C7	-24.05	39.51	39.78	39.37	65.89	-56.74	NA			
C8	-20.58	53.48	31.91	22.76	34.48	-18.02	43.17	NA		
C9	-19.44	29.16	39.09	21.94	75.59	-16.02	84.47	55.55	NA	
C10	86.76	24.24	-20.58	-26.57	-24.00	-37.83	-22.71	-41.37	-10.85	NA
C11	33.84	-11.70	-15.21	-24.15	-21.40	14.87	-11.51	-17.99	-16.16	60.44
C12	25.12	-33.40	-31.56	-44.80	10.59	-12.11	-34.36	29.26	-36.13	41.75
C13	23.54	24.05	-10.36	-12.25	-14.52	-26.55	19.19	-23.15	-10.98	16.48
C14	21.69	-18.30	-10.76	-14.86	-24.49	29.71	-25.06	-28.27	-11.54	14.58
C15	25.58	-29.39	-12.77	-18.68	-12.42	19.91	-33.87	-10.06	-20.77	28.20
C16	33.33	-35.80	-8.75	-12.76	10.19	18.32	-19.13	-18.52	-9.05	29.38
C17	16.39	-14.06	9.81	9.93	-15.86	37.46	-11.91	-9.46	-7.66	13.05
C18	31.07	-41.80	-12.96	-36.63	-34.56	54.88	-49.50	-26.82	-27.15	28.75

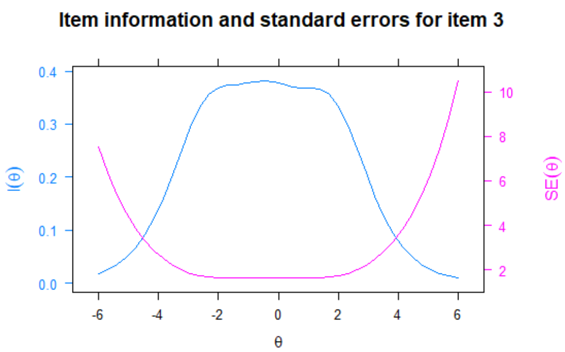
LD X^2 Index for the Initial Item Bank (Continued)

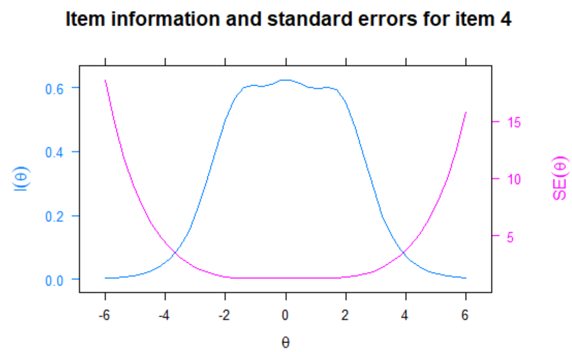
	C11	C12	C13	C14	C15	C16	C17	C18
C11	NA							
C12	68.04	NA						
C13	37.23	70.12	NA					
C14	21.98	25.25	50.47	NA				
C15	13.91	31.07	21.47	39.78	NA			
C16	22.75	38.41	15.27	12.75	69.31	NA		
C17	-10.36	-20.9	-4.98	13.41	31.03	-15.47	NA	
C18	19.18	24.5	30.72	32.52	36.14	26.16	52.26	NA

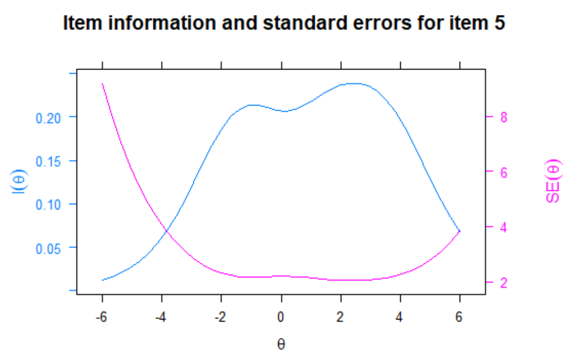
Item Information Function for Each Item

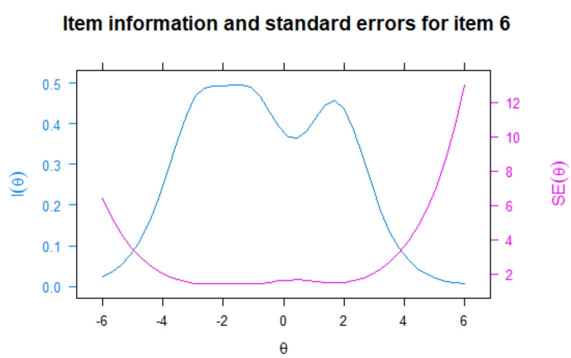


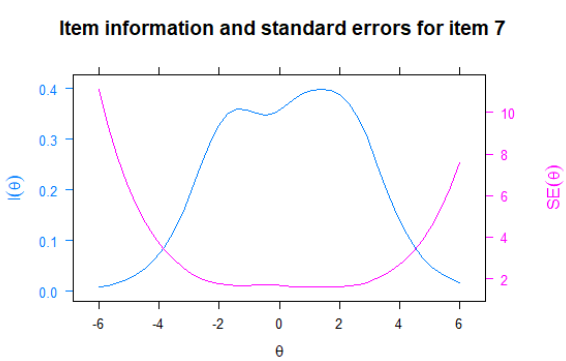


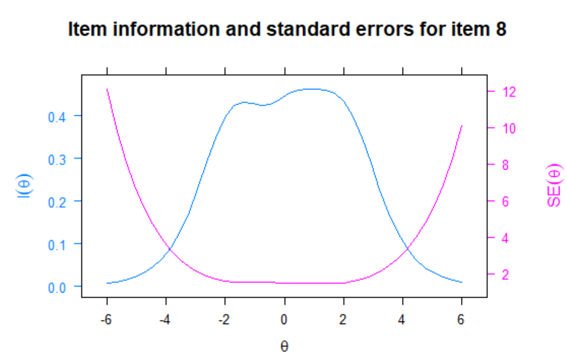




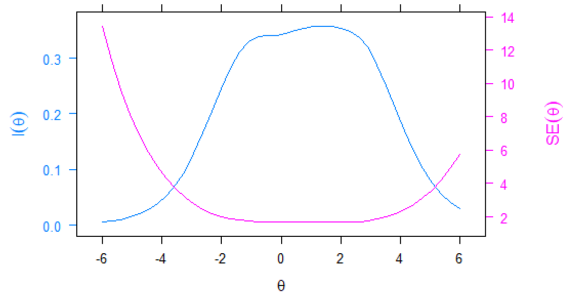




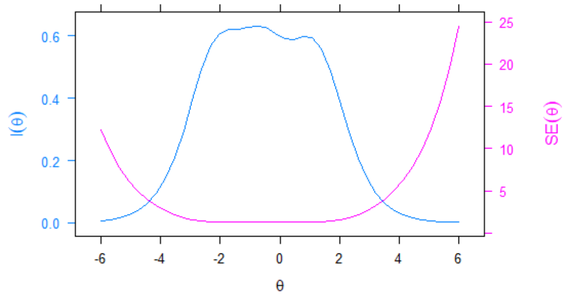




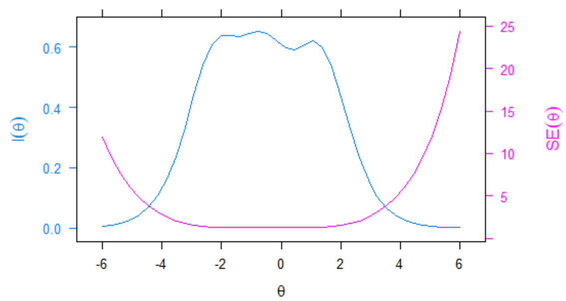
Item information and standard errors for item 9



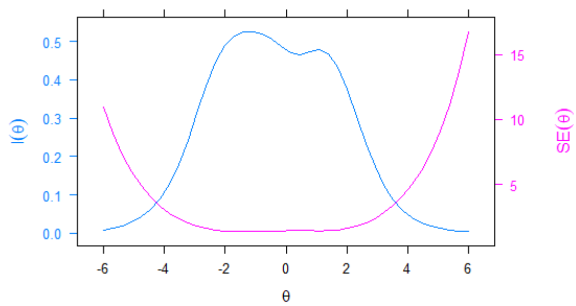
Item information and standard errors for item 10



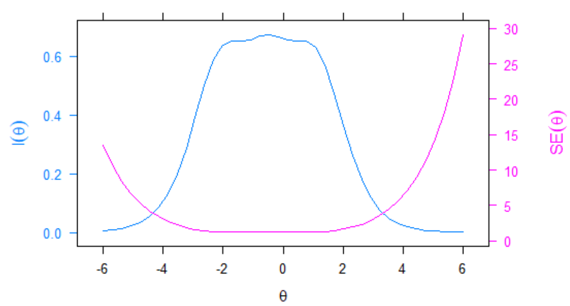
Item information and standard errors for item 11



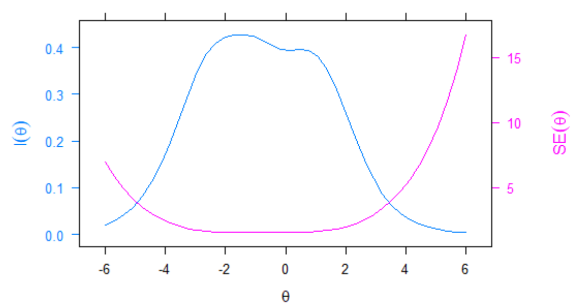
Item information and standard errors for item 12



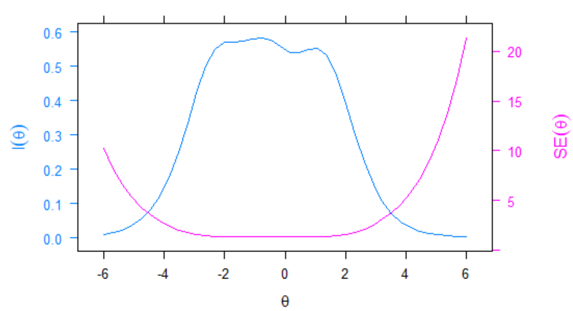
Item information and standard errors for item 13



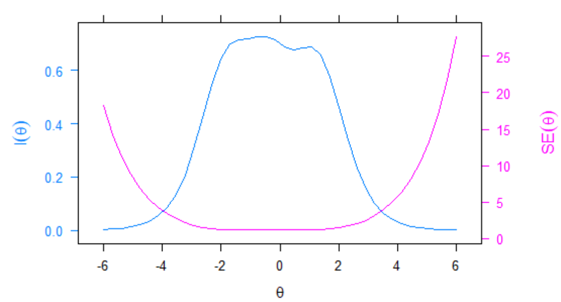
Item information and standard errors for item 14

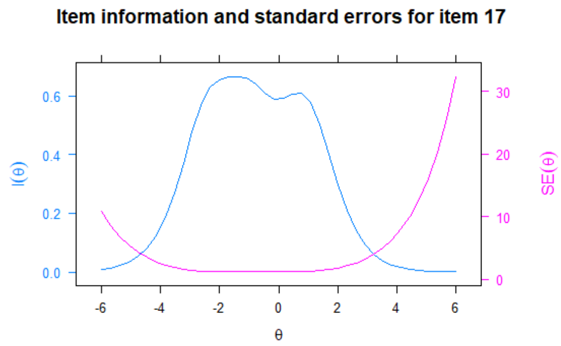


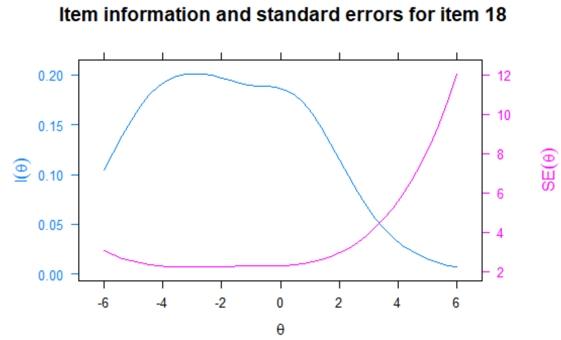
Item information and standard errors for item 15



Item information and standard errors for item 16




Item information and standard errors for item 17
I(θ)
SE(θ)
θ
0.0
0.2
0.4
0.6
0
10
20
30
-6
-4
-2
0
2
4
6

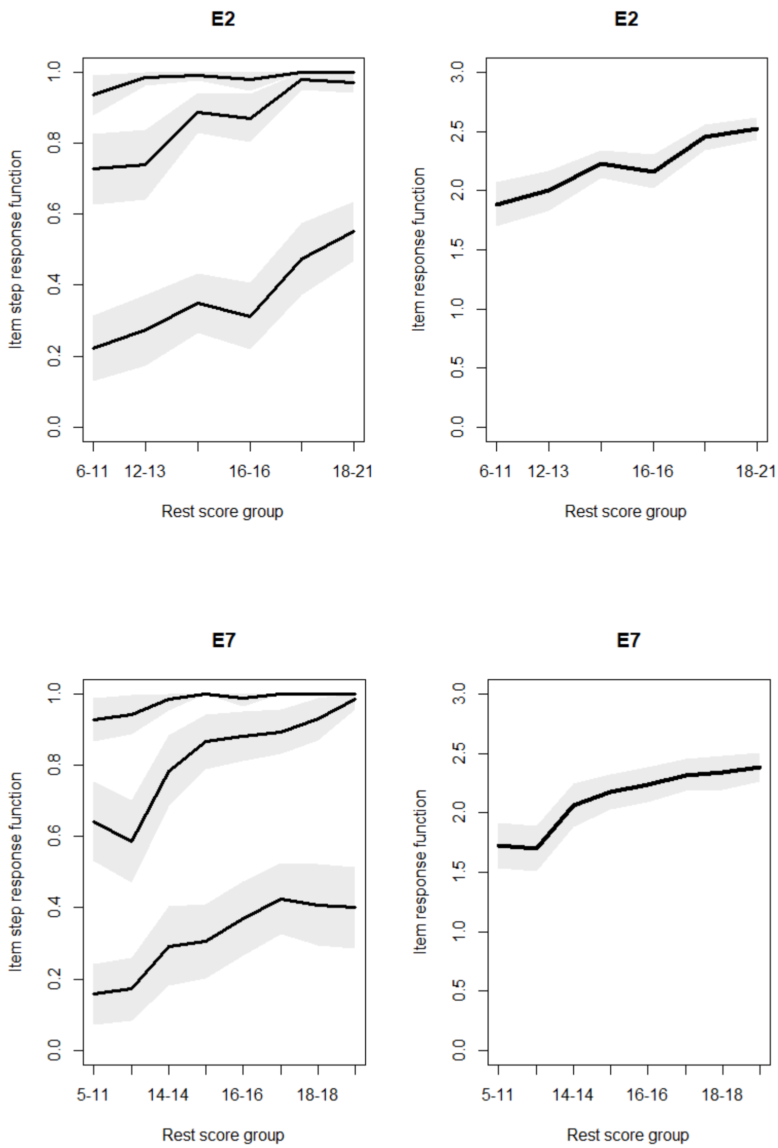

Item information and standard errors for item 18
I(θ)
SE(θ)
θ
0.00
0.05
0.10
0.15
0.20
2
4
6
8
10
12
-6
-4
-2
0
2
4
6

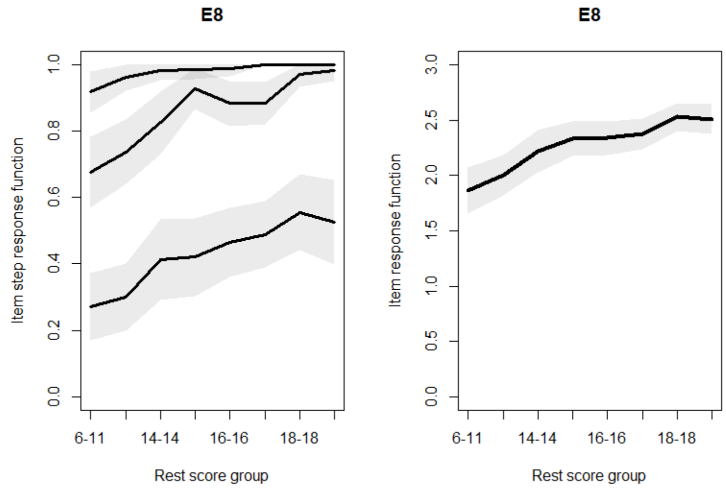
APPENDIX G

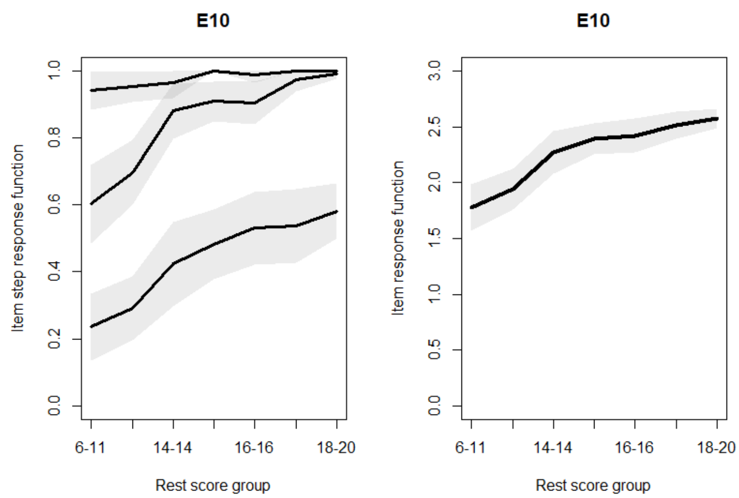
MOKKEN SCALE ANALYSIS PLOTS, LD X^2 INDEX TABLE, AND ITEM INFORMATION FUNCTIONS OF INITIAL ITEM BANK

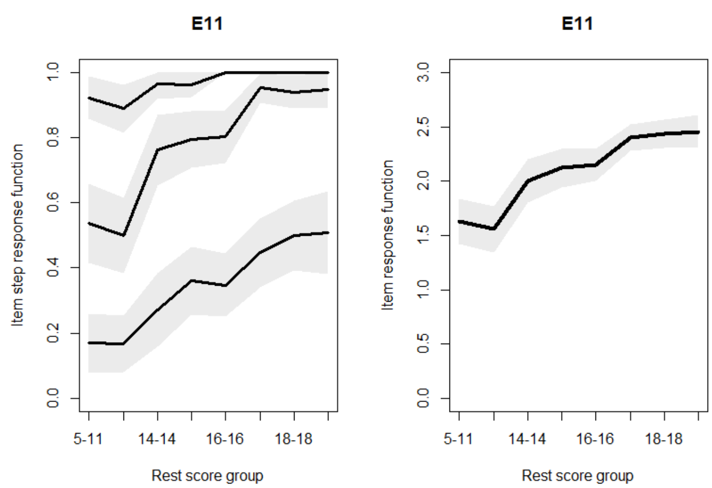
Final Item Bank Analysis of Expectancy

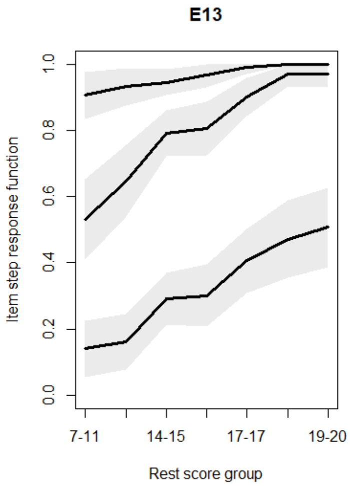
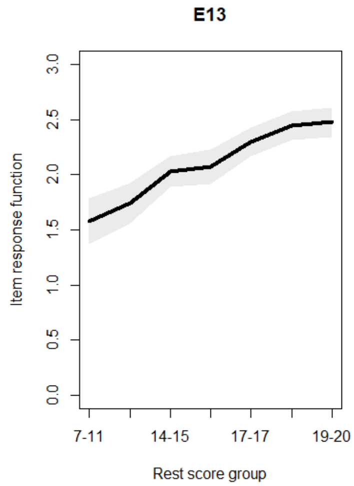
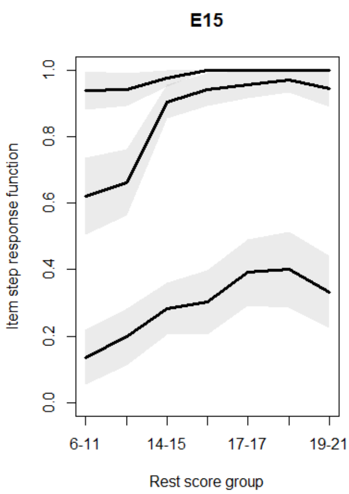
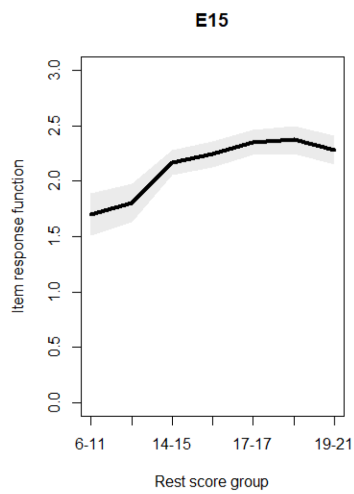
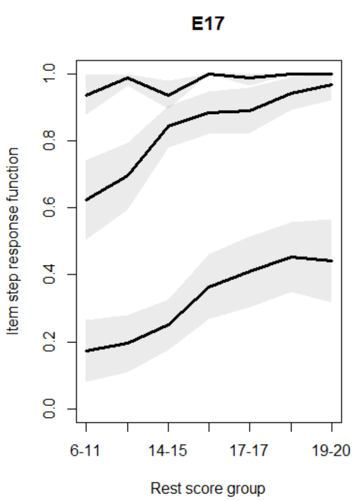
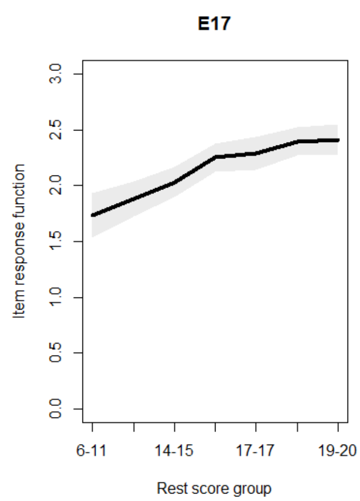
Mokken Scale Analysis for Final Item Bank




E8
Item step response function
Rest score group
6-11
14-14
16-16
18-18
0.0
0.2
0.4
0.6
0.8
1.0
E8
Item response function
Rest score group
0.0
0.5
1.0
1.5
2.0
2.5
3.0


E10
Item step response function
Rest score group
6-11
14-14
16-16
18-20
E10
Item response function
Rest score group


E11
Item step response function
Rest score group
5-11
14-14
16-16
18-18
E11
Item response function
Rest score group


E13
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
7-11
14-15
17-17
19-20
Rest score group

E13
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
7-11
14-15
17-17
19-20
Rest score group

E15
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
6-11
14-15
17-17
19-21
Rest score group

E15
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
6-11
14-15
17-17
19-21
Rest score group

E17
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
6-11
14-15
17-17
19-20
Rest score group

E17
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
6-11
14-15
17-17
19-20
Rest score group

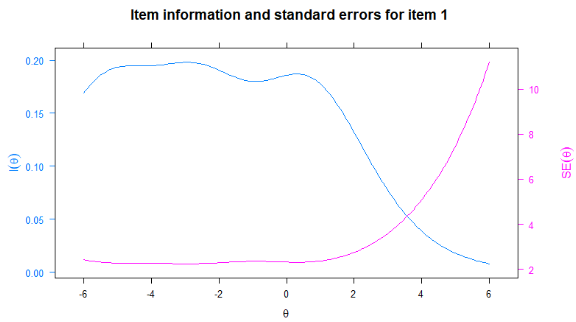
LD X^2 Index for the Final Item Bank

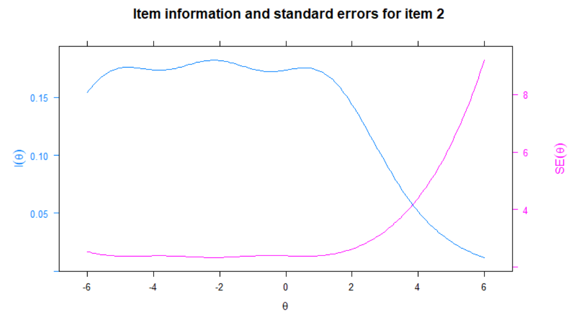
	E2	E7	E8	E10	E11	E13	E15	E17
E2	NA	0.108	-0.080	-0.072	-0.087	-0.095	0.106	0.070
E7	21.153	NA	-0.112	-0.080	-0.122	0.076	-0.094	-0.067
E8	-11.584	-22.577	NA	-0.084	0.108	-0.129	-0.109	0.103
E10	-9.250	-11.635	-12.734	NA	-0.131	-0.085	0.082	0.106
E11	-13.507	-26.741	21.125	-30.681	NA	0.063	-0.126	-0.051
E13	-16.049	10.421	-29.770	-12.930	7.098	NA	-0.097	0.134
E15	20.182	-15.780	-21.531	11.985	-28.546	-16.994	NA	-0.108
E17	8.788	-8.055	19.177	20.110	-4.726	32.315	-20.990	NA

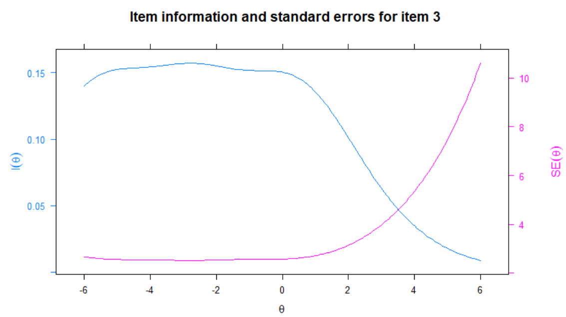
Q3 Statistics for the Final Item Bank

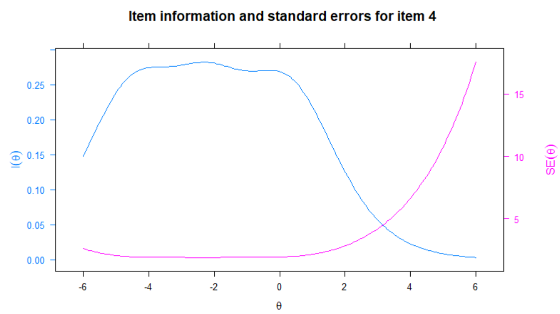
	E2	E7	E8	E10	E11	E13	E15	E17
E2	1.000							
E7	0.025	1.000						
E8	-0.069	-0.038	1.000					
E10	-0.161	-0.119	-0.067	1.000				
E11	-0.111	-0.081	-0.034	-0.079	1.000			
E13	-0.103	-0.037	-0.115	-0.156	-0.107	1.000		
E15	-0.043	-0.051	-0.097	0.008	-0.079	-0.117	1.000	
E17	-0.056	-0.122	-0.025	-0.034	-0.112	0.025	-0.130	1.000

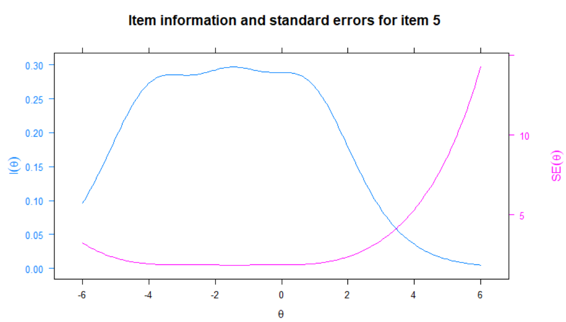
Item Information Function for Each Item

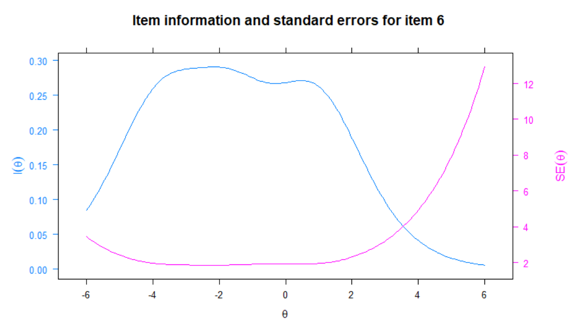


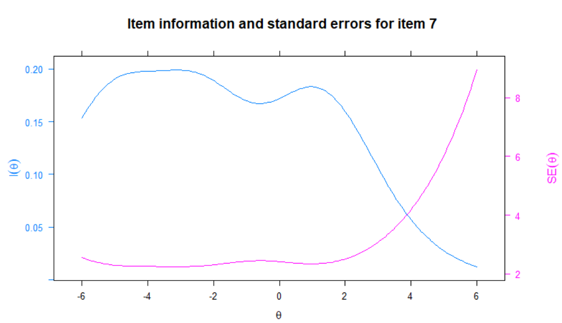


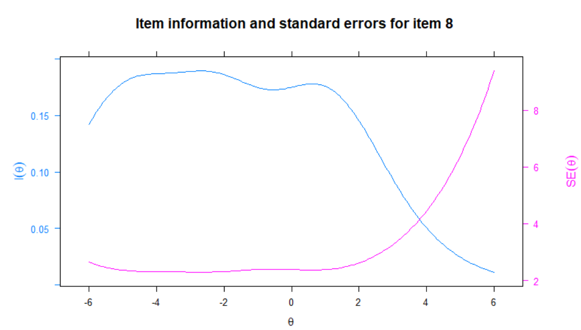






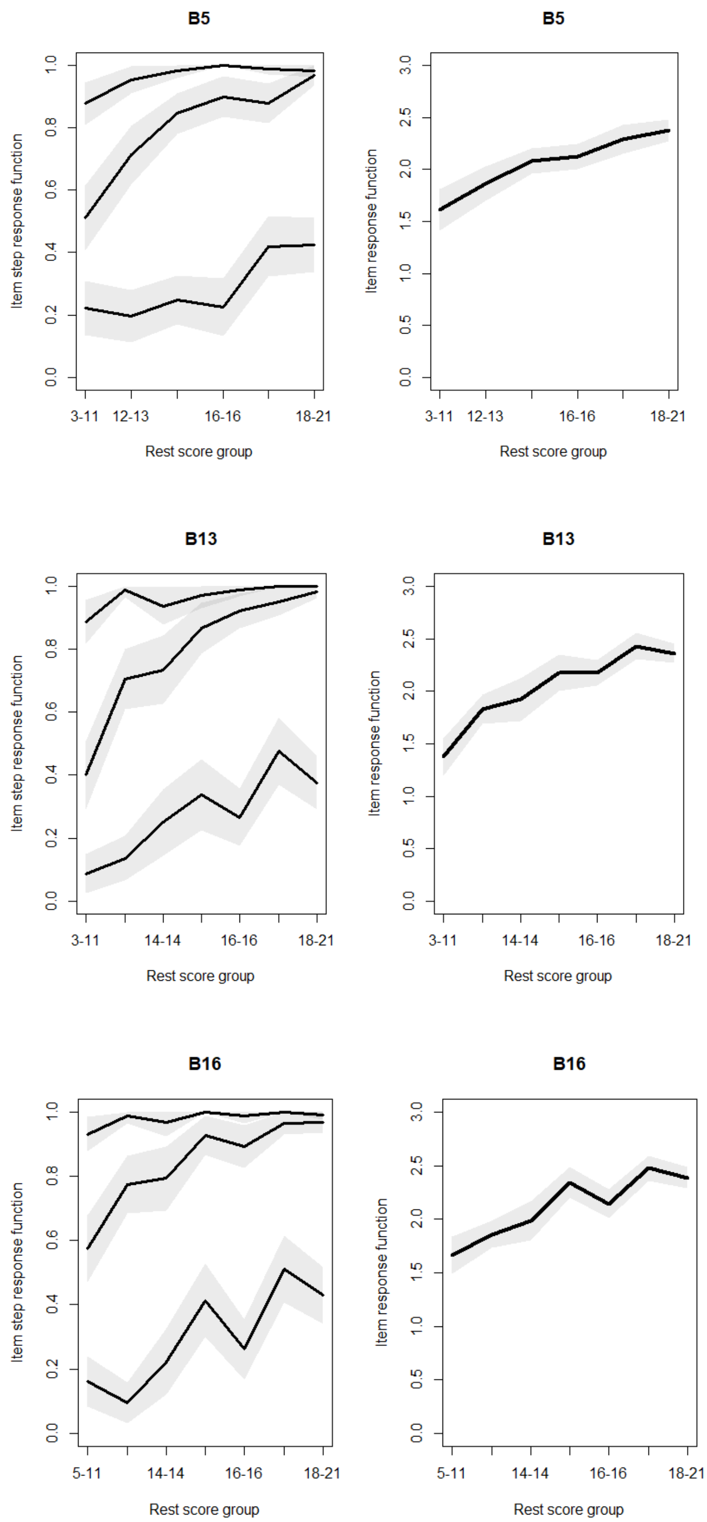


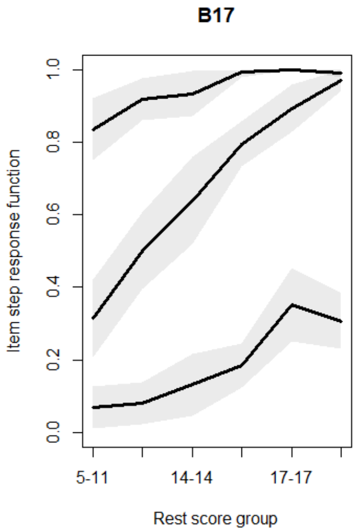


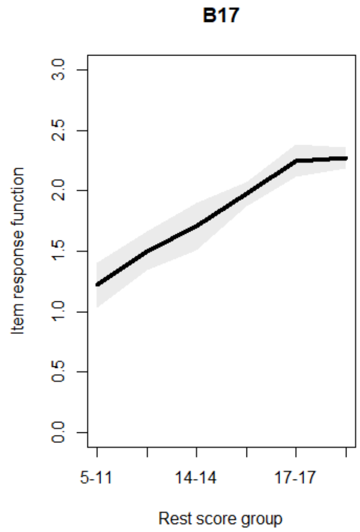


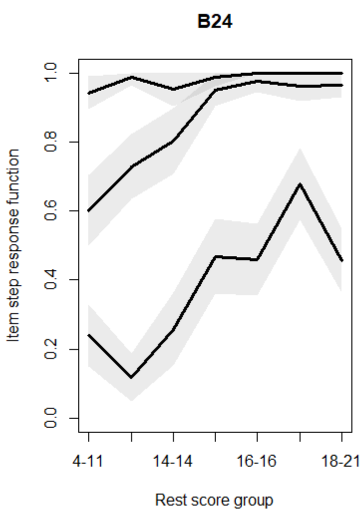
Final Item Bank Analysis of Perceived Benefit

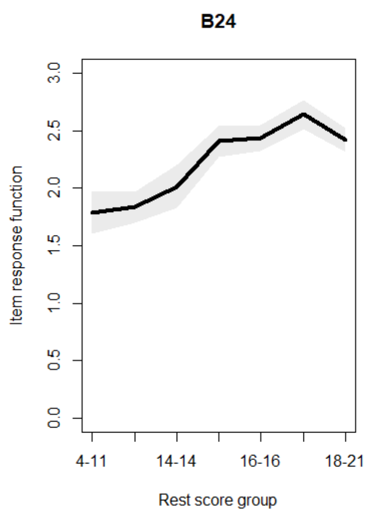
Mokken Scale Analysis for Final Item Bank

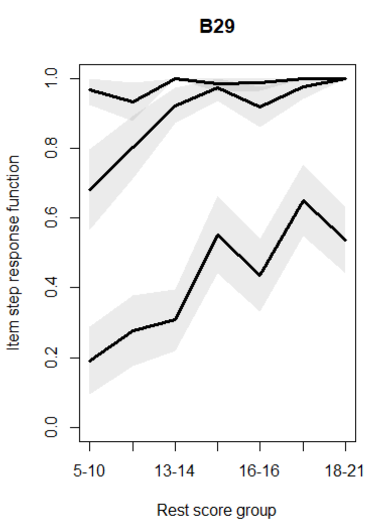


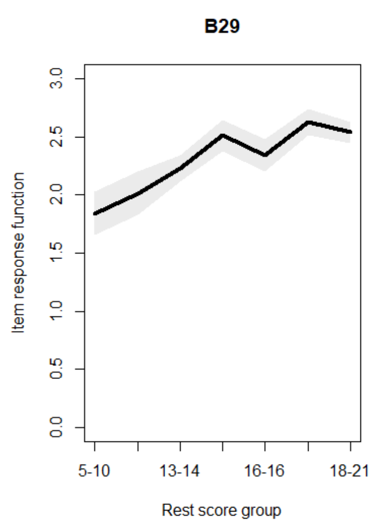

B17
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
5-11
14-14
17-17
Rest score group

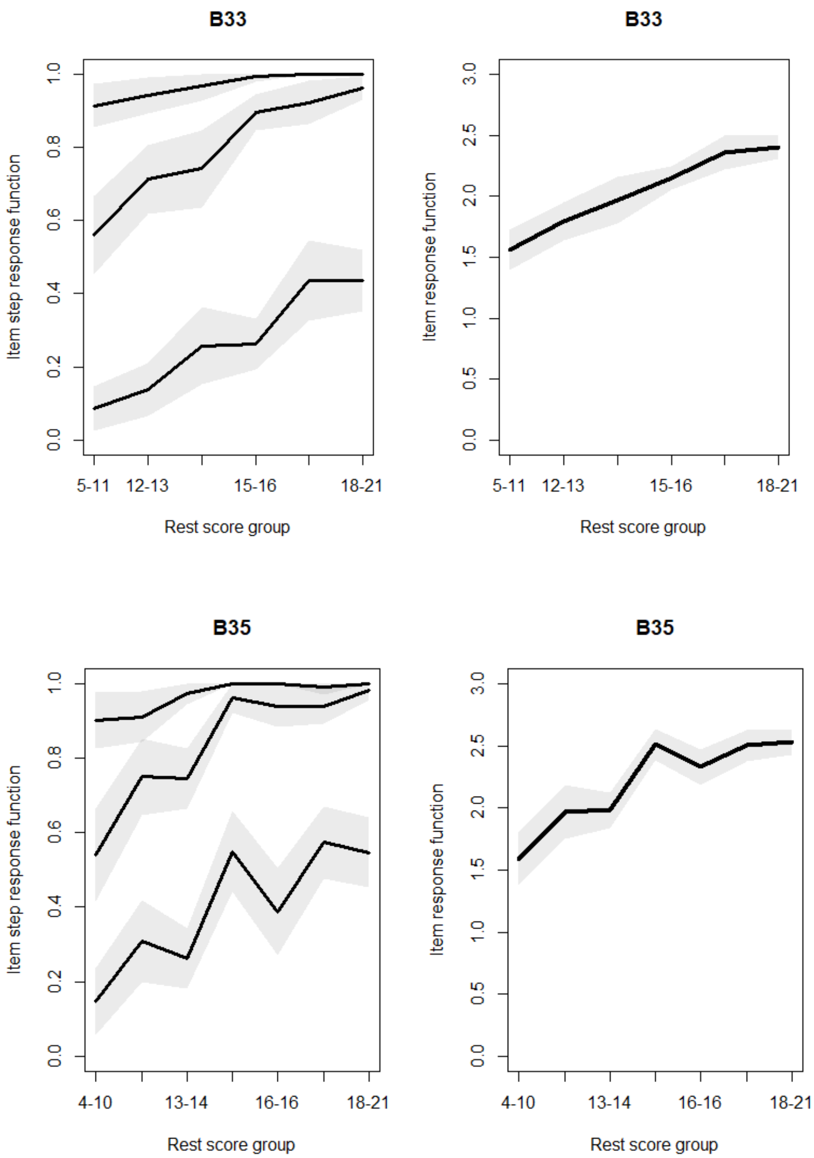

B17
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
5-11
14-14
17-17
Rest score group


B24
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
4-11
14-14
16-16
18-21
Rest score group


B24
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
4-11
14-14
16-16
18-21
Rest score group


B29
Item step response function
0.0
0.2
0.4
0.6
0.8
1.0
5-10
13-14
16-16
18-21
Rest score group


B29
Item response function
0.0
0.5
1.0
1.5
2.0
2.5
3.0
5-10
13-14
16-16
18-21
Rest score group


B33
Item step response function
Rest score group
5-11
12-13
15-16
18-21
B33
Item response function
Rest score group
B35
Item step response function
Rest score group
4-10
13-14
16-16
18-21
B35
Item response function
Rest score group

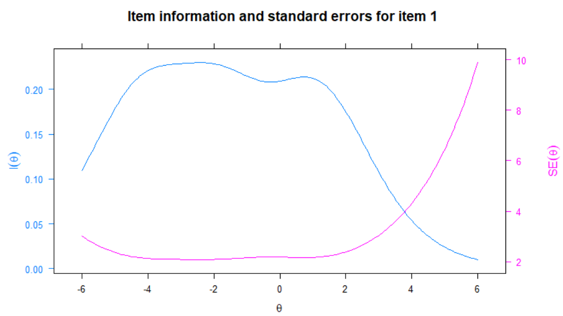
LD X^2 Index for the Final Item Bank

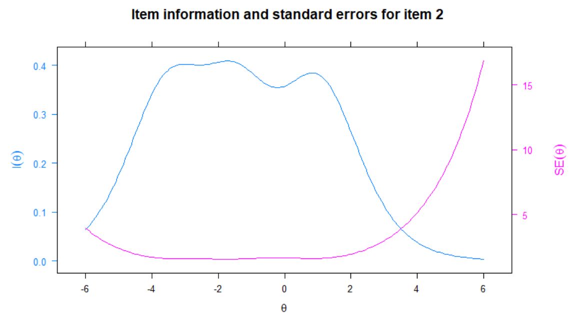
	B5	**B13**	**B16**	**B17**	**B24**	**B29**	**B33**	**B35**
B5	NA	-0.128	-0.091	-0.097	-0.115	-0.091	-0.084	0.128
B13	-29.451	NA	0.123	-0.139	0.098	-0.102	-0.121	-0.072
B16	-14.827	27.158	NA	-0.122	-0.100	-0.132	-0.101	-0.072
B17	-17.063	-32.526	-26.939	NA	-0.117	-0.127	0.113	0.127
B24	-23.575	17.139	-18.036	-24.412	NA	-0.111	0.066	0.085
B29	-14.745	-18.676	-31.232	-28.976	-22.259	NA	0.151	0.103
B33	-12.668	-26.381	-18.420	22.775	7.808	40.986	NA	-0.106
B35	29.548	-9.332	-9.389	29.208	12.914	19.052	-20.184	NA

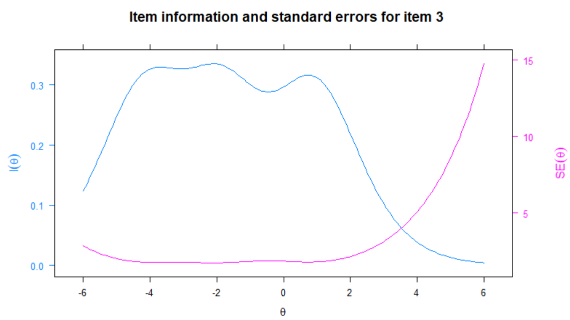
Q3 Statistics for the Final Item Bank

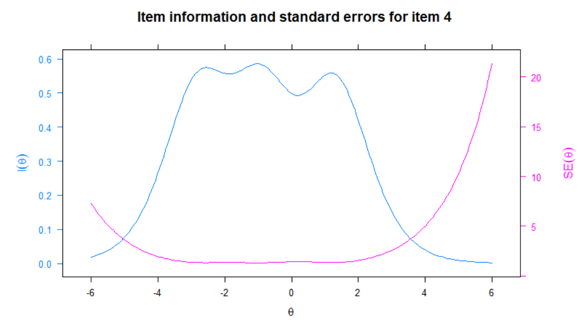
	B5	**B13**	**B16**	**B17**	**B24**	**B29**	**B33**	**B35**
B5	1.000							
B13	-0.074	1.000						
B16	-0.085	0.053	1.000					
B17	-0.083	-0.198	-0.158	1.000				
B24	-0.136	-0.060	-0.069	-0.158	1.000			
B29	-0.082	-0.110	-0.116	-0.072	-0.101	1.000		
B33	-0.103	-0.140	-0.161	-0.075	-0.056	0.014	1.000	
B35	-0.002	-0.124	-0.160	-0.078	-0.028	0.019	-0.151	1.000

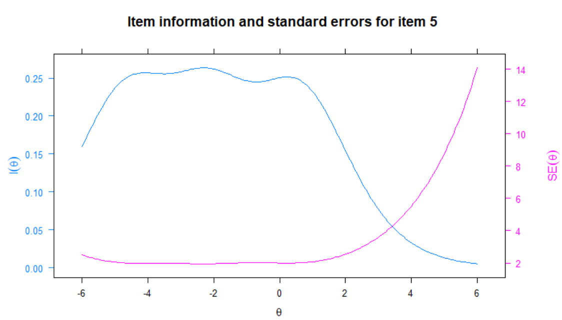
Item Information Function for Each Item

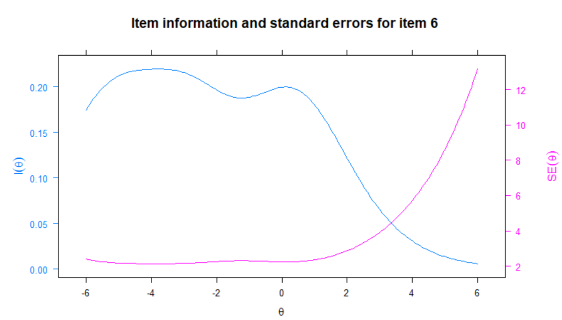


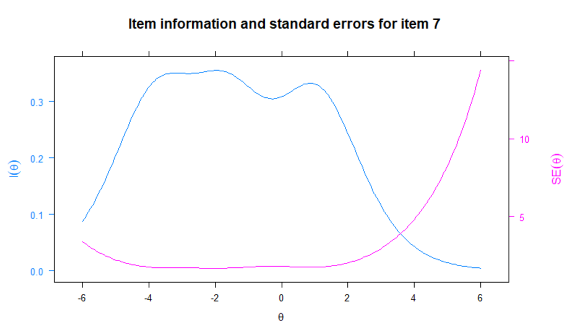


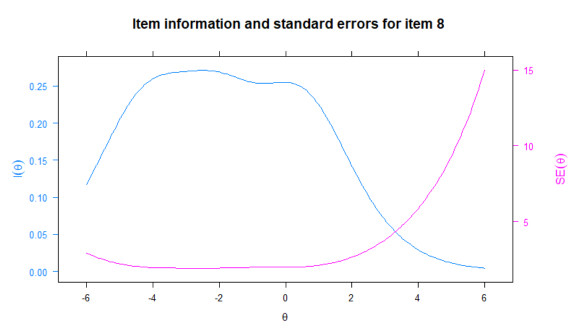






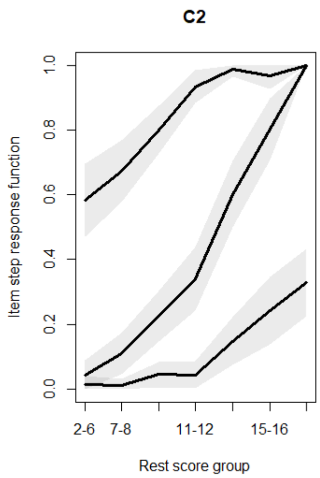


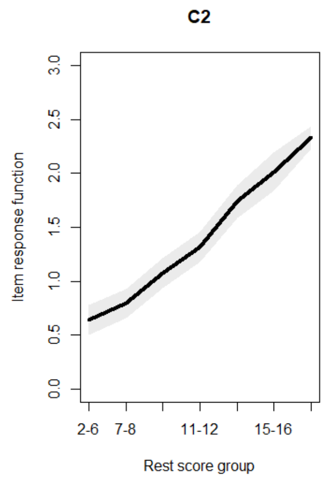


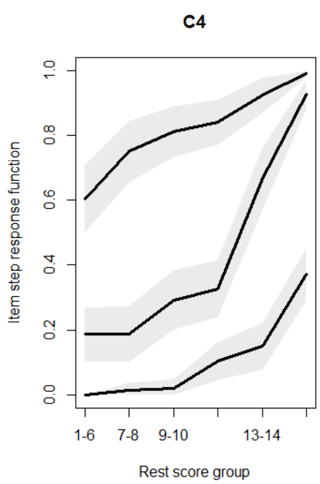


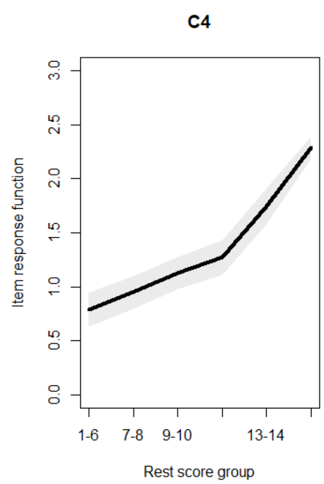
Final Item Bank Analysis of Perceived Cost

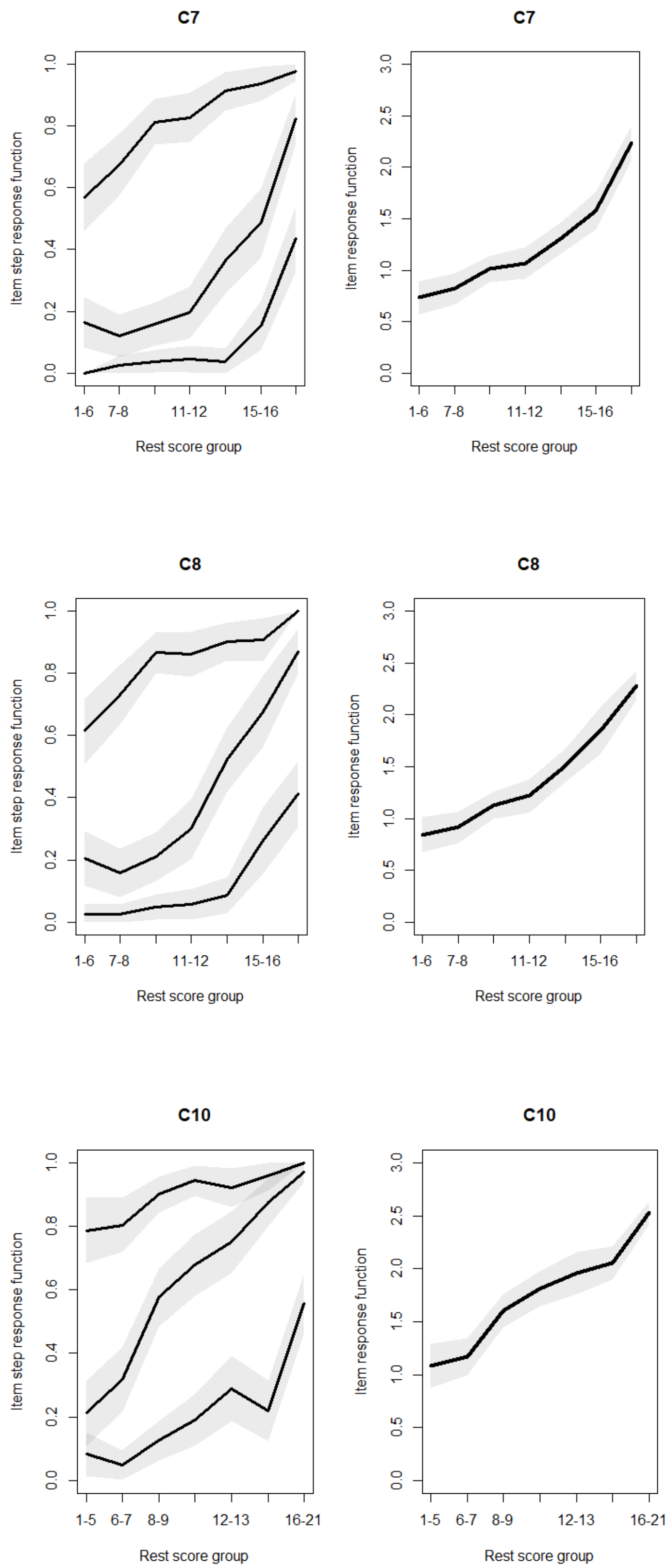
Mokken Scale Analysis for Final Item Bank



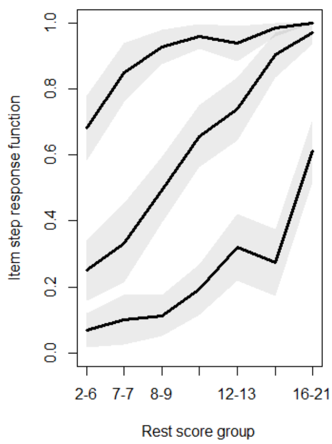







C7
Item step response function
Rest score group
C7
Item response function
Rest score group
C8
Item step response function
Rest score group
C8
Item response function
Rest score group
C10
Item step response function
Rest score group
C10
Item response function
Rest score group

C13



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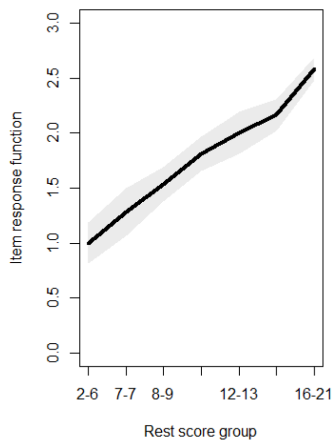
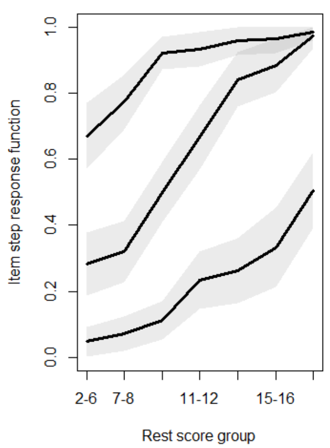


C16



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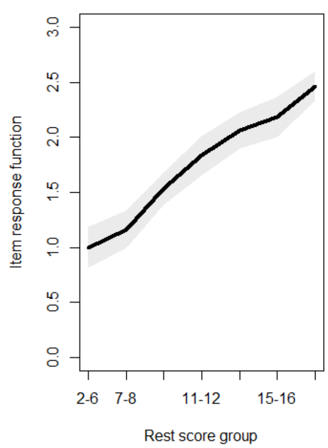
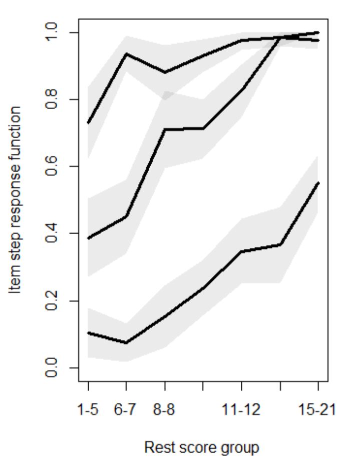
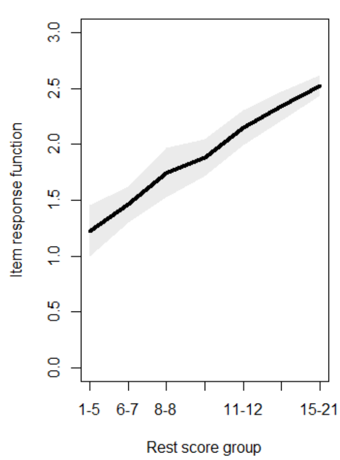


C17



C17



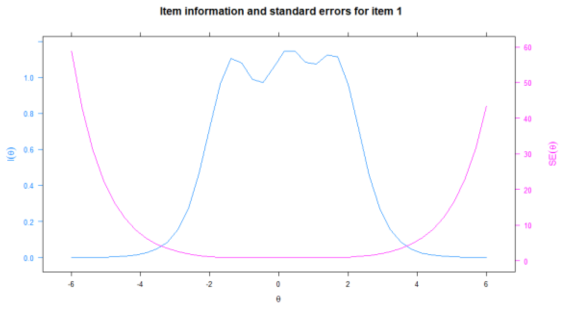
LD X^2 Index for the Final Item Bank

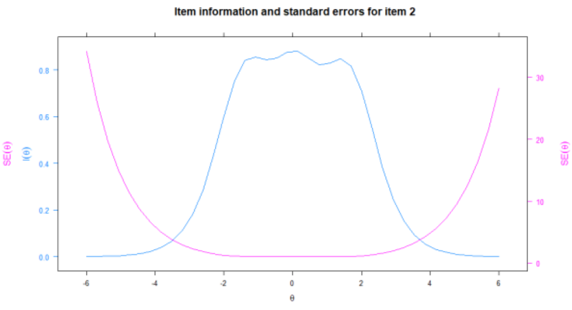
	C2	**C4**	**C7**	**C8**	**C10**	**C13**	**C16**	**C17**
C2	NA	0.149	0.115	-0.152	-0.118	-0.122	-0.141	-0.090
C4	39.751	NA	0.142	0.091	-0.123	-0.097	-0.085	0.074
C7	23.785	36.154	NA	0.141	-0.117	-0.102	-0.102	-0.085
C8	-38.623	14.998	35.855	NA	-0.147	-0.116	-0.096	-0.067
C10	-25.155	-27.079	-24.605	-38.678	NA	0.103	0.132	0.098
C13	-26.822	-16.753	-18.767	-24.259	19.045	NA	0.095	0.055
C16	-35.790	-13.015	-18.824	-16.684	31.278	16.325	NA	0.093
C17	-14.512	9.951	-12.954	-7.991	17.343	5.475	15.541	NA

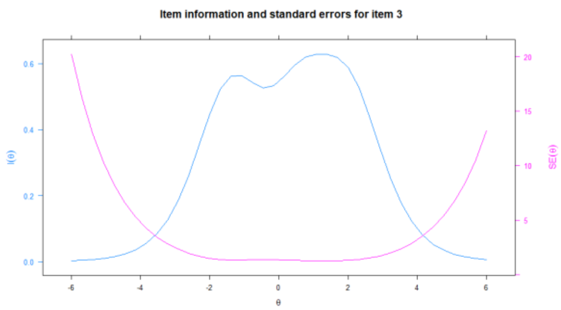
Q3 Statistics for the Final Item Bank

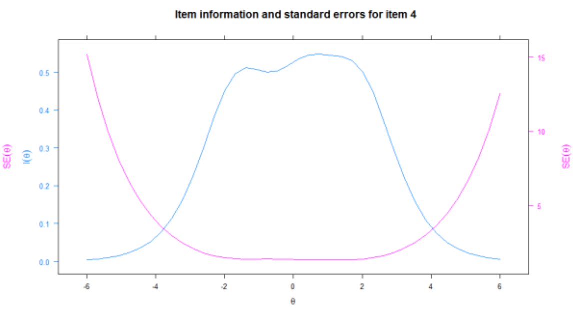
	C2	**C4**	**C7**	**C8**	**C10**	**C13**	**C16**	**C17**
C2	1.000							
C4	-0.060	1.000						
C7	-0.013	-0.129	1.000					
C8	-0.179	-0.002	0.017	1.000				
C10	-0.193	-0.200	-0.192	-0.189	1.000			
C13	-0.191	-0.185	-0.135	-0.149	0.037	1.000		
C16	-0.198	-0.171	-0.157	-0.127	0.034	-0.013	1.000	
C17	-0.164	-0.106	-0.188	-0.129	0.069	-0.032	-0.006	1.000

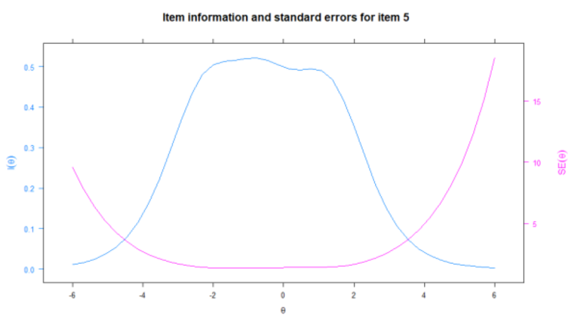
Item Information Function for Each Item

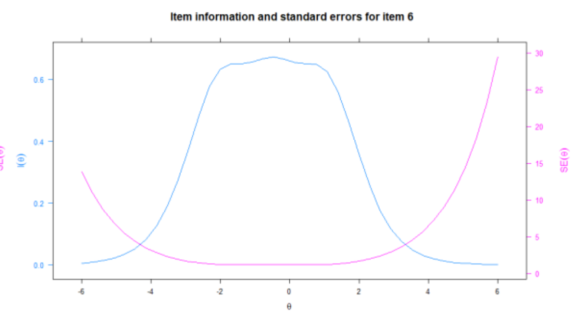


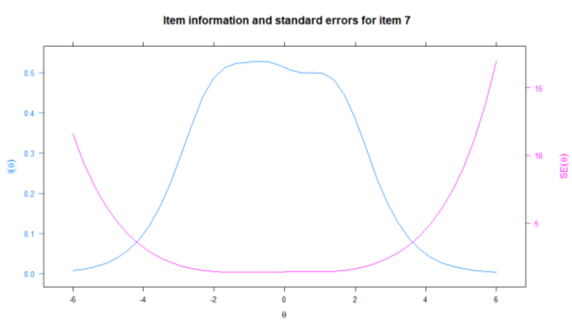


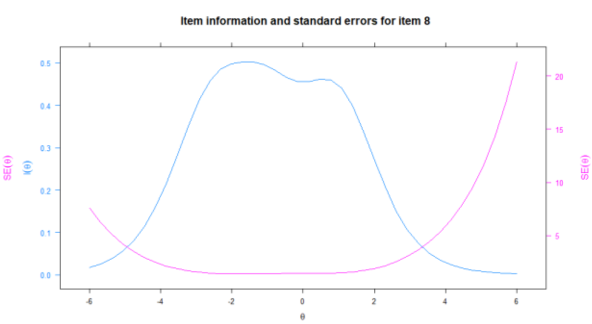












VITA

Baolu Wang, was born in Shan Dong, China. He earned his Bachelor's degree from Beijing Institute of Fashion Technology (BIFT), majoring in fashion design and engineering. He completed his Master's degree from BIFT in 2012. Then, he became an Assistant Professor in BIFT, teaching class within the track of Merchandising. He started his doctoral study in MU in 2016, under the advising of Dr. Jung Ha-Brookshire. His research focuses on the transformation of Textile and Apparel Industry from Industry 3.0 to Industry 4.0 and issues related to it, within the domains of industry, consumer and education. He has published several manuscripts in peer-reviewed journals and given presentations in professional conferences to express his research stand points. He was also the receiver of Kitty G. Dickerson Graduate Fellowship for Excellence, Jana Hawley Graduate Student Scholarship, Adeline M. Hoffman Award and Marjorie Joseph Fellowship. He can reached at bwyvf@mail.missouri.edu or baoluwang0108@gmail.com.