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Towards an Understanding of Mainland Chinese Pre-Service EFL Teachers’ Intention to Use CALL 2.0

Bing Mei

Abstract

The practice of computer assisted language learning 2.0 (CALL 2.0) has become widespread. However, recent research has suggested that acceptance of CALL 2.0 affordances by English as a foreign language (EFL) teachers in mainland China is limited. Furthermore, less is known about factors influencing their adoption of CALL 2.0. Against this backdrop, this thesis focused on the intentions to use CALL 2.0 among mainland Chinese pre-service EFL teachers at one provincial university. The goal was to test the technology acceptance model (TAM) when applied to CALL 2.0 and to identify environmental and/or attitudinal factors impinging upon intentionality.

Six salient factors (i.e., perceived utility, perceived ease of use, computer self-efficacy, subjective norms, facilitating conditions, and technological pedagogical and content knowledge) were used to predict intentions to use CALL 2.0. Following an explanatory sequential mixed methods research design, two surveys and an interview study were conducted to test and refine the proposed model. Confirmatory factor analysis and structural equation modelling were performed to establish causal path models that had good correspondence to the data. Interview results after the first survey identified additional aspects of facilitating conditions, which were used in the second survey to extend our understanding that facilitating conditions include both technical computer infrastructure and access to English-language learning resources on the Internet.

Intention to use CALL 2.0 was directly predicted by perceived usefulness, facilitating conditions (access to English-medium Web 2.0 resources), and technological pedagogical and content knowledge. This result differs from the conventional TAM model in that technology-related facilitating conditions only predicted perceived ease of use. The results also suggest
that in order to promote CALL 2.0 intentionality, greater access to English-medium Web 2.0 resources that are largely inaccessible in mainland China at present, needs to be developed. Further, because modern smartphones, apps, and tablet devices are relatively intuitive and easy to use, TAM research should focus more on content and discipline-related facilitating conditions, rather than its conventional focus on hardware. This thesis, thus, makes a contribution to the field of technology acceptance modelling and suggests that a substantial politically motivated policy challenge exists for effective implementation of CALL 2.0 in mainland China.

*Keywords:* computer assisted language learning; technology acceptance; EFL teacher education; structural equation modelling
During the past four years, I have received abundant support from many great people. First and foremost, I would like to express my deepest gratitude to my supervisor, Professor Gavin Brown. It is his continuous support and encouragement that has guided me through all the ups and downs. He expected the best from me and raised me up to a new level. Thank you, Gavin.

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Last but not least, I am particularly indebted to my parents. Though they have been mostly away from me, their endless love and encouragement has always been there in the past four years. Special thanks go to my wife, Linda, and my son, Max, for their unswerving support. It is your company that makes this PhD journey worthwhile.
Co-Authorship Form

This form is to accompany the submission of any PhD that contains published or unpublished co-authored work. Please include one copy of this form for each co-authored work. Completed forms should be included in all copies of your thesis submitted for examination and library deposit (including digital deposit), following your thesis Acknowledgements. Co-authored works may be included in a thesis if the candidate has written all or the majority of the text and had their contribution confirmed by all co-authors as not less than 65%.

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Section 5.1 of the thesis is extracted from a co-authored manuscript titled "Towards an understanding of Mainland Chinese pre-service EFL teachers' acceptance of Web 2.0-based CALL."

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Acronyms and Abbreviations

CALL 2.0     Computer assisted language learning 2.0
CALL          Computer assisted language learning
CSE           Computer assisted language learning 2.0 self-efficacy
DTPB         Decomposed theory of planned behaviour
EFL           English as a foreign language
FC            Facilitating conditions
IU            Intention to use technology
PEU           Perceived ease of use
PU            Perceived usefulness
SEM           Structural equation modelling
SN            Subjective norm
TAM           Technology acceptance model
TPACK         Technological pedagogical and content knowledge
TPB           Theory of planned behaviour
TRA           Theory of reasoned action
UTAUT         Unified theory of acceptance and use of technology
Chapter 1 Introduction

The future of computer assisted language learning (CALL) seems to be promising when viewed from a CALL researcher’s perspective (Caws & Hamel, 2016; Levy, 2009; Levy & Stockwell, 2006). Prior CALL research (e.g., Levy & Stockwell, 2006; Voogt, Knezek, Cox, Knezek, & ten Brummelhuis, 2013) has suggested that if properly integrated, CALL can benefit both language teachers and learners by creating an interactive language-learning environment, increasing learners’ motivation and engagement, and providing access to authentic linguistic material and even opportunities for virtual face-to-face interaction with native speakers. Furthermore, empirical findings over the past two decades have also shed light on the potential positive effects of CALL on improving learners’ language proficiency and competency (Grgurović, Chapelle, & Shelley, 2013; Leakey, 2010). Yet successful integration of information and communication technologies (ICT) into language learning requires active and meaningful engagement of language teachers (Hubbard, 2008). Recent research (e.g., Jahromi & Salimi, 2013; S. C. Yang & Huang, 2008) has shown that even with the increasing availability of ICT in recent years, language teachers worldwide remain reluctant to, or even refuse to, adopt CALL to engage their students in meaningful and effective language learning. It is clear that effort in maximising the impact of CALL on language teaching and learning has encountered many constraints. Meanwhile, a growing body of research (G. T. Brown, 2008; Zheng, 2015) has demonstrated that this situation may be largely attributed to teacher beliefs (i.e., what they think, know, and believe), and teacher beliefs are directly shaped by the environmental constraints and opportunities surrounding them (G. T. Brown, 2004).

There is, therefore, a need to identify what factors (facilitators and barriers) are influencing language teachers’ acceptance of CALL in their classroom and the possible
interrelationships among these factors. A better understanding of these factors is essential for the improvement of CALL practices and the future success of CALL (Caws & Hamel, 2016). Recognising this urgency, research effort has been made to investigate language teachers’ beliefs about using CALL (e.g., L. Hsu, 2013; Jahromi & Salimi, 2013; Nami, Marandi, & Sotoudehnama, 2016). However, most extant research was conducted outside mainland China. There currently exists a paucity of research on language teachers’ beliefs about using CALL in the context of mainland China, where sociocultural values, educational resources, and accessible Web 2.0 technologies are largely different from most regions of the world (G. Hu, 2005; Li, 2008). The thesis, therefore, made an empirical investigation into factors influencing mainland Chinese pre-service English as a foreign language (EFL) teachers’ acceptance of CALL in the current interactive and collaborative Web 2.0 era and the possible causal relationships between these factors. The research focused on pre-service EFL teachers instead of in-service EFL teachers, because pre-service EFL teachers are the main users of Web 2.0 applications, and they will play an important role in deciding whether to adopt CALL in their future classroom instruction or not. Thus it is necessary to look beyond the current classroom environment.

This chapter starts with an outline of the whole study. Section 1.1 describes the general background of ICT in mainland China. Section 1.2 contains a concise account of the ICT integration into education in mainland China. Section 1.3 provides a briefing of English-language education in mainland China. Section 1.4 introduces the pre-service EFL teacher-preparation system in mainland China. Section 1.5 identifies the research problem. Section 1.6 puts forward the research questions. Section 1.7 discusses the significance of the study. Section 1.8 summarises the methodology. Section 1.9 provides an explanation of relevant terminologies. Finally, Section 1.10 outlines the whole thesis structure.
1.1 ICT Development in Mainland China

Since undergoing reform and opening up to the outside world from the late 1970s, mainland China has undergone tremendous economic and social development during the past four decades. It has become the second largest economy, playing an increasingly important role in the world economy (World Bank, 2015); and is currently the most populous country in the world, with a population of approximately 1.38 billion (United Nations Department of Economic and Social Affairs Population Division, 2015). Since 2006, with the aim to sustain its high-speed social and economic development, ICT has been embraced as a long-term national development strategy by the government (State Council, 2006). As reported in The 37th Statistical Report on Internet Development in China (China Internet Network Information Centre [CNNIC], 2016), by the end of 2015, there were 668 million Internet users, 620 mobile Internet users, 31.02 million domain names, 4.23 million websites, and an International Internet gateway bandwidth of 5,392,116 Mbps in mainland China. The same report also revealed one noteworthy trend in ICT development during the past decade: the rise of Web 2.0. Different from Web 1.0 resources (e.g., multimedia CD-ROMs, static web pages, portal websites, desktop computers), Web 2.0 resources (e.g., wiki, blog, podcast, social bookmarking, social networking sites, media sharing sites, cloud computing, portable digital devices) emphasise dynamicity, interactivity, social networking, and low cost. As of December 2015, 90.1% of the Internet users in mainland China were also mobile Internet users. Smartphone-based Internet applications such as instant messaging, microblogging, mobile search engines, online video streaming, online shopping, and online education are exerting growing influence upon mainland Chinese daily life.

Though great achievements relating to ICT have been made in China, the government has deployed tight and extensive controls over the Internet to prevent negative social content.
or behaviour (e.g., pornography, fraud, and dissident political ideologies.) being circulated via the Internet, (Li, 2008; Liang & Lu, 2010). Besides many regulatory measures by multiple authorities (e.g., Ministry of Information Industry, 2005; Ministry of Public Security, 2005; Office of the Central Leading Group for Cyberspace Affairs, 2016; State Administration of Press, 2002, 2007; State Council, 2000; State Council Information Office, 2005), technological measures have also been in place to monitor the content circulated via the Internet. Though the government has not officially admitted the existence of the Great Firewall, a coinage used to allude to the Web content-regulation measures in mainland China, the Internet gateway has been in operation to regulate mainland Chinese physical access to the Internet outside China since the late 1990s (Goldkorn, 2012; Kalathil & Boas, 2003; Li, 2008, 2009). Along with the burgeoning ICT, these measures combined have also exerted significant influence on the overall Internet ecology in mainland China, which is, to a large extent, different from the rest of the world (see Anti, 2012; Kissel, 2007; Larmer, 2011). For example, services provided by Google (e.g., Gmail, Google Scholar, and Google Drive) are currently difficult to access in China.

1.2 Integration of ICT in Education in Mainland China

Because of its conviction in the potential benefits afforded by ICT, mainland China’s leadership has attached strategic importance to the integration of ICT into education and initiated long-term endeavours to improve its ICT infrastructure, to provide professional training opportunities, and to develop online teaching and learning resources. *The National Plan for Medium and Long-Term Education Reform and Development (2010–2020)* released by the State Council (2010a), stipulated firmly that China should accelerate its educational digitalisation process by “placing the educational digitalisation within the holistic
developmental strategy of national digitalisation, and achieving the initial goal the educational information network in advance” (p. 29).

With the government’s consistent commitment to ICT integration, much investment has been made to improve ICT infrastructure during the past two decades, to support the integration process. Following these initiatives, the teaching, learning, sharing, and managing capacities of educational institutions have been significantly enhanced. As of 2014, 74% of all the schools in mainland China had access to the Internet; over 33,000 online courses have been made freely available to the public; and a massive national database covering the basic information of students, teachers, and schools has been deployed (China Education and Research Network, 2014). Meanwhile, by implementing *The Promotion Project for Education Technology Capacity Building for All Primary and Secondary Teachers*, more than 6,000,000 teachers and 50,000 principals participated in a training programme targeting the improvement of their ICT competence by 2015 (Ministry of Education, 2013). In addition, a national *ICT Application Competence Standards for Primary and Secondary Teachers* (Trial; Ministry of Education, 2014) has also been applied to guarantee future teachers’ ICT competence level. Furthermore, digital platforms covering all levels and types of education such as the *National Public Service Platform Educational Resources and Video Courses of Chinese Universities* have also taken shape, which facilitate the sharing of high-quality education resources, teachers’ innovative practices, and the simplification of education management processes (CNNIC, 2016).

1.3 English-Language Education in Mainland China

During the past five decades, English-language education in mainland China has made a great contribution to social and economic development (G. Hu, 2005). English proficiency is regarded, at state level, as insurance of its international competitiveness; and is deemed a
personal asset, which guarantees more economic, social, and educational benefits for an individual (Gil, 2016). At present, according to the Ministry of Education (2000, 2001, 2007), English-language education has been recommended in primary schools (starting from Year 3), and compulsory at junior secondary, senior secondary, and tertiary levels. Over the years, the Ministry of Education has taken a wide range of measures to improve students’ English proficiency. As a result, clearer learning objectives for each level and stringent standardised English tests have been established (Zheng, 2015).

Judging from this brief introduction, it is reasonable to assume that many mainland Chinese students should be highly competent in using English. However, evidence suggests that though gains have been made, the actual effect is far below the expectation that students’ level of English would enable them to communicate effectively (G. Hu, 2005, 2010). Such a situation has been attributed to the lack of qualified EFL teachers, an over-emphasis on examination rather than language proficiency, and increasing regional socioeconomic disparities (Gil, 2016). In view of the huge impact upon social and economic development and potential pedagogical benefits of ICT, the Ministry of Education has adopted education digitalisation as one integral part of its effort to address these challenges (Ministry of Education, 2013, 2014).

1.4 EFL Teacher Preparation in Mainland China

From the 1970s, EFL teacher preparation has been regarded as an important catalyst for economic development (G. Hu, 2005). The past three decades have witnessed a massive expansion of EFL teacher-preparation programmes in mainland China. In accordance with a highly centralised governance model, EFL teacher preparation in mainland China is centrally regulated by the Ministry of Education (J. Zhou, 2014). Mainland China pre-service EFL teachers of different levels are trained in the following three types of educational institutions...
(Ding & Sun, 2007). The first, secondary teachers’ schools, prepare EFL teachers with a high school diploma for primary and pre-school education. The second, two-year normal colleges, confer upon graduates a sub-degree to teach at junior secondary schools. The third source, normal universities and some comprehensive universities, operate four-year undergraduate EFL teacher-training programmes, providing graduates with a bachelor’s degree for teaching in senior secondary schools or, upon receiving further education, for teaching in higher education institutions throughout mainland China. Though some changes are taking place (e.g., individuals can also apply for a Teacher Qualification Certificate), the three above-listed educational institution types constitute the main sources of pre-service EFL teachers in mainland China (Ding & Sun, 2007).

Since ICT has strategic significance in mainland China (State Council, 2010a) and constitutes an integral part of the curriculum, all pre-service EFL teachers are required to take some generic ICT courses (e.g., Microsoft Office basics, introduction to databases, and fundamentals of the Internet) during their training to improve their information competence. However, completing a course specifically designed for CALL is not a compulsory requirement for the pre-service EFL teachers (Ministry of Education, 2007), which makes courses dedicated to fostering CALL competence a common missing component in most EFL teacher-training sites in mainland China (Cai & Wu, 2014; Zhang, 2010). Compared with similar programmes in other developed countries or areas, such as Singapore and Hong Kong, most current EFL teacher-training programmes in mainland China suffer from a predominant focus on language proficiency, an inadequately defined knowledge base for qualified EFL teachers, disconnection between training and real classrooms, and inconsistency (G. Hu, 2005). Taken together, though great progress has been made in the past six decades, the EFL teacher-preparation programme still remains inadequate.
1.5 Research Problem

A substantial amount of financial investment in ICT has been made in language education with aims to promote the overall outcome of its EFL education, to distribute the uneven EFL educational resources between urban and rural areas, and to improve EFL teachers’ efficiency. However, despite widespread faith in the pedagogical affordances of ICT from the leadership level and the increasing availability of ICT infrastructure and equipment, it is not unusual for the EFL teachers in mainland China to underuse or even refuse to use the extant ICT available to them, which has caused a huge waste of resources and posed a threat to the costly national initiative.

Meanwhile, with the advent of Web 2.0, the current pre-service EFL teachers in mainland China are growing up with Web 2.0 technologies, which provide them with access to an ever-increasing array of flexible applications, portable digital devices, and online resources. However, due to the existence of the Great Firewall, typical English-medium Web 2.0 interactive and collaborative platforms such as Facebook, YouTube, Whatsapp, and Twitter are functionally substituted by local Web 2.0 resources such as Renren, Youku, WeChat, and Weibo. Though these Web 2.0 services are localised in the sense that communication language is predominantly Chinese and their users are mostly from mainland China, the current pre-service EFL teachers in mainland China are under the huge influence of Web 2.0 technologies (see McDonald, 2016; X. Wang, 2016). Additionally, the realisation of the potential benefits afforded by these technologies depends on how language teachers apply these technologies in CALL (Hubbard, 2008). Against this backdrop, a better understanding of the mainland Chinese pre-service EFL teachers’ interaction with CALL 2.0 is important.
1.6 Research Questions

Along with the rapid development of ICT during the past three decades, a large body of research focusing on human–computer interaction aspects, especially individuals’ adoption and use of technology, has emerged, first in the context of business. This type of research is well known as technology acceptance (TA), which is defined as “a user’s willingness to employ technology for the tasks it is designed to support” (Teo, 2011b, p. 1).

On the basis of Shulman’s (1986) pedagogical content knowledge (PCK) framework, Mishra and Koehler (2006) proposed the technological pedagogical content knowledge model (TPACK) as a theoretical framework to investigate teachers’ knowledge needed for technology integration into their classrooms.

Informed by prior relevant research relating to technology acceptance and technological pedagogical content knowledge, the current study aimed to address the following two research questions:

- What factors are influencing mainland Chinese pre-service EFL teachers’ acceptance of CALL 2.0?
- What are the possible interrelationships among these factors?

1.7 Significance of the Research

It has long been noted that there exists a tendency in CALL research to test the latest technologies instead of testing theories (Joy Egbert, 2005). Informative theoretical perspectives are much needed (Chapelle, 2010; Colpaert, 2010). Viewing this need, the current study intends to combine technology acceptance research with CALL research with a specific aim to enrich the theoretical framework of extant CALL normalisation research and
promote the smooth integration of CALL in practice (Bax, 2003; Caws & Hamel, 2016; Chambers & Bax, 2006).

In terms of its theoretical merit, the research can inform the CALL normalisation research by identifying factors related to human–computer interaction. Drawing on the diffusion of innovation theory by Rogers (1995), Bax (2003) suggested a three-step roadmap to realise the goal of CALL normalisation:

The first step is to identify the critical factors which normalisation requires.
The second is to audit the practice of each teaching context in the light of these criteria; the final step is to adjust our current practice in each aspect so as to encourage normalisation. Following this procedure will give each institution and teacher a clear framework within which to audit progress, and within which any obstacles to integration and normalisation can be identified and dealt with. (p. 24)

Therefore, the current study constitutes one integral part of the first step towards CALL normalisation. It is also of prominent practical significance. By identifying the determinants of mainland Chinese pre-service EFL teachers’ intention to use CALL 2.0, teacher educators in mainland China can devise more appropriate corrective steps to remedy the current low uptake of CALL among EFL teachers. In addition, with ever-increasing ICT innovations and the unique Internet ecology in mainland China, it is also hoped that a better and more adequate understanding of these factors and their interrelationships could also help school leaders and policy makers in mainland China make more informed decisions in order to promote the pedagogical uses of ICT for language learning, in accordance with their policy goals. Further evaluation research into the effects of corresponding measures could also be planned and implemented.
1.8 Research Methodology

Detailed information relating to the research methodology used for this research is provided in Chapter 4. This section serves a brief summary of the research methodology for the study.

An explanatory sequential mixed methods design (Creswell, 2013) was adopted to address the research questions framed by technology acceptance research. Specifically, Phase-1 findings were extended and tested in a Phase-2 study. During this process, structural equation modelling (SEM) was employed in quantitative data analysis to assess a model based on prior technology acceptance research and technological pedagogical content knowledge model research. Thematic content analysis was also conducted in a deductive manner to analyse qualitative interview data. Both quantitative and qualitative data were integrated to reach a final conclusion.

1.9 Terminology

1.9.1 Computer assisted language learning. Computer assisted language learning (CALL) is defined as

the exploration, sometimes coherent, sometimes disparate, of all aspects of the human–computer axis, with the primary goal of enhancing the process of second-language teaching and learning, be it in curriculum design, delivery, testing, feedback, monitoring of evaluation, by means of the generation of the improved computer-based platforms, courseware, learning environments and pedagogies. (Leakey, 2010, p. 22)

Research about CALL has shown that CALL contributes positively to language teaching and learning in the following aspects: experiential learning, motivation, student achievement,
authentic materials for study, interaction, individualisation, information retrieval, and global understanding (K. Lee, 2000; Meskill & Anthony, 2005; Thorne & Payne, 2005).

1.9.2 Computer assisted language learning 2.0. Technology-ridden CALL entered a new phase as the World Wide Web (WWW) developed into Web 2.0. CALL in Web 2.0 has been equipped with unprecedented and diversified means to facilitate language learning (Farr & Murray, 2016). Language teachers around the world also have started integrating Web 2.0 resources with language learning; for example, the use of video logging or Vlog (H.-c. Huang, 2015), podcasts (Hew, 2009), Google Drive (Shintani, 2015), mobile technologies (L. Hsu, 2013), and social media (Brick, 2012). Hence, CALL 2.0 refers to the application of Web 2.0 resources for language teaching and learning and is regarded as an important future direction in language learning (e.g., Alm, 2006; Cephe & Balcianli, 2012; Farr & Murray, 2016; Kárpáti, 2009; Sykes, Oskoz, & Thorne, 2008; Thomas, 2009; S. Wang & Vásquez, 2012).

1.10 Structure of the Thesis

Following Chapter 1, which has highlighted the importance and necessity of an investigation of factors influencing mainland Chinese pre-service EFL teachers’ CALL 2.0 acceptance, Chapter 2 reviews a wide array of CALL 2.0 research. Furthermore, it paves the way for connecting CALL normalisation research with technology acceptance research. Next, drawing on prior technology acceptance research and technological pedagogical and content knowledge model research, Chapter 3 proposes a research model for the subsequent study of relevant factors. The methodologies adopted for this research are introduced in detail in Chapter 4. Chapter 5 and Chapter 6 present the detailed results of Phase-1 and Phase-2 studies respectively. Lastly, Chapter 7 reports the conclusion and discusses the implications, limitations of the research and points out possible directions for future research.
Chapter 2 Literature Review

To better situate the current study, this chapter reviews prior research pertaining to Web 2.0 technologies and computer assisted language learning. It consists of three sections. The first section introduces concisely the emergence and the nature of Web 2.0. The second section demonstrates prior empirical findings of computer assisted language learning 2.0 (CALL 2.0) with regard to its potentials and affordances. The third section reviews the challenges posed by the human–computer interaction, when implementing CALL in practice. As a whole, the literature review further necessitates the focus of the current research on investigating factors influencing mainland Chinese pre-service EFL teachers’ acceptance of CALL 2.0.

2.1 Web 2.0

At present, there is no consensus upon the definition of the term Web 2.0 (O'Reilly, 2005). Starting from different conceptual and theoretical stances, scholars have offered many insights about Web 2.0. Since the late 20th century, the global world has witnessed the rapid proliferation of the World Wide Web (WWW), which has changed almost all spheres of human society, such as people’s lifestyle, business models, and the construction and distribution of information. The evolution of WWW, according to Cormode and Krishnamurthy (2008), can be conceptually divided into two stages by its technological, structural and sociological features. These two stages are namely Web 1.0 and Web 2.0. The key differences between the two stages are listed in Table 1.

Table 1

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<tr>
<th>Criterion</th>
<th>Web 1.0</th>
<th>Web 2.0</th>
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<tr>
<td>Content</td>
<td>Website provided, read-only</td>
<td>User generated, read-and-write</td>
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</table>
As is shown in Table 1, in Web 1.0, the content of a website is generally provided by the website itself and usually cannot be modified by users due to high technological requirements; therefore, a Web 1.0 website remains largely static and limited in interacting with its users. However, for a typical Web 2.0 website, content is mostly generated dynamically by users, and the interactive and collaborative processes are further facilitated by increasingly popularised handheld digital devices and unprecedentedly lowered technological thresholds.

Though remaining hard to clearly delineate, the umbrella term Web 2.0 has been adopted in literature to designate a) an evolutionary stage of the WWW (Alexander, 2006; Breeding, 2006), b) a common concept behind numerous emerging tools (O'Reilly, 2005, 2007; Rollett, Lux, Strohmaier, Dosingier, & Tochtermann, 2007; von Muhlen & Ohno-Machado, 2012), and c) a vast array of applications featuring the concept of Web 2.0 (Boulos & Wheeler, 2007). According to M. Lee and McLoughlin (2011), it is the common concept of users’ voices, collaborative production of content, and social construction of knowledge that determines whether it should be labelled as Web 2.0 or not. Therefore, Web 2.0 is also used to refer to the group of new technologies or applications that embodies this common concept. These technologies have changed Internet users from passive online content recipients to active online content generators.

Due to the rapid proliferation of technologies, there currently exists a plethora of Web 2.0 technologies. According to the data from Statista (2016), as of June 2016, the total number of apps in five leading app stores—Google Play, Apple App Store, Windows Store,
Amazon App Store, and BlackBerry World—reached 5.7 million. Given this situation, a classification of the Web 2.0 applications in accordance with functionality is deemed necessary. It is expected that such a classification may bring a better understanding of Web 2.0 technologies and help the later discussion of how these functions facilitate language teaching and learning. Table 2 provides such a classification of Web 2.0 technologies (P. Anderson, 2007; Conole & Alevizou, 2010). It should be pointed out that only major Web 2.0 technologies are listed and Table 2 is only intended to serve as a conceptual framework for further discussion around CALL 2.0.

Table 2

Classification of Mainstream Web 2.0 Technologies by Functionality

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Exemplar applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>Blogs, micro-blogs, instant messaging</td>
</tr>
<tr>
<td>Collaboration</td>
<td>Wikis, social bookmarking, social news, online collaboration</td>
</tr>
<tr>
<td>Generation</td>
<td>File-sharing, live casting, virtual world</td>
</tr>
<tr>
<td>Monitoring</td>
<td>E-portfolios, learning management systems</td>
</tr>
<tr>
<td>Interaction</td>
<td>Social networking sites</td>
</tr>
</tbody>
</table>

Due to their versatility, Web 2.0 applications afford many unprecedented opportunities to stakeholders (e.g., teachers, students, school leaders) in an educational context. Prior research on the integration of Web 2.0 applications into education (e.g., DePietro, 2013; McHaney, 2011; Solomon & Schrum, 2007) has shown that by taking advantage of the affordances of Web 2.0 applications, a dynamic educational community featuring connectivity, communication, and active participation can be built. Within this community, Web 2.0 applications can be employed to support teaching and learning, to increase teacher-student interaction, to facilitate scholarly research and collaboration, to improve library services, and to prompt students’ innovation and sharing.
2.2 Promises of CALL 2.0

In view of the transition from Web 1.0 to Web 2.0, CALL researchers around the world have long started their explorations for more embedded and tangible integration of Web 2.0 technologies into a wide array of language education practices such as teaching, learning, assessment, and evaluation (see Conole & Alevizou, 2010; Luo, 2013; S. Wang & Vásquez, 2012).

Next, a review of relevant empirical findings of CALL 2.0, in accordance with the aforementioned functionality classification of Web 2.0 technologies, is provided. It should be borne in mind that the purpose of the review is not to provide a complete and most up-to-date list of CALL 2.0 practices. Moreover, CALL 2.0 is by no means a panacea and cannot solve all the problems in language education, though most of these explorations tend to make positive claims or generalisations. Nevertheless, these explorations have offered valuable insights into how new ways of language learning can be fostered and to what extent they have contributed to language learning.

2.2.1 Communication. Research on Web 2.0 technology-mediated communication for language learning has been prevalent for many years (Conole & Alevizou, 2010; S. Wang & Vásquez, 2012). The research topic that has received the most academic attention is the integration of blogs in language learning (e.g., Ducate & Lomicka, 2008; H.-c. Huang, 2015; Lin, 2015; Martínez, 2012; Nguyen, 2012). The word blog, derived from the conflation of Web and log, stands for a regularly updated diary-type website run by either an individual or a small group to communicate ideas to a target audience (Pedersen, 2010). During the past decade, research on blogging, the actual practice of maintaining a blog, in the context of language teaching and learning, has uncovered some positive findings in different aspects such as language proficiency, engagement and motivation, and communicative skills.
**2.2.1.1 Blog-based writing learning.** Arslan and Şahin-Kızıl (2010) conducted a quasi-experiment to test whether using blogs can facilitate the improvement of EFL learners’ writing skills. A convenience sampling of 50 intermediate-level English students from two classes at a Turkish university was recruited and randomly assigned into a control group \((n = 23)\) and an experimental group \((n = 27)\). The same classroom instruction concerning English paragraph types was provided to both groups. However, students in the experimental group were required to create two personal blogs, one for sharing their writing and receiving feedback, and the other for documenting their own learning process. In addition, a tutor-constructed blog was set up for the experimental group; students in the group could access the complete course material and more examples according to their needs and preferences. Tasks measuring students’ writing performance were assigned at the beginning and end of the experiment for both groups. Paired sample \(t\) tests comparing writing performance scores found that both groups made significant progress, but the experimental group showed a significantly higher gain rate than that of the control group. Results from a subsequent analysis of covariance suggested that this improvement should be attributed to the blog-mediated instruction.

A qualitative study by Nguyen (2012) explored how blogs could be used as a peer feedback tool to practise their English writing among a group of Vietnamese EFL students \((N = 11)\). The students posted writing drafts on their own blogs and commented on each other’s work. After receiving comments, they then made corresponding revisions before posting the final drafts. Content analysis of students’ perceptions revealed that the Vietnamese EFL students held positive attitudes towards the integration of blogs in language learning and that they perceived that peer feedback via blogs could play a positive role in cultivating their English writing skills.
Lin (2015) studied 18 Taiwanese EFL students’ experiences with learner-centred blogs for an EFL writing course. In the 16-week study, learners were given full control of their learning processes by blogging on any topic they wanted to cover. Qualitative data gathered in this mixed methods research showed that these Taiwanese EFL students held strong beliefs and high enthusiasm for blogging for language-learning purposes. Statistical analysis results further revealed that the use of blogs improved their writing skills, engagement, and self-efficacy. However, Lin also emphasised that it might not be easy to turn that belief and enthusiasm into blogging practice for Taiwanese EFL students due to their fear of losing face by blogging with limited English.

In an exploration of effective models organising EFL writing for students in mainland China, Guo (2009) conducted an experiment to identify effective ways of integrating blogs into an EFL writing course. A blog-based model, which consisted of three major steps of preparation, writing, and revision, was proposed and implemented in a writing course at a university in mainland China. Students in an experimental group \((n = 50)\) were encouraged to brainstorm, share writings via blogs with their classmates, and revise writings according to the feedback they received. Meanwhile, students in a control group \((n = 50)\) were taught in the traditional teacher-led model. An independent sample \(t\) test revealed that the experimental group made more significant progress than the control group. Guo concluded that when integrated appropriately, the blog-based writing model could complement traditional face-to-face classroom instruction, promote students’ participation in language learning activities, bolster their autonomous learning, and be a common platform for mutual help.

Viewing the pedagogical potentials of blogs for improving writing skills, Fellner and Apple (2006) ascertained the effectiveness of integrating blogs into language teaching. A total of 21 students from a Japanese university participated in their research, which lasted for seven days. All students had prior low English proficiency and low motivation to study
English. A blog platform (Blogger.com) was adopted, and a single class blog was created by the instructor to post students’ writing assignments completed within a limited time frame of 20 minutes, instead of students’ individual blogs. Students could make their comments and suggestions on these posts. A one-way repeated measure analysis of variance found that there was a significant increase in the total word counts in students’ writing assignments. The results indicated that the interactive, meaningful negotiation process afforded by blog-based writing tasks for language learning could promote language learners’ writing fluency, especially at the lexical level.

Sun (2010) investigated the effect of extensive writing through blogs on Taiwanese language learners’ writing performance. Using a blog platform, 23 students, enrolled in an academic writing course at a university in Taiwan, were required to write as much as possible around a wide range of topics in different ways at a faster-than-usual speed. Altogether, each student needed to complete 30 blog entries and 10 response entries to comment on others’ writing. At the end of the course, the first three and last three blog entries of 23 participants were compared, and a survey on the students’ perception of blogging was administered. Sun concluded that blogging could be an ideal platform for extensive writing for it provided students with more opportunities to practise their writing, and that sharing their own thoughts and ideas with a wider audience could also help students develop good writing habits, language awareness, and learner autonomy.

**2.2.1.2 Audio and video blogs for speaking and listening.** Apart from these mainly text-based explorations, CALL researchers also strived to take full communicative advantages afforded by the Web 2.0 technologies.

Using a video blog, a variant of a typical blog with video as its major content, R. C. Shih (2010) tested a blended teaching and learning model in an EFL public-speaking course.
A convenience sampling of 44 students majoring in English at a Taiwanese university was recruited in this study. Video clips of participants’ public speaking were completed and shared via a blog. After that, they were required to comment upon others’ video clips. During the process, both quantitative data and qualitative data were collected. The results uncovered that the blended learning model could be a valuable tool to help language teachers to improve their students’ public-speaking skills effectively.

Sun (2009) integrated audio blogs into an English-speaking course in order to encourage students to practise their speaking skills outside the classroom. Within the course, participants would complete weekly oral assignments, upload them to a class blog, and comment on each other’s work. Before the courses ended, they were also asked to finish a questionnaire survey on their perceived gains in public-speaking skills, their learning process, and their attitudes towards audio blogs. The results showed that the use of audio blogs enhanced the students’ extensive speaking performance and was perceived by the students as an effective means of self-presentation, information exchange, and social networking.

In their pilot study, H. Y. Hsu, Wang, and Comac (2008) sought to investigate the effect of integrating audio blogs into an advanced English conversation course. A purposive sampling strategy was employed, and 22 international students from the course participated in their study. During the course, instructors would first post the assignments through a blog. Students would then complete their own audio blogs and comments on others’ work through an online audio recording system that could be embedded in blog entries. Data, which were collected through open-ended questionnaires, instructors’ interviews, and students’ audio blogs, showed that using audio blogs not only increased learners’ reflective oral practices, but also provided teachers with an efficient method to evaluate students’ oral assignments and to offer individualised oral feedback.
2.2.1.3 Podcast-based learning. When discussing blogging facilitated by innovative Web 2.0 technologies, another similar technology that deserves attention is the podcast, which is defined as “a digital audio or audiovisual file, usually updated regularly, that can be subscribed to and downloaded automatically by a computer user connected to the Internet” (Gilman, 2014, para. 1). Since their inception, podcasts have been a popular channel for Internet users to disseminate their own voices or find content they are interested in. Language education is no exception to this trend.

Shiri (2015) investigated the impact of podcasts on Iranian EFL learners’ motivation for listening and their listening comprehension abilities. Thirty-four participants were randomly divided into two groups. While the experimental group had access to supplementary podcasts, the control group received only traditional practice. Pre- and postlistening test results were compared to examine whether significant progress had been made. Results suggested the experimental group significantly outperformed the control group. Shiri further concluded that due to the convenience and rich content, if integrated properly, podcasts could contribute to the improvement of listening skills of EFL learners. She further recommended that podcasts should be employed by language educators as a supplementary teaching tool.

In their probe into the pedagogical use of podcasts, Asoodar, Marandi, Vaezi, and Desmet (2016) conducted a mixed methods study to explore the relationship between the use of podcasts and students’ motivation for an online academic English course. Data were gathered from 179 students enrolled in the online course, in which podcasts were used to share course instructions, lectures, and other supplemental materials. Data analysis results suggested that most students were in favour of integrating podcasts in the course, for they could have more control of their own learning, find more suitable learning methods, keep connected with their classmates, and remain engaged in language learning.
Bamanger and Alhassan (2015) carried out a similar experiment to test whether the use of podcast could improve English writing competence of EFL learners in Saudi Arabia. For six weeks, an experimental group \((n = 26)\) listened to selected podcast episodes of writing tips and lesson recordings, while a control group \((n = 29)\) was exposed to traditional classroom lessons. Pre- and postwriting tests were administered. Paired sample \(t\)-test results showed that students in the experimental group made greater progress, with no significant gains being detected among those in the control group. Their research suggested that podcast lectures could function as a convenient tool for students to review lessons and receive real-life authentic target-language input.

**2.2.2 Collaboration.** Collaboration via Web 2.0 applications for language learning has been another research area attracting widespread academic attention. CALL researchers have revealed that well-designed collaborative CALL tasks can increase students’ engagement and motivate them to achieve their learning goals (e.g., Chao & Lo, 2011; J. C. Chen & Browne, 2012; Ducate, Anderson, & Moreno, 2011; J. Egbert, Akasha, Huff, & Lee, 2011; Franco, 2008; Y. C. Wang, 2015). On account of these benefits, many studies have been conducted in various learning contexts to explore the innovative use of the collaborative affordances of Web 2.0 applications, and have confirmed some expected benefits.

**2.2.2.1 Wiki-based collaborative learning.** As another typical technology associated with the tag of Web 2.0, wiki is defined as “web-based software that allows all viewers of a page to change the content by editing the page online in a browser” (Ebersbach, Glaser, Heigl, & Dueck, 2006, p. 10). Since it allows multiple users to create and edit information collaboratively, wikis have been constantly employed by CALL researchers as an interaction platform to see how collaborative knowledge construction is fostered.
Franco (2008) conducted a study using wiki-based peer correction among a group of Brazilian EFL students \((N = 18)\) in a private language school. In a semester, all participants would complete four assignments and tasks adapted from their course books on a wiki site, and then revise others’ work through the site. The main aim of this step was to facilitate students’ co-construction of knowledge. Both qualitative data and quantitative data were collected during the process. The results suggested that these students showed an increasing interest in the wiki-based language-learning model, which enhanced their learning autonomy and helped them gain better understanding of writing strategies.

In view of the authentic audience afforded by wikis, J. C. Chen and Browne (2012) did a case study investigating their influence upon EFL students’ writing proficiency. In their study, a task-based, computer-mediated approach was adopted for six adult EFL learners enrolled in an intensive language course in the United States. Within 16 weeks, all students were asked to create three different informative websites through either Wikispaces or Weebly, two free websites that allow users to create and maintain their own wiki sites. Their study revealed that the presence of an authentic audience and the ability to view peers’ websites motivated these students to pay more attention to their own lexical and syntactical elements. Furthermore, the direct feedback from the authentic audience also boosted their confidence in English writing.

Y. C. Wang (2015) examined the effect of collaborative writing through wikis on English-for-specific purposes learners’ writing proficiency. The participants \((N = 48)\), enrolled in a business-English writing course at a university in Taiwan, were divided into two groups: a wiki group \((n = 24)\) and a non-wiki group \((n = 24)\). During a 12-week period, a wiki site was used as a platform for the students in the wiki group to draft, peer-edit, and revise their written assignments. The students in the non-wiki group were asked to hold a face-to-face weekly meeting and complete the assignments collaboratively. Two writing tests were
administered, at the beginning and the end of the terms for both groups. Though paired samples’ t-test results suggested both groups made significant improvement in their writing, a subsequent analysis of covariance uncovered that the wiki group outperformed the non-wiki group in terms of audience awareness, text organisation, information richness, and style. The study also reported a positive attitude held by these students towards the wiki-based collaborative learning environment.

Elola and Oskoz (2010) tracked eight students’ Spanish writing assignments through the use of PBwiki, a free wiki system that allows users to have their own wiki sites. Both individual and collaborative writings were gathered and analysed. Though no significant differences in fluency, accuracy, and complexity were detected between the participants’ individual writings and collaborative writings, they found that the collaborative process of creating and maintaining their own wiki sites could expand traditional classroom boundaries and enrich language learners’ linguistic experiences. They further suggested that when introducing new topics, collaboration tools should be used for they could reduce language learners’ stress or frustration.

Zou, Wang, and Xing (2016) explored the effect of wiki-mediated collaborative tasks of error correction on the EFL learning of students in mainland China. Their research, involved an experimental group (n =32), who used a wiki platform as an error correction tool, and a control group (n = 34), who received no wiki support. Students’ language corrections and comments on the wiki platform, interviews, and pre- and posttests were employed to collect data. The results revealed that the EFL students from mainland China held positive attitudes towards the collaborative wiki-mediated writing tasks and that wiki-mediated writing tasks could effectively improve EFL learning.

In a study focusing on the relationship between EFL students’ engagement in a wiki-based ESL writing course and their academic achievement, Nakamaru (2011) studied 47 ESL
language learners enrolled in a wiki-based EFL remedial writing course in the United States.

Regular assignments were sent to the EFL language learners to promote multimodal authoring, searching, navigating, and collaborative activities on the wiki site. The archived activity records, including page edits, page views, and page comments, were used to gauge students’ engagement in the wiki site. A strong positive correlation was found between students’ repeated out-of-class engagement with the wiki site and their academic achievement.

Kennedy and Miceli (2013) evaluated the integration of wiki into their first-year Italian course. Using wiki, they created a friendly environment for these beginner foreign language learners to practise target-language writing skills with a real audience, to share and work collaboratively, and to stay connected. Two questionnaires were administered, at the beginning and the end of the semester. They found that though students were not as technically competent and confident as expected when interacting with each other, students still acknowledged that the site provided them with valuable language-learning opportunities. In addition, it helped encourage students’ out-of-classroom interaction and build students’ sense of class community.

2.2.2.2 Google Docs-based collaborative learning. As a rising Web 2.0 tool, Google Docs, a free cloud-based platform for users to work collaboratively on documents, is attracting increasing attention from CALL researchers.

Shintani (2015) investigated the effect of Google Docs-mediated synchronous corrective feedback (SCF, provided while students wrote) and asynchronous corrective feedback (ACF, provided after students had finished writing) in an EFL writing course. In this case study, two Japanese EFL students’ writing processes, documented by Google Docs, and their perceptions of computer-mediated feedbacks, were analysed. The findings highlighted the advantages of SCF over ACF, such as it is more useful in eliciting students’
self-correction and fostering metalinguistic understanding. A follow-up study involving 15 participants further confirmed the research findings.

Using Google Docs, Baten, Bouckaert, and Yingli (2009) employed a project-based approach to foster students’ skills and competency in using business English. Within their project, a group of business-English students \( (N = 27) \) from a Belgian university were required to build a student-driven virtual learning environment via Google Docs. The core task for these students was to work collaboratively to create a medium, convey content, and manage a project. Their findings suggest that this collaborative practice via Google Docs could stimulate students’ interaction in the target language, boost students’ confidence in speaking and writing, and foster collaborative learning and project-management skills.

Likewise, Kessler, Bikowski, and Boggs (2012) did a collaborative writing study with 38 Fulbright scholars from a pre-academic orientation programme. In the programme, these scholars of various disciplines were grouped together by their academic interests and completed a primary research project presentation collaboratively via Google Docs. A subsequent survey on their perception of collaborative writing was run at the end of the programme. The results revealed that these scholars held positive attitudes towards collaborative writing, and they reported that they benefitted from each other’s contribution and feedback during the collaborative writing process.

S. H.-J. Liu and Lan (2016) conducted a study comparing the differences between collaborative learning and individual learning. Google Docs was employed to conduct an 8-week experiment. The same teaching methods and material were used for both groups. However, those in the experiment group were able to edit and revise one document simultaneously and collaboratively, while the control group worked on the same document individually. The results identified a positive association between collaborative learning and vocabulary gains. Furthermore, they also revealed that the collaboration group was more
motivated to use Google Docs to acquire new knowledge and that participants held positive attitudes towards Google Docs.

Similarly, in a recent experiment focusing on the effect of repeated in-class online collaborative writing tasks on language learners’ writing skills, Bikowski and Vithanage (2016) recruited 52 ESL students from a university in the United States. The experimental group \(n = 32\) simultaneously wrote and edited four in-class writing tasks via Google Docs, while the control group \(n = 27\) completed the same tasks individually via the same platform. Pre- and posttests, along with a follow-up questionnaire survey, were administered. A paired sample \(t\) test found that both groups made a statistically significant improvement in their writing performance; however, a follow-up independent sample \(t\) test showed that the experimental group (collaborative) outperformed the control group (individual).

2.2.3 Generation. Compared with other areas, fewer empirically grounded studies have been documented so far around the generative convenience afforded by Web 2.0 technologies. However, Kozlova and Priven (2015) argued that along with communication and collaboration, the virtual reality generated by Web 2.0 applications—especially digital games—could provide language learners with a simulation of real-life experiences, contribute to their development of metacognitive strategies, enhance their communicative competence, and reduce affective barriers experienced in the process of language learning.

2.2.3.1 Game playing technologies. Recently, with an aim to clarify the effectiveness of different types of digital game upon EFL learning, Chiu, Kao, and Reynolds (2012) conducted a meta-analysis. Fourteen studies, from Taiwan, Korea, and Hong Kong, involving 1116 students, were reviewed and analysed. Compared with drill and practice games, meaningful and engaging games were more likely to promote EFL learners’ achievement
because they provided EFL learners with abundant opportunities to negotiate, interact, and communicate.

In another meta-analysis of 25 studies pertaining to digital game-based learning (DGBL) in English, Kao (2014) uncovered a medium-positive effective size for DGBL over traditional EFL instruction. Furthermore, the results also suggested that DGBL is more effective in maintaining the EFL learners’ long engagement, which then facilitates the mastery of procedural knowledge.

Chang, Sheldon, Si, and Hand (2012) introduced their pilot study of using innovative applications to teach Mandarin. A multiplayer mystery game involving virtual reality, physical props, and virtual agents was developed. Students could use the Microsoft Kinect, a motion-sensing input device for game consoles, released by Microsoft, to interact with a game with rich content. Though the game was still at a preliminary stage, the students in this study showed high levels of engagement and could master the content rapidly.

Also on the basis of Microsoft Kinect, Edge, Cheng, and Whitney (2013) did a similar study aiming to help language learners to learn through body motion. They developed a language-learning game called SpatialEase. In the game, gamers had to move their body when they received audio commands in the second language. Preliminary results suggested that the move-to-learn SpatialEase could be as effective as traditional language-learning games.

In a case study by Rama, Black, van Es, and Warschauer (2012), six Spanish learners’ language-learning experiences involving the Spanish version of the massive online game World of Warcraft were collected through multiple sources, including students’ in-game text chat logs and semi-structured interviews. The follow-up inductive-deductive content analysis results suggest that the game can be used as a safe language-learning space to foster language
learners’ communicative competence in a given context. In addition, game-based learning is a goal-directed, collaborative action, which leads to socialisation.

Similarly, Thorne (2008) also conducted a descriptive case study on the basis of the game World of Warcraft. Two game players were involved. One was from the United States and the other was from Ukraine. Both in-game transcripts and semi-structured interview data were collected. Results showed that playing the game increased their motivation for interaction due to the affordances of gaming activities such as reciprocity, negotiation, and requests for help.

Focusing on the contribution of computer games to language acquisition, Newgarden and Zheng (2016) explored four English-language learners’ development during World of Warcraft group play. Through multimodal analysis, they found that repeated recurrent activities and use of avatars in playing the game could improve players’ speaking proficiency and foster further communication among game players.

In Reinders and Wattana’s (2014) study of the effect of digital game play on language learners’ willingness to communicate, a convenience sample of 30 Thai EFL students played an online role-playing game, which was tailored for collaboration and communication. A series of questionnaire surveys were administered. Paired sample t tests detected significant differences with large effect sizes between in-classroom context and in-game environment in learners’ willingness to communicate, state of anxiety, communicative competence, and communicative self-confidence. The findings support the feasibility of using digital games in language learning and teaching.

By mixing ethnography and action research, Strachan, Kongmee, and Pickard (2016) reported a study on students’ language-learning experience during playing massive, multiplayer, online role-playing games (MMORPGs). Two participants in their study were assigned game-related tasks, aiming to increase their game-related vocabulary and
understanding of other game players’ conversation. Their findings highlighted the fact that in the virtual reality of the MMORPGs, students could be endowed with more joyful, personalised, and broad language-learning opportunities than the conventional language-learning approaches.

2.2.3.2 Avatar playing technologies. A. Wang (2015) integrated Second Life (SL), a free role-play game where users can socialise in a virtual world by either voice chatting or text chatting, in a task-based business-English speaking course to clarify teachers’ roles in the virtual environment. Seventeen students, enrolled in the course, participated in this 5-week study including group discussion, role-play practice, presentation, and assessment. Recordings of students’ SL activities and teacher’s interviews were collected, transcribed, and analysed. Results showed that the integration of the role-play game in this course kept the students motivated and led to positive outcomes.

Lan (2014) designed a two-stage study to determine whether using SL can improve the Mandarin oral performance of overseas Chinese students. In Stage 1, SL was used as an oral communication platform for 20 participants, who were evenly assigned into an experimental group and a control group. Two units were delivered with a task-based learning approach through a virtual classroom in SL to the experimental group, but through a conventional classroom to the control group. A chi-square test of goodness of fit was performed to test whether the percentage of students talking remained the same in these two settings. The results showed that the percentage of students’ oral output was significantly higher in the virtual classroom than in the conventional classroom. In Stage 2, another 24 participants were enrolled in a Mandarin course mediated by SL. Pre-and posttests were administered at the beginning and the end of the course respectively. In addition, a questionnaire was also used to capture these students’ learning attitudes. Paired sample t-test
results suggested that these students made significant progress; meanwhile, the results of the learning-attitude survey indicated that the use of a virtual classroom in a game setting significantly increased these students’ engagement, interest, and motivation in learning Chinese.

Viewing the potential benefits of the virtual world for language teaching and learning, Wehner, Gump, and Downey (2011) carried out a study on the effect of virtual-world language-learning experiences upon students’ motivation. The participants consisted of two sections from the same Spanish language course, with one group involved in SL activities. The SL group was required to find native speakers to communicate with and send copies of their chat logs to the instructor. The survey results for this study indicated that the use of virtual worlds could potentially reduce language learners’ anxiety, and lead to an increase in their learning motivation.

Kozlova and Priven (2015) reported a study on integrating 3D virtual worlds into an EFL teacher training programme in a Canadian college. Six Turkish EFL teacher trainees and eight Turkish EFL students were involved in this case study. Two virtual worlds were created by a cloud-based platform and employed as learning platforms in the study. Participants could interact with others in this multimodal virtual environment. Qualitative data of their wiki posts, journal entries and online session screencast recordings were collected and analysed interpretatively. The results demonstrated that this approach developed EFL teacher trainees’ pedagogical and technological skills by fostering their evaluation awareness, creating a sharing online community, and encouraging mutual understanding.

2.2.3.3 Miscellaneous generative technologies. In a recent experiment by Mohsen (2016) on the effect of computer-based simulation on language learning, 43 EFL students from a university in Saudi Arabia were randomly assigned into an experimental group (n = 22),
which played a simulation game of knee surgery, and a control group ($n = 21$), which watched YouTube clips of the simulation game. After 45 minutes, both were required to sit a multiple-choice comprehension test and a vocabulary acquisition test of image identification. Subsequent statistical analysis demonstrated that the experimental group outperformed the control group in comprehension and vocabulary tests. Mohsen concluded that interacting with visual stimuli can be a more effective than simply watching the video via YouTube.

Hwang, Shih, Ma, Shadiev, and Chen (2016) evaluated the contribution of a mobile game-based virtual learning environment to the improvement of language learners’ listening and speaking skills. Forty female high-school students were randomly and evenly assigned to two groups. During the 3-week period, both groups were exposed to the same classroom instruction; however, after class, the control group used a paper-and-pencil method to practise, while the experimental group used their mobile devices to participate in a series of interactive learning games such as jigsaws and card games. Independent sample $t$ tests were run to compare the two scores in the pre- and posttests of EFL speaking and listening skills. Though no significant differences were found in the pretest, the experimental group outperformed the control group in the verbal posttest. They concluded that mobile-assisted gamed-based learning activities could effectively foster language learners’ speaking skills.

Using the three-dimensional virtual environment afforded by Google Street View, which provides panoramic views of most cities around the world, Y.-C. Shih (2015) conducted a qualitative study with four Taiwanese students. An experience-based culture-learning strategy was adopted. These four students took a virtual tour of London, while being guided by a native English-speaking instructor. They ventured around the city to acquire knowledge about local residents’ daily life during the virtual tour and shared their experiences with others via blogs. Qualitative analysis of the interviews, observations, and learners’ blog entries suggested that this innovative way of cultural immersion and interaction...
helped learners develop positive attitudes towards the target culture and increase their knowledge of the target culture.

2.2.4 Social networking. The other integral part of CALL 2.0, which endows language teachers and learners with previously unimaginable opportunities, is social networking sites. They provide virtual platforms for people with similar interests to socialise. Users of social networking sites can create profiles, befriend each other, and stay connected. For language learners, social networking sites of the target language afford them an opportunity to witness the real daily life and language of native speakers. Research has indicated that this area is possibly the most frequently used Web 2.0 application outside the classroom (Lai & Gu, 2011).

2.2.4.1 Facebook. As one of the leading English-medium social networking sites in the world, Facebook allows its registered users to easily stay connected with friends, find people with similar interests, and share their thoughts and ideas.

Suthiwartnarueput and Wasanasomsithi (2012) conducted a mixed methods study investigating whether communicating via Facebook can effectively improve the English grammatical knowledge and writing proficiency of low-intermediate EFL students. Eighty-three Thailand undergraduate students, whose English level was deemed as low-intermediate by test scores, discussed topics relating to English grammar and writing in a Facebook group. Pre- and posttests were completed at the beginning and the end of the academic year respectively. Paired sample t tests comparing the mean scores suggested significant differences for grammatical knowledge and writing proficiency in favour of the Facebook-mediated discussion. A further analysis of the interview data showed these students deemed Facebook as an effective method for English grammar learning and writing practice though it was not specifically designed for language learning.
Saylag (2013) conducted an action study of Facebook use by EFL teachers in a Turkey university with 47 EFL university students. In the research, Facebook was used as a tool to disclose the teacher’s personal and course-related information. Saylag found that the EFL teacher’s self-disclosure via Facebook fostered the establishment of interpersonal relationship with students, which, in turn, could enhance students’ motivation, autonomy, and participation in classroom activities.

Boonkit (2011) tested the use of Facebook to connect classroom English with real world English with the EFL students in a Thailand university \((n = 31)\), who enrolled in the course of Reading and Discussion. During 14 weeks, the students were asked to complete their extra-curricular reading activities. They posted their reading topics, reading strategies, and understandings on Facebook to their peers. Teachers also participated in the discussion by giving their comments through Facebook. The results of this study revealed that Facebook helped these EFL students to apply what they had learned from the classroom into their real life and strengthened their real-world English.

Promnitz-Hayashi (2011) conducted an observational study examining how Facebook activities could be implemented to help EFL students with low-level language proficiency. Twenty-seven Japanese students voluntarily joined a teacher-started discussion on Facebook. Qualitative analysis results suggested that students from the discussion group expressed more opinions and reasoning in both face-to-face interactions and writing assignments. Promnitz-Hayashi attributed this positive change to the fact the social networking nature of Facebook allowed these students more control of their own learning.

S. Jin (2015) reported a study on using Facebook to foster South Korean EFL learners’ intercultural awareness between 20 American undergraduates and 32 South Korean EFL learners. A Facebook group page was created for them. Each week, they needed to discuss a pre-designed intercultural topic via the Facebook group. Qualitative data suggested
that social network sites could develop EFL learners’ intercultural communication skills, which is particularly valuable to those who have no opportunities to be immersed in the target culture.

Kabilan, Ahmad, and Abidin (2010) surveyed 300 undergraduate students in a Malaysian university on their interaction with Facebook as a learning environment. The results suggested that the students believed Facebook could improve their language proficiency, confidence, motivation, and attitude. They concluded that Facebook can be feasible as a tool to facilitate language learning if planned appropriately as part of the curriculum.

Alias, Manan, Yusof, and Pandian (2012) explored the combination of online social networking websites with language-learning strategies to develop students’ academic writing skills. Specifically, they focused on whether the training of indirect language-learning strategies via Facebook Notes could significantly improve students’ use of language-learning strategies and their academic writing performance. Forty Malaysian university students participated in this quasi-experimental study structured around academic writing. The findings suggested that though no significant differences were detected in academic writing performance, the training model mediated by Facebook Notes did have a positive impact on students’ use of language strategies in practice.

2.2.4.2 Alternative social media sites. Mompean and Fouz-González (2016) examined the possible use of Twitter as a pronunciation teaching/learning tool. Within five weeks, 27 tweets containing audio and video links to pronunciation instructions were sent to the 16 students from a language school in Spain. Students were also encouraged to interact through Twitter with the researchers. After comparing pre- and posttest scores, they concluded that the Twitter-based practice, combining authentic material, metalinguistic information, and
typographic saliency, had a positive association with the improvement of students’
pronunciation.

Toetenel (2014) reported a study focusing on a user-owned social networking site as a
platform for asynchronous communication outside a classroom setting. The study was carried
out in a second-language classroom at a further-education college in the UK on the basis of
Ning, a web service for users to create their own social networking sites. Sixteen students
were invited to join a closed Ning group set up by the researcher. Within a 2-week period, the
group was used in the classroom an hour per day. Both qualitative data and quantitative data
were collected and analysed. Findings suggest using social networking sites in a language-
learning classroom could break cultural barriers and promote group cohesion among students.

Alimirzaee and Ashraf (2016) conducted an experiment to verify the effect of peer-
knowledge sharing mediated through social networking sites upon EFL teachers’ professional
development. Fifty Iranian EFL teachers were randomly and evenly assigned to an
experimental group and a control group. The experimental group participants shared with
each other their teaching experiences, teaching plans, teaching methods, classroom
educational aids they had employed, and their comments relating to future improvement,
through the channel of Yahoo Groups, a social networking service especially for people with
similar interests. Meanwhile, the EFL teachers in the control group only received relevant
information from the researchers. An independent sample $t$ test detected a significant
difference with a higher mean for the experimental group, which suggested that peer-
knowledge sharing exerts a positive influence upon EFL teachers’ professional development.

2.2.5 Monitoring. Though currently still a less studied area, research on the monitoring
potentials of CALL 2.0 has started gaining momentum.
2.2.5.1 Learning management systems. Y.-T. Yang, Chuang, Li, and Tseng (2013) reported their study on a blended language-learning environment mediated by the learning management system Moodle, an open source course-management system and learning platform. Participants of the study (\(N = 83\)) were from a general English course at a large university in Taiwan. They were divided into three groups according to their language proficiency. During the course, in-classroom instruction was blended with online discussions, peer feedback, and additional individualized learning activities embedded within the Moodle system. Their findings indicated that such a blended language-learning environment had significant positive association with the improvement of these students’ listening and speaking skills. Furthermore, they suggested the individual feedback through the learning management system fostered students’ awareness of errors and accuracy.

With an aim to improve Chilean students’ English proficiency, especially their oral production and listening comprehension, Bañados (2006) proposed a blended learning model, which combines a learning management system, UdeC English Online, with in-classroom instruction. The English programme was delivered, incorporating the concepts of task-based language-learning and Web 2.0 technology-supported collaborative learning. The longitudinal analysis of the model’s impact upon learners’ linguistic competence in the pilot study found that there were significant improvements in their listening, vocabulary, reading, grammar, and pronunciation. The survey on learners’ satisfaction with the blended learning model at the end of the pilot study further revealed that the students held favourable attitudes towards the system.

Dehaan, Johnson, Kondo, and Yoshimura (2012) used a wiki-based platform as a learning management system in a 4-week course. Their two-cycle study aimed at improving the oral communication skills of a group of EFL students (\(N = 13\)) in a Japanese university. In Cycle 1, students’ performance in a strategic interaction scenario task was video recorded
and uploaded onto the wiki platform for students’ self-evaluation and self-correction. Meanwhile, the instructor also provided online feedback through the wiki platform. Then in Cycle 2, the same strategic interaction scenario task was repeated. Survey and interview data indicated that it not only developed these students’ confidence, creativity and critical thinking, but also improved their linguistic awareness of pragmatic knowledge, and communicative strategies.

2.2.5.2 Additional systems. Roy, Brine, and Murasawa (2016) focused on the usability of online note-taking applications such as Evernote, a cloud-based, cross-platform app for collecting and sharing ideas. Their pilot study revealed that students could easily use note-taking applications to complete the pre-designed tasks, and their remarks demonstrated their positive impression of using note-taking applications for language-learning purposes.

In a case study, M. Liu, Navarrete, Maradiegue, and Wivagg (2014) reported their study on a project of using iPod touch technology to support English-language learning in the United States. Their findings indicated that mobile devices can be used as a valuable tool for teachers to support English-language learners because mobile devices allow students ubiquitous access to references and multimedia-enriched resources, help improve their linguistic skills and content-specific knowledge, and facilitate differentiated language learning. Furthermore, they suggest that mobile devices could enable students to get just-in-time support from their teachers and extend students’ learning engagement beyond the classrooms.

Rubio (2014) compared the gains of Spanish pronunciation and comprehensibility between students taught in a language MOOC (Massive Open Online Course) and a face-to-face classroom. Both groups were taught the same content; however, the MOOC group had more opportunities to review course content, discuss in groups, and engage in peer learning.
Students’ speeches at the beginning and end of the course were collected and rated by two native speakers. The results indicated that both groups made significant improvement, with a larger effect size detected in the MOOC group \((d = 1.21)\).

To sum up, the research quoted above suggests that in the past several years, there has been a surge of CALL 2.0 studies around the world, providing a wide spectrum of insights into the affordances and potentials of CALL 2.0. However, CALL 2.0 research is not flawless. Specifically, most research to date has been conducted with an experimental design to test its effectiveness in language education or with a correlational design using self-reported data to gauge CALL stakeholders’ attitudes towards a specific CALL 2.0 practice (e.g., a MOOC language course). These studies also suffer from common limitations such as limited sample size, use of convenience sampling strategy, and lack of longitudinal studies. Nonetheless, an incremental theme, which can be inferred from a growing body of CALL 2.0 research, is that the inherent features of CALL 2.0, including interaction, collaboration, generation, social networking, and ubiquity, can positively contribute to language learning and teaching. Moreover, it has also demonstrated that both language learners and educators hold great interest and enthusiasm towards this innovative language-learning approach. Yet CALL researchers (e.g., Johnson, Vilhjálmsson, & Marsella, 2005) have also pointed out that although CALL 2.0 may be deemed valuable in fostering innovative and effective ways for language learning, the translation of these promises into expected outcomes largely depends on language teachers’ meaningful engagement with CALL 2.0, which deserves further exploration.

2.3 Challenges in Implementing CALL 2.0

Although the educational affordance and effectiveness of CALL 2.0 has been attracting growing attention, and there exists widespread enthusiasm towards CALL 2.0, the full
benefits afforded by CALL 2.0 cannot be achieved without teachers’ and learners’
engagement with CALL 2.0 (Hubbard & Levy, 2006). Currently, it is not rare to witness a
lack of adequate human agency for the integration of CALL into language classrooms, such
as teachers’ underuse of, or even refusal of, available technologies (see Conole, 2010; Helm,
2015).

As one of the pioneers noticing the problems caused by teachers’ resistance to CALL,
Daud (1995) developed a computer attitude scale measuring language-teacher users’
friendliness towards CALL. The research suggested that teacher training, administrative
encouragement, and computer access could be effective in improving language teachers’
attitudes towards CALL. Starting from the same assumption, Brett (1996) conducted a
questionnaire survey to measure undergraduate users’ attitudes towards CALL. He used the
attitudinal data as the basis for evaluating the feasibility of integrating multimedia
programmes into language learning. His research suggested that since these undergraduates’
attitudes towards CALL were highly positive, CALL should be further integrated with the
university curriculum.

Jahromi and Salimi (2013) pointed out that in the field of CALL, “the concept of
human agency has often been touched upon in studies addressing computer-related attitudes”
(p. 160). Influenced by the view that users’ attitudes towards CALL is one critical factor
influencing CALL uptake, CALL scholars have employed various methods and perspectives
to investigate users’ motivation and reasons for the uptake of CALL. For example, viewing
students’ attitudes and motivation towards CALL as the most critical factor for successful
CALL projects, Ushida (2005) investigated the role of motivation and attitudes on student L2
learning in an online course and showed that the new online learning environment influenced
students’ attitudes and motivation, which, in turn, influenced students’ L2 learning. Similarly,
in view of the attitudinal importance, Kessler (2007) employed teachers’ attitudes towards
technology as a criterion to compare the influence of formal and informal CALL teacher-preparation programmes. Furthermore, following a three-step procedure including principal component analysis, confirmatory factor analysis, and the Rasch-Andrich rating scale model, Aryadoust, Mehran, and Alizadeh (2016) validated a 27-item research instrument measuring Iranian EFL learners’ attitudes towards computer assisted language learning.

Though achievements have been made in this stream of attitudinal research, and the relationship between users’ attitudes and CALL uptake was to some extent clarified, Warschauer and Healey (1998) have long pointed out that though students generally show positive attitudes towards CALL, more work needs to be done to “identify the factors involved in using software effectively for language teaching” (p. 62). Following this research vein, Gillespie and Barr (2002) further proposed to investigate factors underlying students’ reluctance to CALL programmes. They argued that behind the low uptake of CALL, there existed a psychological dimension to be explored. However, there is currently a paucity of research in this regard.

Meanwhile, in view of the need to promote the smooth integration of CALL into language-learning programmes, drawing on the diffusion of innovation theory by Rogers (1995), Bax (2003) proposed CALL normalisation research, which aims at “the stage when a technology is invisible, hardly even recognised as a technology, taken for granted in everyday life” (p. 23). Though its aim sounds attractive, CALL normalisation research has long been criticised for the lack of a clear research agenda, with too many aspects being included (Hubbard & Levy, 2006). This was clearly evidenced by Mahdi (2013) whose research suggested that to achieve the state of normalisation, five broad aspects had to be taken into consideration: personal characteristics, technical difficulty, pedagogical benefits, institutional support, and sociocultural influence.
In response to being too general, a noteworthy research tendency has been a greater focus on employing models to ascertain factors influencing individual users’ adoption and use of CALL. Yunus (2007), on the basis of the technology acceptance model (TAM; Davis, Bagozzi, & Warshaw, 1989), investigated Malaysian EFL teachers’ use of ICT. The questionnaire survey and semi-structured interview results suggested that Malaysian EFL teachers were not being adequately prepared to integrate ICT into EFL classrooms and that low-level access to computers, modest computer competence, and lack of training opportunity and on-site support were also the possible causes of the underuse of ICT.

In view of the influence of technology acceptance research, Fageeh’s (2011) study showed that both students and teachers who held positive attitudes or perceptions towards using the computer/Internet are more willing and likely to adopt CALL. Similarly, from a Chinese perspective, Li and Walsh (2013) conducted research on factors influencing Chinese EFL teachers’ technology uptake. Through questionnaires and follow-up focus group interviews, they found that computer use was mainly limited to classroom presentations. They also pointed out that the technology uptake among Chinese EFL teachers was below expectation.

Furthermore, in recent research on how collaborative tasks should be formatted in the context of CALL 2.0, Fuchs (2016), working with university students from both Turkey and United States, reported that unexpected political turmoil in Turkey led to the blockage of social media and adversely affected the research plan. This also highlights the importance of social-political factors in certain contexts.

Therefore, this review of the CALL normalisation research indicates that though the problem concerning human–computer interaction has long been noticed, it was not until recently that a tendency began to emerge, which builds research upon the technology acceptance research framework and employs hypothetical constructs (e.g., self-efficacy,
perceived usefulness, perceived ease of use, etc.) to summarise, explain, and predict human behaviours in CALL. However, to date, not much empirical research related to CALL 2.0 has been published in this direction; moreover, there lacks a fine-grained understanding of the factors influencing users’ acceptance of CALL 2.0 (Aryadoust et al., 2016). To promote widespread CALL 2.0 adoption, it is imperative to identify these factors and their relationships so that corresponding effective measures can be developed and put in place.

Next, Chapter 3 reviews prior pertinent research on technology uptake. By doing so, a hypothesised research framework consisting of salient factors is also constructed.
Chapter 3 Theoretical Framework and Research Model

In light of the research gap identified in Chapter 2, this chapter introduces the theoretical framework and proposes a research model for the current study. It starts with a brief account of technology acceptance. Next, it presents some well-established theoretical models pertinent to technology acceptance and pedagogical use of ICT. Finally, it discusses the proposed model and hypotheses for this research.

3.1 Technology Acceptance

Technology acceptance is defined as “a user’s willingness to employ technology for the tasks it is designed to support” (Teo, 2011b, p. 1). With the ever-increasing availability of technology, a large body of research has shown that besides system usability, users’ perceptions towards, and beliefs in, technologies could also influence the technology integration (e.g., Davis, 1993; Davis et al., 1989; Davis, Bagozzi, & Warshaw, 1992; Taylor & Todd, 1995). In view of the importance of these technology-related psychological constructs, technology acceptance research in the information system (IS) discipline has gained increasing momentum since the 1990s (King & He, 2006).

The basic tenet for technology acceptance research is that users’ beliefs, attitudes, and intentions could influence their actual use of technology (Taylor & Todd, 1995; Venkatesh, Morris, Davis, & Davis, 2003). Figure 1 presents the fundamental concept underlying this tenet. Since prior acceptance research has underpinned the close relationship between intention to use and actual use in technology acceptance research (Ajzen, 1991; Davis, 1989, 1993), both actual use and behavioural intention to use technology have been frequently employed as reliable anchors to predict users’ technology acceptance.
3.2 Theoretical Models in Technology Acceptance Research

It is generally acknowledged that the underpinning research into technology acceptance is the theory of reasoned action (TRA; Fishbein & Ajzen, 1975), the theory of planned behaviour (TPB; Ajzen, 1991), and the decomposed theory of planned behaviour; (DTPB; Taylor & Todd, 1995). With the increasing development of technology since the 1990s, several models focusing on the investigation of users’ technology acceptance sprang from TRA, TPB, and DTPB. These models include the technology acceptance model (TAM; Davis, 1989, 1993; Davis et al., 1989; Davis & Venkatesh, 1996), TAM Version 2 (Venkatesh, 2000; Venkatesh & Davis, 2000), TAM Version 3 (Venkatesh & Bala, 2008), and the unified theory of acceptance and use of technology (UTAUT; Venkatesh et al., 2003). Each of these models is briefly discussed below.

3.2.1 Theory of reasoned action. As a strong theoretical backbone for the attitude-behaviour research, especially technology acceptance research, TRA (Ajzen & Fishbein, 1977, 1980; Fishbein & Ajzen, 1975) was first developed to model consumers’ volitional behaviour and intention in the business context and was later extended to other contexts, including the

Figure 1. The basic tenet of technology acceptance research.
education sector (Madden, Ellen, & Ajzen, 1992). The model posits that behavioural intention serves as a trigger and predictor of human behaviour and is under the co-influence of an individual’s attitude and subjective norms towards certain behaviour of interest. Furthermore, attitude towards the behaviour is seen as being determined by behavioural beliefs and outcome evaluations, while subjective norms are determined by normative beliefs and motivations to comply (Figure 2). According to Ajzen and Fishbein (1980), external variables are related to behavioural intention through their influence upon the behavioural and normative beliefs. Thus external variables, such as characteristics of the tasks, organisational structures, and political influence, may not determine an individual’s behavioural intention directly.

Figure 2. Theory of reasoned action.

The empirical research for TRA was meta-analysed by Sheppard, Hartwick, and Warshaw (1988), who suggested that TRA possesses strong predictive utility for most human behaviour. With TRA adopted as a fundamental theoretical framework in explaining individuals’ technology acceptance, Davis et al. (1989) also showed that TRA could explain a large portion of the variance in users’ behavioural intention to use computer technology.
3.2.2 Theory of planned behaviour. TPB was developed on the basis of TRA by adding a third determinant of behavioural intention—perceived behavioural control (Ajzen, 1991). In TPB, perceived behavioural control refers to “an individual’s belief in how easy or difficult performance of the behaviour is likely to be” (Blue, 1995, p. 107). According to Ajzen (1991), the incorporation of perceived behavioural control into TPB provides additional explanatory power for the situations where individuals do not have the volitional control necessary to perform the intended behaviour.

TPB posits that an individual’s behaviour is determined by an individual’s behavioural intention and perceived behavioural control. Under the framework of TPB, in a non-volitional situation, the influence from motivational factors upon behaviour should be mediated through behavioural intention and perceived behavioural control. Behavioural intention is, therefore, under the direct influence from three constructs: (a) attitude towards certain specific behaviour, (b) subjective norm, and (c) perceived behavioural control. In turn, the three constructs are under the influence of three corresponding underlying beliefs: (a) behavioural beliefs, (b) normative beliefs, and (c) control beliefs (Figure 3).

![Figure 3 Theory of planned behaviour.](image-url)
In brief, TPB theorises that with more favourable attitude, greater subjective norm, and stronger perceived behavioural control, an individual’s behavioural intention increases. Similar to TRA, the application of TPB in technology acceptance research has also been quite successful, revealing a close relationship between attitudes towards technology, subjective norm, perceived behavioural control, and intention to use technology. For example, Teo and Lee’s (2010) research on 157 Singaporean pre-service teachers’ intention to use technology found that a TPB-based model could explain 40% of the variance in their intention to use technology.

3.2.3 Decomposed theory of planned behaviour. In their probe into behavioural intention towards using information systems, Taylor and Todd (1995) further expanded the TPB by proposing DTPB, in which, the attitudinal, normative and control beliefs specified in TPB are further decomposed into underlying beliefs, to accommodate the research needs in technology acceptance. Specifically, attitudinal beliefs are decomposed into perceived usefulness, perceived ease of use, and compatibility; normative beliefs are decomposed into peer’s influence and superior’s influence; and perceived behavioural control beliefs are decomposed into self-efficacy, resource facilitating conditions, and technology facilitating conditions.
According to Taylor and Todd (1995), in this decomposition approach, the clarification of relationships between these belief structures and the antecedents of behavioural intention can facilitate future research and managerial decisions. Employing DTPB, Sadaf, Newby, and Ertmer (2013) found that 71.5% of the variance in pre-service teachers’ intention to use Web 2.0 technologies in their future classroom could be jointly explained by their attitude towards Web 2.0 technologies, subjective norm, and perceived behavioural control.

3.2.4 Technology acceptance model. As a widely tested model for predicting user acceptance, the development of TAM underwent three stages: original TAM (Davis, 1989, 1993; Davis et al., 1989, 1992; Davis & Venkatesh, 1996), TAM Version 2 (Venkatesh, 2000; Venkatesh & Davis, 1996, 2000), and TAM Version 3 (Venkatesh & Bala, 2008; Venkatesh, Davis, & Morris, 2007). On the basis of TRA, Davis (1989) proposed the original TAM. Compared with TRA, TAM focuses specifically on the adoption of IS. Figure 5 shows the generic TAM model.
As shown in Figure 5, TAM consists of four major constructs: (a) perceived usefulness, (b) perceived ease of use, (c) attitude towards use of technology, and (d) behavioural intention to use technology. In TAM, perceived usefulness is defined as the degree to which an individual believes that using a particular system would enhance his or her productivity, while perceived ease of use is defined as the degree to which an individual believes that using a particular system would be free of effort (Davis, 1989). TAM theorises that (a) the actual use of an information system is determined by behavioural intention to use; (b) behavioural intention to use is determined by attitude towards use and perceived usefulness; (c) attitude towards use is determined by both perceived usefulness and perceived ease of use; and (d) perceived ease of use exerts an indirect or mediated influence upon attitude towards use via perceived usefulness. Furthermore, TAM postulates that external variables (e.g., objective system-design characteristics, training, computer efficacy, user’s involvement in design, and the nature of the implementation process) influence perceived ease of use and perceived usefulness rather than directly impact attitudes towards use and behavioural intention to use. Hence, TAM provides a basis for examining the relationships among external variables, beliefs, attitudes, intention to use, and actual use. Among these variables, perceived usefulness and perceived ease of use are of primary relevance for users’ acceptance.
In view of its robustness, parsimony, and flexibility, TAM has gained increasing popularity among educational researchers. For example, Gibson, Harris, and Colaric (2008) employed TAM to investigate the acceptance of online education by the faculty members (N = 110) from a college of business and a college of education in the United States. A subsequent multiple regression analysis was carried out to predict their acceptance of online education based upon perceived ease of use and perceived usefulness. The results suggested that the two indicators explained 60.2% of the variance in the users’ self-reported uses of online education. Further, in a longitudinal study, P. J.-H. Hu, Clark, and Ma (2003) examined the response of 130 teachers to Microsoft PowerPoint in a 4-week training programme. Comparison of the data collected at the beginning and end of the training suggested that the core elements of TAM—perceived ease of use and perceived usefulness—remained relatively stable. On the basis of a TAM-based model, Nistor, Baltes, and Schustek (2012) examined the acceptance of academic virtual communities of practice by a sample of academic staff (N = 72) at a German university. Their study revealed that participants’ intention to use technology had a significant effect on their actual use (β = .52, p < .001).

With regard to pre-service teachers, on the basis of an extended TAM, Ma, Andersson, and Streith (2005) found that perceived usefulness and perceived ease of use were two key constructs influencing Swedish student teachers’ intention to use technology.

The key purpose of the original TAM was to provide a basis for tracing the impact of external factors on internal beliefs, attitudes, and intentions. Later, viewing the weak association between attitude and intention in empirical research, Davis and Venkatesh (1996) excluded the attitude construct from TAM and kept the behavioural intention as “research in psychology and TAM itself suggest that users’ intention to use is the single best predictor of actual system usage” (p. 20). In their constant effort to better understand the key determinants of perceived usefulness, Venkatesh and Davis (2000) extended the original TAM by
incorporating the social influence processes and the cognitive instrumental processes (TAM2, Figure 6). Social influence processes include subjective norms, voluntariness; that is, the extent to which one perceives the adoption decision to be non-mandatory, (Venkatesh & Davis, 2000), and image; that is, the degree to which one perceives the use of an innovation could enhance one’s status in one’s social system (Moore & Benbasat, 1991). The new cognitive instrumental processes include job relevance; that is, the degree to which one perceives a target system to be applicable to one’s job (Venkatesh & Davis, 2000), output quality; that is, the degree to which one believes that using a system performs one’s job tasks well (Venkatesh & Davis, 2000), and result demonstrability; that is, the degree to which one perceives the results of using an innovation to be tangible, observable, and communicable (Moore & Benbasat, 1991).

![Figure 6. Technology acceptance model 2 (TAM2).](image)

Using longitudinal data collected from four sites, Venkatesh and Davis (2000) tested the proposed TAM2. They found strong support for TAM2, supporting the incorporation of both social influence processes and cognitive instrumental processes. Moreover, results revealed
that TAM2 could account for 40%-50% of the variance in perceived usefulness and 34%-52% of the variance in usage intention.

In their synthesis of the prior research on TAM, Venkatesh and Bala (2008) summarised the determinants of perceived usefulness and perceived ease of use in prior research and classified these determinants into four types: (a) individual differences, (b) system characteristics, (c) social influence, and (d) facilitating conditions. Facilitating conditions are defined as “factors in the environment which exert an influence over a person’s desire to perform a task” (Teo, 2009, p. 306). On the basis of TAM2, Venkatesh and Bala (2008) developed an integrated TAM3 (Figure 7) with an aim to build “a complete nomological network of the determinants of individuals’ IT adoption and use” (p. 279).

![Technology Acceptance Model 3 (TAM3)](image)

*Figure 7. Technology acceptance model 3 (TAM3).*

In their studies to test the explanatory power of TAM3, Venkatesh and Bala (2008) collected data from four organisations during the implementation of new systems. Their results showed that overall, TAM3 explained 52%-67% of the variance in perceived usefulness, 43%-52% of the variance in perceived ease of use, 40%-53% of the variance in behavioural intention, and 31%-36% of the variance in actual use.

### 3.2.5 Unified theory of acceptance and use of technology.

With an aim of summarising the constructs in prior studies on the explanation to IS usage behaviour, Venkatesh et al. (2003)
developed UTAUT, which postulates four core constructs linked to intention to use technology. These four constructs include (a) performance expectancy, (b) effort expectancy, (c) social influence, and (d) facilitating conditions. Meanwhile, UTAUT also theorises that the influence of these constructs upon intention to use technology may be moderated by age, gender, experience, and voluntariness, as shown in Figure 8.

Despite the fact that UTAUT is intended to be a coherent and unified theory, Williams, Rana, Dwivedi, and Lal’s (2011) review of 450 studies citing UTAUT suggests that little research has been conducted to test the predictive power of UTAUT and there existed a strong tendency to use it as the basis to incorporate more external variables or theories.

![Figure 8. Unified theory of acceptance and use of technology.](image)

As a whole, among these theoretical models, the most widely used and well tested is TAM. Overall, TAM has been empirically proven successful in predicting about 40% of system use (Legris, Ingham, & Collerette, 2003). After being introduced into the educational context, TAM quickly has gained popularity in the educational sector and has been applied to a wide
range of organisational settings and user populations, to identify the potential factors influencing users’ technology acceptance in the educational context (Teo, 2011b).

Currently, a plethora of factors have been identified in the technology acceptance research (Legris et al., 2003). However, a synthesis of these aforementioned research models revealed that six factors remain relatively stable across all of these models. Table 3 presents these six constructs.

Table 3

**Salient Factors from Technology Acceptance Research**

<table>
<thead>
<tr>
<th>Factors</th>
<th>TRA</th>
<th>TPB</th>
<th>DTPB</th>
<th>TAM</th>
<th>TAM2</th>
<th>TAM3</th>
<th>UTAUT</th>
</tr>
</thead>
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<tr>
<td>Perceived usefulness</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
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<tr>
<td>Perceived ease of use</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Self-efficacy</td>
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<tr>
<td>Subjective norm</td>
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<tr>
<td>Facilitating conditions</td>
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<tr>
<td>Behavioural intention</td>
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</tbody>
</table>

*Note. TRA = Theory of reasoned action, TPB = Theory of planned behaviour, DTPB = Decomposed theory of planned behaviour, TAM = Technology acceptance model, TAM2 = Technology acceptance model 2, TAM3 = Technology acceptance model 3, UTAUT = Unified theory of acceptance and use of technology.*

Among these six factors, behavioural intention to use is generally treated as the dependent psychological variable that predicts users’ actual use of a technology. The remaining five factors are taken as predictor variables, which exert either direct or indirect influence upon behavioural intention to use. Though these six salient factors appear to have covered almost every aspect in technology acceptance research, a critical review of the TAM research by Legris et al. (2003) suggested that when applying TAM in educational contexts, domain-specific variables should be taken into consideration to better account for the stakeholders’ technology acceptance (e.g., the subject being taught, the age level of students, the normative
teaching practices in the environment, etc.). In light of these discussions, the current research has also incorporated the technological pedagogical content knowledge model, which concentrates on the pedagogical use of ICT.

3.3 Technological Pedagogical and Content Knowledge Model

Aiming to demystify the complexity of teachers’ pedagogical use of ICT, Mishra and Koehler (2006) proposed the technological pedagogical content knowledge (TPACK) model (Figure 9) on the basis of Shulman’s (1986) pedagogical content knowledge (PCK) framework. PCK is a form of knowledge unique to teachers, which connects teachers’ subject content knowledge and pedagogical knowledge. TPACK is an extension of this notion in that teachers need to know how to incorporate technological tools and processes effectively in their teaching. According to Mishra and Koehler (2006), technological pedagogical content knowledge refers to the knowledge required by teachers for effective technology integration in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (i.e., content knowledge, pedagogical knowledge, and technological knowledge) by teaching content using appropriate pedagogical methods and technologies.

In their TPACK model, seven distinct components are listed, which are (a) content knowledge (knowledge of subject matter), (b) pedagogical knowledge (knowledge of teaching methods), (c) technological knowledge (knowledge of technology tools), (d) pedagogical content knowledge (knowledge of teaching methods with respect to subject matter content), (e) technological pedagogical knowledge (knowledge of using technology to implement teaching methods), (f) technological content knowledge (knowledge of subject matter represented with technology), and (g) technology pedagogical content knowledge; that
is, knowledge of using technology to implement constructivist teaching methods for different types of subject matter content (Chai, Koh, Tsai, & Tan, 2011).

According to Koh, Chai, and Tsai (2012), the TPACK model can be conceptualised as both a “situated, complex, multifaceted, integrative and transformative” (p. 32) form of knowledge and as a framework to unpack the integration of technology in education. Additionally, an increasing amount of research has suggested that the TPACK model could serve as a guiding framework to promote or explore teachers’ acquisition of knowledge for technology integration (Chai, Koh, & Tsai, 2010; Chai et al., 2011; Dong, Chai, Sang, Koh, & Tsai, 2015; J. Harris, Mishra, & Koehler, 2009).

![Figure 9. Technological pedagogical content knowledge model. Reproduced by permission of the publisher. Copyright 2012 by tpack.org.](image_url)
However, to date, most research around the TPACK model has mainly focused on its measurement validity (Archambault & Barnett, 2010; Giannakos, Doukakis, Pappas, Adamopoulos, & Giannopoulou, 2015; Sang, Tondeur, Chai, & Dong, 2016; Schmidt et al., 2009), the interrelationships among the seven constructs (Chai et al., 2010; Chai et al., 2011), and the model’s value in scaffolding teachers’ knowledge (Cox & Graham, 2009; Dong et al., 2015). Little is known about the contribution of the TPACK framework to the improvement of technology acceptance in education. Therefore, technological pedagogical content knowledge, the core component of the TPACK model, has been incorporated into the TAM research model in this thesis to empirically verify its contribution to Chinese pre-service EFL teachers’ pedagogical uptake of CALL 2.0.

3.4 Research Hypotheses

The primary purpose of this study was to examine factors influencing Chinese pre-service teachers’ acceptance of CALL 2.0. Drawing from prior research around TAM and TPACK, six salient factors were selected as the candidate predictor variables, including perceived usefulness (PU), perceived ease of use (PEU), CALL 2.0 self-efficacy (CSE), subjective norm (SN), facilitating conditions (FC), and technological pedagogical and content knowledge (TPACK). Intention to use CALL 2.0 (IU) was treated as the dependent variable. In next section, the research hypotheses for this study are presented with corresponding theoretical, logical, and empirical justification.

3.4.1 Perceived usefulness. Perceived usefulness is defined as “the degree to which a person believes that using a particular system will enhance job performance” (Davis, 1989, p. 320). Prior technology acceptance research has constantly shown that when perceived to be useful in teaching (e.g., improving educational achievement, promoting knowledge sharing,
facilitating students’ learning, and enhancing teachers’ productivity), a technology is more likely to be used (Aibar, Lladós-Masllorens, Meseguer-Artola, Minguillón, & Lerga, 2015; Perez, Peters, & Desmet, 2014; Zacharis, 2012). Furthermore, a recent mixed methods research on pre-service teachers’ intention to use Web 2.0 technologies, by Sadaf, Newby, and Ertmer (2016), revealed a significant positive influence of perceived usefulness upon student teachers’ intention to use Web 2.0 technologies. Thus the following hypothesis was formulated.

Hypothesis 1 (H1): Perceived usefulness will have a statistically significant positive influence on intention to use CALL 2.0.

3.4.2 Perceived ease of use. Perceived ease of use refers to “the degree to which a person believes that using a particular system would be free from effort” (Davis, 1989, p. 320). It has been well documented that when a technology is perceived as easy to use, its perceived usefulness also increases, which in turn produces greater intention to use the technology (Liaw & Huang, 2003; Moon & Kim, 2001; Saeed & Abdinnour-Helm, 2008; Teo, Lee, & Chai, 2008). In a national survey of 813 Chinese journalists’ intention to use the Internet, Y. Zhou (2008) found that perceived ease of use had a direct positive influence upon their intention to use the Internet. When given choices, they chose tools that required the least mental effort to master. Therefore, the following two hypotheses were proposed.

Hypothesis 2 (H2): Perceived ease of use will have a statistically significant positive influence on perceived usefulness.

Hypothesis 3 (H3): Perceived ease of use will have a statistically significant positive influence on intention to use CALL 2.0.
3.4.3 CALL 2.0 self-efficacy. Self-efficacy is defined as “people’s beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives” (Bandura, 1994, p. 71). Self-efficacy is closely related to a belief in one’s ability instead of one’s actual skills, and it has been demonstrated to affect how people behave (Bandura, 1986, 1991, 1994; Compeau & Higgins, 1995; Schwarzer, 1992). People with high self-efficacy beliefs in their capabilities are more likely to face challenges and overcome them while people with low self-efficacy beliefs tend to shy away from difficulties. Therefore, if they have confidence in their ability to use CALL 2.0, teachers will be less worried about their personal deficiencies, technical complexities, and adverse outcomes (McIlroy, Sadler, & Boojawon, 2007; Scherer & Siddiq, 2015; Yeşilyurt, Ulaş, & Akan, 2016). In their research, Ariff, Yeow, Zakuan, Jusoh, and Bahari (2012) identified a positive influence of technology self-efficacy (e.g., computer self-efficacy, Internet self-efficacy, digital technology self-efficacy, etc.) upon perceived ease of use and intention to use an innovation. Hence, two hypotheses around CALL 2.0 were formulated.

Hypothesis 4 (H4): CALL 2.0 self-efficacy will have a statistically significant positive influence on perceived ease of use.

Hypothesis 5 (H5): CALL 2.0 self-efficacy will have a statistically significant positive influence on intention to use CALL 2.0.

3.4.4 Subjective norm. Subjective norm is defined as “the person’s perception that most people who are important to him or her think he or she should or should not perform the behaviour in question” (Fishbein & Ajzen, 1975, p. 302). Confucian heritage has a strong influence in mainland China; Confucianism advocates ren 仁 (humaneness), yi 义 (justice), li 礼 (ritual or propriety), zhi 智 (knowledge), and xin 信 (integrity), and Chinese people tend
to be strongly influenced by their perception of the social norm (Phuong-Mai, Terlouw, & Pilot, 2005). An important doctrine developed in a Confucian-influenced education system is to learn from models and authorities and follow their advice (L. Jin & Cortazzi, 2006). Therefore, it is highly likely that mainland Chinese pre-service EFL teachers’ behavioural intention would also be under the influence of their teachers’, leaders’, or policy makers’ opinions (J. Chen & Brown, 2013). Therefore, the following two hypotheses were developed.

Hypothesis 6 (H6): Subjective norm will have a significant positive influence on perceived usefulness.

Hypothesis 7 (H7): Subjective norm will have a significant positive influence on intention to use CALL 2.0.

3.4.5 Facilitating conditions. Facilitating conditions are broad in nature (Pynoo et al., 2012). According to Taylor and Todd (1995), facilitating conditions in TAM research should include two dimensions: (a) recourse availability and (b) technology compatibility. Specifically, for teachers, these may cover ICT infrastructure availability, professional development opportunities, technical support and guidance, policies that promote the pedagogical use of technology, and so on. With regard to its influence upon teachers’ acceptance of technology, Teo and van Schaik (2009) found that, in addition to perceived usefulness, perceived ease of use, and subjective norm, facilitating conditions also had a significant influence on Singaporean pre-service teachers’ intention to use technology. In addition, with the presence of facilitating conditions, teachers may feel more at ease when interacting with technologies (Ngai, Poon, & Chan, 2007). Hence, two hypotheses around facilitating conditions were proposed.
Hypothesis 8 (H8): Facilitating conditions will have a significant positive influence on perceived ease of use.

Hypothesis 9 (H9): Facilitating conditions will have a significant influence on intention to use CALL 2.0.

3.4.6 Technological pedagogical and content knowledge. The goal of a teacher training programme should be to foster teachers’ technological pedagogical and content knowledge so that they are able to choose from ever-changing educational technologies, make a teaching design, and integrate technology seamlessly into their curriculum. Therefore, it is reasonable to assume that with this type of knowledge, teachers can be more confident and less anxious in using CALL 2.0. Considering its focal position in the TPACK model and the lack of relevant empirical research evidence to support its contribution to teachers’ technology acceptance, the following hypotheses were formulated.

Hypothesis 10 (H10): Technological pedagogical and content knowledge will have a significant positive influence on perceived usefulness.

Hypothesis 11 (H11): Technological pedagogical and content knowledge will have a significant positive influence on perceived ease of use.

Hypothesis 12 (H12): Technological pedagogical and content knowledge will have a significant positive influence on intention to use CALL 2.0.

Figure 10 provides a schematic presentation of the hypothesised research model. As a whole, the model consists of seven factors including perceived usefulness (PU), perceived ease of use (PEU), CALL 2.0 self-efficacy (CSE), subjective norm (SN), facilitating conditions (FC), technological pedagogical and content knowledge (TPACK), and intention to use CALL 2.0.
3.5 Summary

This chapter has reviewed the relevant literature on technology acceptance and technological pedagogical and content knowledge. Based on the synthesis of prior research around technology acceptance and the technological pedagogical content knowledge model, 12 hypotheses were formulated and a conceptual model was proposed to be tested. The next chapter will give a detailed introduction to the research methodology adopted for this thesis.
Chapter 4 Methodology

The purpose of this thesis was to investigate factors influencing mainland Chinese pre-service EFL teachers’ intentions to use CALL 2.0 and the interrelations among these factors. This chapter presents the methodological considerations for achieving this goal. Research methodology is a systematic approach to addressing research questions (Creswell, 2013). It includes principles of, and procedures for, data collection, data analysis, and data interpretation (Creswell & Plano Clark, 2011; Hall & Howard, 2008). The following sections provide a detailed account of considerations around these principles and procedures for the thesis, presented in the order of research paradigm, research approach, research design, and research methods.

4.1 Research Paradigm and Research Approach

Research paradigm is defined as “a set of beliefs, values, and assumptions that a community of researchers has in common regarding the nature and conduct of research” (Johnson & Onwuegbuzie, 2004, p. 24). For social science researchers, the four mainstream research paradigms are postpositivism, constructivism, transformativism, and pragmatism (Wahyuni, 2012). Though remaining invisible in most research, it is useful for a researcher to clarify the preferred research paradigm early on to allow rational decisions about which research approach (i.e., qualitative, quantitative, or mixed methods) to follow (Creswell, 2013). According to Mertens (2010), the research paradigm embraced by a social science researcher is best reflected in his or her ontological, epistemological assumption. Table 4 lists the ontological and epistemological differences of these four research paradigms.
Table 4

*Differences Between Major Research Paradigms*

<table>
<thead>
<tr>
<th></th>
<th>Postpositivism</th>
<th>Interpretivism</th>
<th>Transformativism</th>
<th>Pragmatism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontological assumption</td>
<td>Single reality, independent</td>
<td>Multiple realities, constructed socially</td>
<td>Various realities based on social positioning</td>
<td>Coexistence of single and multiple realities</td>
</tr>
<tr>
<td>Epistemological assumption</td>
<td>Dispassionate, objective</td>
<td>Interactive</td>
<td>Interactive and political</td>
<td>Flexible</td>
</tr>
</tbody>
</table>

Given these different ontological and epistemological assumptions, the researcher clarifies that the research paradigm adopted for the current study is pragmatism (Creswell, 2013; Margolis, 2006).

Ontologically, pragmatism holds that a determinist and reductionist postpositivist singular worldview would diminish the understanding of individuality and that an interpretivist worldview of individuals’ own interpretations of reality would lead to the loss of generalisability of the research finding. Pragmatism endorses the importance of physical, social, and psychological worlds (Greene, 2007). Therefore, through the pragmatist ontological stance of a single objective reality independent of the human mind as well as socially constructed multi-realities, can the truth behind the complexity be truthfully unveiled.

Epistemologically, different from positivism or postpositivism’s doctrine of scientific realism and interpretationism’s rule of subjectivism, pragmatism emphasises the fluidity of truth, suggesting that knowledge is not static but dynamic under the influence the world’s individuals experience. Thus it adopts a flexible position by choosing whatever works in specific research contexts (Creswell, 2013).
In light of the discussion around research paradigms, a mixed methods research approach, which is defined as “an approach to inquiry that combines both qualitative and quantitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frameworks” (Creswell, 2013, p. 4), was deemed the most appropriate choice. Simple reliance upon a quantitative research approach may result in the misspecification of statistical models or the absence of in-depth and rich information, while excessive dependence upon a qualitative research approach may yield findings with limited reliability, validity, and generalisability (Silverman, 2006).

Furthermore, the aim of the thesis requires working with qualitative and quantitative research approaches in tandem so that comprehensive and in-depth insights into the complex social phenomenon under study can be achieved. Educational researchers (e.g., Creswell & Plano Clark, 2011) have long argued that by juxtaposing and analysing both quantitative and qualitative data, mixed methods research can be less vulnerable to errors, biases, and limitations caused by a single approach. As an important vein of social science research, qualitative research adds in-depth information to an emerging issue, enhancing the researcher’s understanding of the complexity of given situations and the multifaceted meanings attributed by individuals. Usually, these features are not readily captured in a structured, prespecified, and standardised quantitative survey, which can reveal underlying general trends and patterns (Miles, Huberman, & Saldaña, 2013). Therefore, mixed methods research can help generate new knowledge and perspectives about the complexity of a multifaceted world and relevant implications from the collected data (Yin, 2010).

Taking these reasons into consideration, a mixed methods approach was adopted. Specifically, in this research, a semi-structured interview in Phase 1 was conducted to complement the Phase-1 questionnaire survey testing and validate the proposed models.
drawn from prior theories. It was hoped that the research findings in Phase 1, be they corroborating, extending, or contradicting, could better inform the Phase-2 quantitative study and lead to a most comprehensive, up-to-date, and in-depth understanding of factors influencing mainland Chinese pre-service EFL teachers’ intention to use CALL 2.0 (L. R. Harris & Brown, 2010; Johnson & Onwuegbuzie, 2004; Johnson, Onwuegbuzie, & Turner, 2007).

4.2 Research Design and Research Methods

According to Wahyuni (2012), research design and research methods are defined as two distinctive concepts. Research design refers to “a model to conduct a research within the context of a particular paradigm” (p. 72), while research method stands for “a set of specific procedures, tools and techniques to gather and analyse data” (p. 73). In other words, research design functions as a bridge connecting research approach and research method.

Because of the flexibility of the mixed methods approach and its popularity among social science researchers in recent years, various models of mixed methods research designs have been proposed (Creswell & Plano Clark, 2011; Creswell, Plano Clark, Gutmann, & Hanson, 2003; Ivankova, Creswell, & Stick, 2006; Johnson & Onwuegbuzie, 2004; Johnson et al., 2007; Tashakkori & Teddlie, 2010). In the fashion of the notation system proposed by Morse (1991) for presenting different mixed methods research, quantitative and qualitative are abbreviated as *quan* and *qual* respectively. In the notation system, concurrent collection of quantitative and qualitative data is indicated by a + sign, and priority is differentiated by the font case (i.e., capitals indicate priority, lower case indicate subordination). In choosing a specific mixed methods design, besides the nature of the research question, three aspects should be taken into consideration: priority, implementation, and integration (Creswell &
Plano Clark, 2011; Creswell et al., 2003; Johnson & Onwuegbuzie, 2004). These three aspects result in different mixed methods research design (i.e., concurrent parallel, explanatory sequential, and exploratory sequential designs; Table 5). The concurrent parallel design collects qualitative and quantitative data simultaneously, and gives equal priority to both methods while mixing takes place in either the analysis or interpretive phases. The explanatory sequential design collects either quantitative or qualitative data first and uses data to shed insights on results generated by the other research method. The exploratory sequential design usually starts with the collection of qualitative data, from which possible theories or testable propositions are formulated. These are then evaluated with quantitative methods.

Table 5

Classification of Mixed Methods Research Design

<table>
<thead>
<tr>
<th>Implementation (Timing)</th>
<th>Concurrent (parallel)</th>
<th>Sequential (exploratory or explanatory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priority</td>
<td>QUAN + QUAL</td>
<td>QUAN —&gt; QUAL</td>
</tr>
<tr>
<td>(Weighting)</td>
<td>QUAL + QUAN</td>
<td>QUAL —&gt; QUAN</td>
</tr>
<tr>
<td></td>
<td>QUAN + qual</td>
<td>QUAN —&gt; qual</td>
</tr>
<tr>
<td></td>
<td>QUAL + quan</td>
<td>QUAL —&gt; quan</td>
</tr>
</tbody>
</table>

Note. qual = qualitative, quan = quantitative, + = concurrent, —> = sequential. Capitalised words denote priority, and lower case words indicate subordination.

Taking the three aspects into consideration, an explanatory sequential mixed methods design was adopted. This thesis reports a Phase-1 QUAN + qual study and a Phase-2 QUAN study. For the Phase-1 study, both quantitative and qualitative data were collected concurrently, analysed separately, and compared in a mixing stage to discover potential relationships across methods (Creswell, 2013; L. R. Harris & Brown, 2010). On the basis of Phase-1 findings, a
Phase-2 QUAN survey study was carried out to test interpretations developed in the Phase-1 findings.

After the separate analyses of Phase-1 and Phase-2 data, both findings were compared and integrated in the interpretation (see Figure 11).

Figure 11. The explanatory sequential mixed methods design for this thesis.

With regard to the specific data collection methods adopted for this two-phase study, a structured questionnaire survey and a semi-structured interview were employed to collect relevant data from the pre-service EFL teachers trained at a comprehensive university located in the central part of mainland China. In view of the practical problems in aligning quantitative and qualitative data in practice, guidelines recommended in Harris and Brown’s (2010) research were followed during the implementation. Moreover, the two types of data were analysed through structural equation modelling and content analysis respectively.

The following sections provide a detailed account of the explanatory sequential mixed methods design, including the research site, research instrument design, data collection procedure, data analysis techniques, and ethical consideration for this research.
4.3 Participants

4.3.1 Case study site. According to Ulriksen and Dadalauri (2016), “case studies can, if carefully selected, contribute to the testing and modification of solid theoretical frameworks undertaken through a rigorous research design that ensures substantial empirical leverage and constructive conclusions” (p. 223). Considering the explanatory sequential, theory-testing nature of the study, a university, which is located in the central part of mainland China, was selected as the case study site. There were multiple reasons for choosing this university. Firstly, the university has a long history and its EFL programme dates back to the early 20th century. Statistics from the foreign language school indicate that since 1956, more than ten thousand teachers of English have received training there. It is one of the major sources of EFL teachers for the local province. Currently, around 150 pre-service EFL teachers are enrolled annually into the EFL teacher-training programme through the national entrance examination for higher education (i.e., Gaokao; Y. Liu, 2013; Y. Wang & Ross, 2010).

The second consideration was its representativeness. Geographically, the university is located in central China, connecting the developed eastern China and the impoverished western China, which represent the two poles of economic and social development of mainland China (State Council, 2010b). Additionally, in terms of its ranking among mainland Chinese universities, the university is neither among the top universities listed in the Chinese government’s 211 or 985 projects (i.e., the Chinese government’s national-level endeavour to build world-renowned universities; (see Q. Wang & Cheng, 2014), nor among the low-ranked provincial, regional, or municipal universities. The university is ranked middle among mainland Chinese universities, and it is jointly sponsored by the Ministry of Education and the local provincial government. This is especially important in that a majority of pre-service EFL teachers in China are trained in middle-ranking universities (Ding & Sun, 2007).
Therefore, choosing this university as a research site suited the aim of the research, providing a glimpse of the “normal” or “average” mainland Chinese pre-service EFL teachers’ reasons for using or not using CALL 2.0.

Last, but not least, the researcher had worked as a lecturer at the university in the past, which guaranteed full support from the university. To avoid the risk of insider status which could potentially generate contaminated or biased results such as flattering or favourable responses (Costley, Elliott, & Gibbs, 2010), the researcher’s past working experience was not disclosed to the participants.

4.3.2 Sampling strategy. A convenience sampling strategy was adopted to recruit participants for the research even though this method is prone to producing inaccurate, unrepresentative, and biased data (Creswell, 2012). Self-selected participants result in potential biases because volunteers may differ in meaningful ways (e.g., motivation or interest) from those who decline to participate. However, under the ethical constraint of voluntary and informed participation, a convenience sampling strategy is necessary. Without a population frame from which to select or draw replacement samples, the field researcher was restricted to attempting to achieve a complete census of the target population. Furthermore, as suggested by Creswell (2013), the convenience sampling strategy can afford researchers a preliminary understanding of the problem under the research lens. In view of the purpose of the study—to provide a preliminary understanding of mainland Chinese pre-service EFL teacher’s acceptance of CALL 2.0—and the representativeness of the research site, a convenience sampling strategy was deemed appropriate for the research. Nonetheless, results were considered in the light of voluntary response rates, total sample size, and limitations in generalisation due to sampling from a single case site.
In Phase 1, 330 paper-and-pencil questionnaires were completed and returned (response rate = 55%), and 26 of 31 volunteers (response rate = 84%) participated in a follow-up interview. In Phase 2, 497 online questionnaires were completed (response rate = 83%).

4.4 Instruments

4.4.1 Phase-1 study questionnaire. In the Phase-1 quantitative study, a paper-and-pencil questionnaire survey was administered to produce a generalised idea of factors influencing mainland pre-service EFL teachers’ intention to use CALL 2.0. The questionnaire consisted of three parts.

Part 1 was demographic in nature, and was designed to collect some basic background information from these pre-service EFL teachers. Part 2 was designed to measure their familiarity with various CALL 2.0 practices. Part 3 contained the items for the seven constructs. Each of the seven latent constructs, which could not be measured directly, was measured through multiple indicators to ensure greater validity and reliability. Considering the advantage of using existing scales (Bourque & Clark, 1992), candidate items were drawn from prior studies and have been widely tested and verified in different contexts. Table 6 presents a list of the reliability and validity of these candidate items reported in prior studies.

Table 6

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Source</th>
<th>Sample size</th>
<th>Cronbach's alpha</th>
<th>Composite reliability</th>
<th>Average variance extracted</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPACK</td>
<td>Schmidt et al. (2009)</td>
<td>124</td>
<td>.92</td>
<td>.94</td>
<td>.65</td>
</tr>
<tr>
<td>Constructs</td>
<td>Source</td>
<td>Sample size</td>
<td>Cronbach's alpha</td>
<td>Composite reliability</td>
<td>Average variance extracted</td>
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<td>---------------------------</td>
</tr>
<tr>
<td>TSE</td>
<td>Tarhini, Hone, and Liu (2015)</td>
<td>1173</td>
<td>.84</td>
<td>.90</td>
<td>.76</td>
</tr>
<tr>
<td>SN</td>
<td>Terzis and Economides (2011)</td>
<td>173</td>
<td>.79</td>
<td>.87</td>
<td>.62</td>
</tr>
<tr>
<td>FC</td>
<td>Teo (2011a)</td>
<td>592</td>
<td>.93</td>
<td>.86</td>
<td>.79</td>
</tr>
<tr>
<td>PEU</td>
<td>Lay et al. (2013), D. Y. Lee and Lehto (2013)</td>
<td>719</td>
<td>.91</td>
<td>.89</td>
<td>.58</td>
</tr>
<tr>
<td>IU</td>
<td></td>
<td>432</td>
<td>.77</td>
<td>.87</td>
<td>.69</td>
</tr>
</tbody>
</table>

Note. TPACK = technological pedagogical and content knowledge; TSE = technology self-efficacy; SN = subjective norm; FC = facilitating conditions; PU= perceived usefulness; PEU= perceived ease of use; IU = intention to use technology.

After selection of candidate items, two experts with rich psychometric research experience judged, in face-to-face discussions, the relevance and overall quality of those items for content validity (Fraenkel, Wallen, & Hyun, 2012). Modifications, such as the layout, order of questions, the scale of the questionnaire, and so on, were made accordingly. This process yielded a 23-item questionnaire with one item for CALL 2.0 self-efficacy reverse coded.

4.4.2 Questionnaire rating scale. A six-point positively-packed rating scale (Lam & Klockars, 1982) was adopted to increase the variation and discrimination of the participants’ responses (Masino & Lam, 2014). The rating scale had four positive agreement response points and two negative response points indicating the participants’ agreement level for each statement. The scale responses were 1 = strongly disagree, 2 = disagree, 3 = slightly agree, 4 = moderately agree, 5 = mostly agree, and 6 = strongly agree. This type of response format
has been reported to be effective to combat the potential ceiling effect caused by participants’ inclination to agree with all statements (G. T. Brown, 2004).

4.4.3 Questionnaire translation. Harzing, Reiche, and Pudelko (2012) pointed out that “the choice of survey language should be primarily determined by respondents’ language proficiencies” (p. 121). In the current study, since the target participants ranged from Year 1 to Year 4 and possessed varying levels of English proficiency, a combined three-step (i.e., forward translation, review, and back translation) adaptation method (Hambleton, 1993; van de Vijver & Hambleton, 1996) was employed to produce a reliable Chinese version of the questionnaire. First, the author, who is fluent in both English and Chinese and has rich English–Chinese translation experience, translated the adapted questionnaire from the source language (English) to the target language (Chinese), creating Version 1.

Next, following the guidance of functional equivalence in Hambleton (1993), five Chinese PhD students of the University of Auckland, who had English–Chinese translation experience, were asked to review the quality of the forward translation by the researcher. The goal in this step was to identify possible inaccurate expressions/concepts in the forward translation and any discrepancies between the English version and the Chinese version. The reviewers were e-mailed a rating form (derived from Gable & Wolf, 1993), in which each part of the English questionnaire (e.g., introduction to the questionnaire, demographic information, and items) was separated and listed with its Chinese translation. Under each pair, a four-point rating scale (1 = Not close, 2 = Little bit close, 3 = Close, 4 = Very close) was provided. The reviewers were asked to evaluate the quality of the translation with similar guidelines of functional equivalence (see Appendix A). They could also leave their comments on the translation and usability in a text box under each item. The overall quality of the Version 1 translation was deemed close ($M = 3.05; SD = 0.44$). A meeting with all five
reviewers was held to discuss the quality of the Version 1 translation after each reviewer had submitted their ratings. Their suggestions were taken into consideration and generated some minor modifications (e.g., fixing typographic errors, ensuring consistency in translation of keywords, and adding instructions) to create Version 2.

Then, another certified translator, who was a PhD student in the Faculty of Arts at the University of Auckland and known to the researcher, was asked to do a back translation from Chinese to English for the Version 2 questionnaire. After that, a native speaker of English was asked to compare the original English Version 1 with the English version back translated from Version 2. The reviewer was asked to adhere to the guideline for semantic and conceptual equivalence by van de Vijver and Hambleton (1996) during this process. The comments from the native speaker indicated that semantic and conceptual equivalence was achieved in these two versions. The questionnaire was considered ready for the full-scale study. The final Chinese version questionnaire is shown in Appendix B.

4.4.2 Phase-1 study interview protocol. Following the Phase-1 survey, a semi-structured interview was conducted to explore, in depth, mainland Chinese pre-service EFL teachers’ intention to use CALL 2.0. To ensure the quality of a semi-structured interview, guidelines for how to develop high-quality interview questions such as using simple questions, rapport-building questions, and questions directly related to the interviewees’ experience (Berg, 2001), were strictly followed. Additionally, prior research on TAM and TPACK was consulted in the development of an interview protocol (Creswell, 2013). The interview protocol addressed several themes related specifically to potential factors influencing individuals’ intention to use technology: perceived ease of use, perceived usefulness, subjective norm, facilitating conditions, and technological pedagogical and content knowledge (see Appendix C). Altogether, four questions were formulated around the research
question. These four questions were then arranged in a way to progressively lead the participants into a full account of the variables of interest.

After design of the questions, they were shown to two PhD students who had prior interview experience. Their suggestions resulted in revisions to avoid potential problems caused by poor construction (e.g., affectively loaded questions, double-barrelled questions, and long complex questions). The revised interview questions were piloted with another Chinese PhD student with similar background knowledge; this indicated that the interview should take approximately 30 to 50 minutes. The pilot also resulted in further refinement of the research questions and sequencing of questions. Some exemplary questions used in the semi-structured interviews are listed below.

- Please describe your interaction with Web 2.0 applications (e.g., blogs, wikis, WeChat, Weibo, Facebook, YouTube, bookmarking tools, etc.).
- To what extent are you using the Web 2.0 applications to supplement your language learning?
- What motivates or hinders you from using Web 2.0 applications for language learning?
- What is your opinion of using CALL 2.0 in your future teaching career?

4.4.4 Phase-2 study questionnaire. In the Phase-2 quantitative study, on the basis of Phase-1 QUAN + qual study findings, the survey instrument used in Phase 1 was extended with more items relating to the facilitating conditions. These 15 items fell into two categories: ICT infrastructure and access to English-language Web 2.0 resources; Table 7 presents the newly developed items for facilitating conditions.

Table 7

New Items for Facilitating Conditions
<table>
<thead>
<tr>
<th>Item Code</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ICT infrastructure</strong></td>
<td></td>
</tr>
<tr>
<td>FC1_1</td>
<td>When I need help to use CALL 2.0, guidance is available to me.</td>
</tr>
<tr>
<td>FC1_2</td>
<td>When I need help to use CALL 2.0, specialised instruction is available to help me.</td>
</tr>
<tr>
<td>FC1_3</td>
<td>When I need help to use CALL 2.0, someone is available to help me.</td>
</tr>
<tr>
<td>FC1_4</td>
<td>Schools have the hardware needed to use CALL 2.0 in teaching English.</td>
</tr>
<tr>
<td>FC1_5</td>
<td>Schools have the software needed to use CALL 2.0 in teaching English.</td>
</tr>
<tr>
<td>FC1_6</td>
<td>Schools have the necessary peripheral equipment to use CALL 2.0 in teaching English.</td>
</tr>
<tr>
<td>FC1_7</td>
<td>Schools have the necessary Internet access to use CALL 2.0 in teaching English.</td>
</tr>
<tr>
<td>FC1_8</td>
<td>Schools allow me enough time to find and develop CALL 2.0 materials for teaching English.</td>
</tr>
<tr>
<td>FC1_9</td>
<td>Examination pressures get in the way of developing and using CALL 2.0 materials when teaching English.</td>
</tr>
<tr>
<td>FC1_10</td>
<td>School policy and resources allow me easy access to English-language CALL 2.0 resources.</td>
</tr>
</tbody>
</table>

**Access to English-medium Web 2.0 resources**

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC2_1</td>
<td>I am able to access English-language social networking sites/tools for CALL 2.0 in teaching English.</td>
</tr>
<tr>
<td>FC2_2</td>
<td>I am able to access English-language collaborative sites/tools for CALL 2.0 in teaching English.</td>
</tr>
<tr>
<td>FC2_3</td>
<td>I am able to access major English-language sharing websites/tools as part of CALL 2.0 in teaching English.</td>
</tr>
<tr>
<td>FC2_4</td>
<td>I am able to access major English-language search engines as part of CALL 2.0 in teaching English.</td>
</tr>
<tr>
<td>FC2_5</td>
<td>I am able to access major English-language educational sites/tools as part of CALL 2.0 in teaching English.</td>
</tr>
</tbody>
</table>

*Note. FC1 = facilitating conditions (ICT infrastructure); FC2 = facilitating conditions (access to English-medium CALL 2.0 resources).*
4.5 Data Collection Procedures

4.5.1 Phase 1. The data collection for the Phase-1 study was completed in Autumn 2014, the first semester of the academic year 2014-2015 in mainland China. After gaining consent from the head of school, teachers of the school were asked to arrange venues and time for the administration of the paper-and-pencil questionnaire survey. All pre-service EFL teachers enrolled in the EFL teacher-training programme were invited to participate in the questionnaire survey. Participants were briefed about the research via project information sheets (see Appendix D) on the purpose of the research, and informed of their right to not participate. Neither course credit nor penalty was incurred by a decision to participate in the survey or not. Participants were asked to indicate on the survey questionnaire if they were willing to participate in a follow-up interview. Foldable questionnaires were returned to their teachers without showing the completion status. Later, the returned questionnaires were handed to the researcher who remained in an office to assist with any queries or issues.

Two weeks after the questionnaire survey, participants who indicated their willingness for follow-up interviews were contacted through multiple means such as e-mails, phone calls, and text messages (SMS) to arrange time for the face-to-face semi-structured interview. Finally, 26 interviewees participated in an interview, which took place in a private, mutually agreed-upon location (i.e., participants’ choice of place or confidential office space arranged by the researcher) so that confidentiality could be maintained. This sample size fell into the range of adequate sample size for a qualitative study, recommended by Mason (2010). Informed consent was obtained in writing from each participant before the interview began. Interviews were digitally recorded with participants’ consent, and participants were assured that they had the right to withdraw their data within two weeks after the interview. Interviews varied from 30 to 45 minutes, in accordance with the pilot process. All interviews were
conducted by the researcher in Chinese. Throughout the interview, the guidelines recommended by Yin (2010), including being nondirective, maintaining rapport, being an engaged listener, and staying neutral, were followed.

4.5.2 Phase 2. In spring 2016, the pre-service EFL teachers at the same university were contacted through a Chinese social networking smartphone app—WeChat. The message was sent by an administrative staff member, who had access to the public WeChat discussion groups set up by the school administration for notification and discussion purposes. The message sent through WeChat directed recipients to an online questionnaire survey hosted by Wenjuan.com, which is an online survey platform in mainland China. This arrangement was feasible because of the high penetration of smartphones and online applications among mainland Chinese, especially university-age students (CNNIC, 2016).

Due to the unique Internet environment in mainland China (e.g., difficulties in accessing URLs hosted outside China), the use of non-mainland China online survey tools may be unreliable. Before choosing Wenjuan.com, a simultaneous test of the accessibility to Qualtrics, an online survey platform, in three major cities in mainland China (Beijing, Kaifeng, and Shenzhen) revealed that although the survey site itself was accessible, the loading speed was quite slow, which would adversely affect users’ experience with the survey and negatively impact on survey completion. Hence, it was decided to use Wenjuan as the platform to carry out the online survey.

The participation information sheet was presented at the beginning of the Phase-2 questionnaire. The time taken to complete the survey ranged from 8 to 15 minutes. As the survey was carried out just after the Chinese New Year–Spring Festival, each participant who completed the questionnaire survey received a WeChat “red envelope” of 5 Chinese Yuan (5 CNY ≈ 1 NZD) as compensation. Red envelopes are traditionally distributed at Chinese New
Year to young people and WeChat provides a digital red envelope system to deliver WeChat credit as an indicator of cheerful generosity associated with actual red envelope giving.

4.6 Quantitative Data Analysis

4.6.1 Overview of structural equation modelling. All survey data were analysed using structural equation modelling. As a versatile multivariate analysis technique, structural equation modelling (SEM) has become the norm for analysis of complex quantitative data (Bollen, 1989; Hoyle, 2012; Kline, 2010). SEM extends General Linear Modelling techniques such as analysis of variance, path analysis, factor analysis, and multiple regression analysis (Lei & Wu, 2012). It has been acknowledged as the most robust multivariate analysis technique for testing hypothesised relationships among latent variables measured by multiple indicator items (Hair, Black, Babin, Anderson, & Tatham, 2006). To sum up, SEM affords social science researchers a powerful tool to detect their hypothesised theoretical relationships, provided these can be expressed in linear terms.

SEM incorporates the concept of observed or manifest variables and latent variables. This is particularly useful in educational research, where many, if not most, of the key constructs involved are understood as latent or implicit causal variables that cannot be directly measured and are mostly assumed to be explained by responses to multiple observable indicator items (Borsboom, 2005). While conventional GLM techniques usually ignore ubiquitous measurement errors, SEM directly accommodates measurement errors in the estimation of a series of relationships and tests for model fit. SEM takes a confirmatory approach to analysing data in which a priori theoretical models about relationships among manifest and latent variables are specified and then tested for fit to the data under scrutiny.
The basic rationale is that if the hypothesised model is correct, the deviation of the covariance matrix generated by the hypothesised model from the obtained sample covariance matrix should be within chance. In other words, SEM, based on the covariance matrix, intends “to understand patterns of correlations among a set of variables and to explain as much of their variances” (Kline, 1998, pp. 10–11). Therefore, SEM allows researchers to test models containing complex relationships and various data types (e.g., categorical, ordinal, and continuous), compare alternative models, and test whether models are invariant between times or groups and whether mean differences in latent variables are statistically significant. A complete SEM model can be specified either by mathematical equations or by a visual portrayal. Figure 12 presents a schematic visual portrayal of SEM.

Figure 12. Schematic presentation of SEM.
The notation system used in Figure 12 follows the symbolic terminologies for LISREL, a statistical software specifically developed for SEM. Within this system, a double headed arrow indicates correlation, a single headed arrow stands for regression, an oval represents a latent variable such as a latent factor (ξ or η), a measurement error (δ or ε), or a latent factor residual (ζ), and a rectangle symbolises manifest indicator items (x or y). Moreover, latent factors are further classified as latent exogenous factors (ξ), which are under no influence from other latent factors, and latent endogenous factors (η), which are under influence from other latent factors. Further information can be found in Appendix E.

The following section covers several fundamentals for conducting SEM analysis, which include sample size, estimation methods, model fit indices, and model specification procedures. All statistical procedures for the current research were conducted with Amos 21 (Arbuckle, 2012) with maximum likelihood (ML) estimation.

4.6.2 Sample size requirement. For any statistical analysis, large sample sizes (i.e., \( N > 500 \)) are fundamental in ensuring adequate power and determining whether the model reflects the true relationships within the sample data. This is especially true for SEM, for parameters estimated through SEM are based upon sample covariance matrix rather than individual observations (Bollen, 1989). Therefore, with a small sample size (e.g., \( N < 100 \)), the probability of getting an inadmissible solution by chance increases. However, if other favourable conditions are present such as the model itself is simple or the residual variance is small, even a small sample size (e.g., \( N = 50 \)) may be adequate (Wolf, Harrington, Clark, & Miller, 2013). Clearly, large sample sizes require more time and cost more to obtain. Hence, there exists no agreed-upon sample size for SEM, but it is generally agreed that models based on smaller sample sizes are more prone to inadmissibility (Boomsma & Hoogland, 2001).
In practice, four rules of thumb with regard to sample size are frequently cited. The first rule of thumb is the rule of 10 by Nunnally (1967), which requires that at least 10 observations should be guaranteed for each indicator. Another similar rule of thumb is the ratio of sample size to freely estimated parameters should be at least 5 (Bentler, 1989). The third is the minimum sample size requirement. With regard to this rule of thumb, different researchers have given different minimum sample size requirements ranging from 50 to 500 (de Winter & Dodou, 2012; de Winter, Dodou, & Wieringa, 2009; Gagne & Hancock, 2006; MacCallum, Widaman, Zhang, & Hong, 1999; Mundfrom, Shaw, & Ke, 2005; Velicer & Fava, 1998). The last approach to sample size emphasises the achievement of sufficient statistical power (i.e., \(1-\beta \geq .80\); Fabrigar, Porter, & Norris, 2010).

In this research, the minimum sample size requirement was determined on the basis of statistical power consideration. Using the computation tool developed by Soper (2015), with an anticipated effect size of \(d = .20\), statistical power (1-\(\beta\)) level set as .80, and probability set as .05, the minimum sample size was calculated as \(N = 180\).

### 4.6.3 Estimation method choice.

A number of methods can be used to estimate the many free parameters in an SEM study. Appendix E provides a list of the commonly used notations for parameters in SEM. The basis for SEM analyses is the sample covariance matrix derived from the observed variables. Within a hypothesised research model, each indicator item can be written as a function of freely estimated parameters (factor loadings) in relation to an latent exogenous or endogenous factor in the model, which describes measurement relations among them, and can be represented in the following measurement model equations (Bollen, 1989).

\[
\begin{align*}
    x &= \Lambda_x \xi + \delta \\
    y &= \Lambda_y \eta + \epsilon
\end{align*}
\]
Formula 1 relates manifest indicator items \((x)\) to latent exogenous factors \((\xi)\), while Formula 2 connects manifest indicator items \((y)\) to latent endogenous factors \((\eta)\).

Latent variables can also be formulated as functions of freely estimated parameters (path coefficients) in relation to other latent variables, which describe structural relations among the latent variables, and can be represented by the structural equation below (Bollen, 1989).

\[
\eta = B\eta + \Gamma \xi + \zeta \quad (3)
\]

Formula 3 specifies the relations between latent exogenous variables \((\xi)\) and latent endogenous variables \((\eta)\).

The goal of these three equations is to derive values for the freely estimated parameters so as to minimise the discrepancy between the vector of elements in sample covariance matrix \((S)\) and that of the reproduced one \((\Sigma(\theta))\). Because a priori specified research model is usually over identified, more equations than freely estimated parameters would be achieved through the operation of covariance algebra, meaning no closed form solution is available. To deal with this situation, different estimation methods have been proposed, aiming to obtain an identified solution when certain estimation criteria are met.

Multiple estimation methods can be grouped as (a) the ML family, (b) the least squares family, or (c) the Bayesian method family (Lei & Wu, 2012). Estimators from these families all come with desirable properties and disadvantages, and apply to different situations. Among these choices, the ML function popularised by Jöreskog (1977) remains the most widely used estimator to date, and functions as the “motor of SEM” (Kline, 2010, p. 12). Below is the fit function for ML (Bollen, 1989).

\[
F_{ML} = \log |\Sigma(\theta)| + \text{tr}(S \Sigma^{-1}(\theta)) - \log|S| - (p + q) \quad (4)
\]
In Formula 4, $S$ and $\Sigma(\theta)$ refer to the sample covariance matrix and reproduced matrix respectively, $\log$ and $\text{tr}$ stand for natural logarithm function and trace function respectively, and $p + q$ is the total number of items. Through this function, iterative computations can be conducted in SEM software to derive consistent parameter estimates, maximising the likelihood that the data are drawn from a certain population. Considering its ability to produce “asymptotically unbiased, efficient and consistent” (Kline, 2010, p. 155) estimates for large samples and its compatibility with the adopted 6-point ordinal response scale (Finney & DiStefano, 2006), ML was chosen as the estimator in this study.

4.6.4 Model fit indices. With parameters being estimated, the overall model fit of the research model can be checked by gauging the discrepancy between the reproduced covariance matrix and the sample covariance matrix. An over identified model will always result in some discrepancies (Kline, 2010). With a large sample size as a prerequisite and parsimony as a goal for most SEM studies, multiple fit indices have been proposed to help ascertain the overall model fit from different perspectives. The classic measure of discrepancy is the chi-square ($\chi^2$) test which determines the difference between the expected (the actual data covariance matrix) and the observed (the model obtained covariance matrix). However, the $\chi^2$ statistic is notoriously sensitive in the presence of large number of parameters to be estimated or large sample sizes (Bentler, 2007). Normed chi-square is widely used to remedy the problem for chi-square difference test caused by large number of parameters to be estimated or large sample sizes (Kline, 2010). In the light of Marsh, Hau, and Wen’s (2004) discussion on the $\chi^2/df$ ratio value, ratios of 3.80 or less will yield a $p$ value larger than .05.

In view of the shortcoming of the $\chi^2$ statistic, alternative fit indices have been developed to overcome this weakness and the industry-accepted convention is to report...
multiple indices (Fan & Sivo, 2005, 2007; L.-t. Hu & Bentler, 1998). Root mean square error of approximation (RMSEA) estimates the amount of error of approximation per model degree of freedom and takes the overall sample size into consideration. Gamma hat copes with the problem associated with $\chi^2$ statistic by including sample size and model complexity in its computation (Fan & Sivo, 2007; Steiger, 1989). Standardised root mean square residual (SRMR) checks the standardised difference between the sample correlation matrix and the reproduced correlation matrix. Comparative fit index (CFI) assesses the relative improvement in fit of the proposed research model against a baseline model, in which all observed indicators are uncorrelated (Byrne, 2001). It can also be viewed as the discrepancy ratio between the tested model and the baseline model. As a normed value, CFI ranges from 0 to 1, with a higher value indicating good fit (Kline, 2010).

Another complication is that not all fit indices are stable across different model conditions. For example, the CFI rewards simple models (i.e., three or fewer factors), while the RMSEA rewards complex models (i.e., more than three factors; Fan & Sivo, 2007), meaning that more stable indices (i.e., standardised root mean residual, gamma hat) need to be given greater weight. Absolute fit indices that directly measure how well the research model reproduces the observed data (e.g., gamma hat, SRMR, and RMSEA) are superior to incremental fit indices (e.g., TLI and CFI) that only compare the research model with an alternative baseline model rather than the data itself (L.-t. Hu & Bentler, 1998).

Given the discussion above, the model fit indexes and cut-off criteria used in this study are listed below.

- A normed chi-square value that has a $p$ value higher than .05 would indicate acceptable fit to sample data (Courtney, 2014).
• Maccallum, Browne, and Sugawara (1996) suggested the RMSEA values of .01, .05, and .08 indicate excellent, good, and acceptable model fit respectively.

• L.-t. Hu and Bentler (1998) suggested that a gamma hat value above .90 shows acceptable fit, while a value of above .95 indicates good fit.

• According to L.-t. Hu and Bentler (1998), a value of SRMR close to .06 is generally considered a sign of good fit.

• As a rule of thumb, a CFI value greater than roughly .90 would indicate reasonably good fit (L.-t. Hu & Bentler, 1998).

4.6.4.1 Deciding between models. Multiple models can fit the covariance matrix of the sample data. For example, a path specified between two latent factors as a correlation will fit acceptably to the data in the same way as if the path were specified as a regression. Hence, methods are needed to compare models to determine whether one of many has closer fit to the data. A number of approaches to evaluating fit indices have also been proposed to address this potential threat.

The chi-square difference test is used to test the differences between nested models. Nested models involve models that are structurally identical except for minor changes (e.g., the removal of a manifest item from a factor or the deletion of a structural path). The $\chi^2$ value with its degree of freedom of a baseline model is subtracted from those of an alternative model. Then the remaining $\chi^2$ difference can be tested for statistical significance given the remaining degrees of freedom, with values having $p < .05$ indicating that the compared models do not fit equally well to the data. In such cases, the smaller $\chi^2$ value is preferred.

When models are not nested (i.e., they have quite different factors or relationships among items and/or factors), the Akaike information criterion (AIC) can be used to choose a better fitting model. As a rule of thumb, among a set of competing non-hierarchical models,
the model with the smallest AIC is preferred (Kline, 2010). Since a difference value less than 2.00 would suggest the models are equivalent (Burnham & Anderson, 2004), when models cannot be distinguished statistically, the more parsimonious model with fewer paths should be preferred (Kline, 2010).

4.6.5 Measurement model and structural model tests. A two-step SEM analysis (J. C. Anderson & Gerbing, 1988) was performed to test the proposed models in the study (see Figure 13 for details of the procedure).

In Step 1, a measurement model of the inter-correlated latent constructs with their corresponding items should be first examined to establish the convergent and divergent validity of the factors (Fornell & Larcker, 1981). Convergent validity examines whether the items for a corresponding factor properly group around that factor. It is conventionally deemed established if all factor loadings of the factor are ≥ .70 and the average variance extracted (AVE) of that factor is ≥ .50 (Hair, Black, Babin, & Anderson, 2010). Discriminant validity has to do with the establishment of a simple structure so that items for a corresponding factor have zero or low loadings on other factors. When the square root of the AVE (\(\sqrt{\text{AVE}}\)) of the factor is greater than its inter-factor correlations with other factors in the measurement model, it can be assumed that the factor diverges from other factors (Fornell & Larcker, 1981). Under these conditions, it is reasonably assured that the measurement model has good fit to the data. Nonetheless, it is also possible to have acceptable fit to the data covariance matrix if a small number of items have loadings as low as .30 (Bandalos & Finney, 2010).
In Step 2, following establishment of the measurement model, the hypothesised relationships among factors are then tested in a structural equation model. The second step involves examining the relationship between latent factors which have adequate fit in the measurement model. For example, two factors which are well measured may be correlated or have a causal
relationship, in which one factor causes the second one to vary. While purely empirical examination of correlations among factors can lead to a model, theoretically meaningful explanations for the model must be available. Thus, though a well-fitting model may be achieved, it is not sufficient to establish the validity of a model (Kline, 2010).

For example, in the Phase-1 SEM study, the relationship between the newly added construct TPACK and the other TAM constructs was examined. A meaningful approach to investigating construct relationships is the systematic testing of alternative models to avoid potential confirmation bias. Six additional alternative models were proposed with varying levels of mediation through PEU and PU between TPACK and IU. These alternative models were further tested and compared for the best candidate. Selection of model followed the recommendations discussed in Section 4.6.4.1.

4.6.6 Measurement invariance. As a versatile statistical technique, SEM also affords researchers the opportunity to investigate measurement invariance, which determines whether model parameters differ by more than chance when tested with a second set of data (e.g., a different group or a different time; Kline, 2010). In view of the importance of reliability and validity of research instruments, a test of measurement invariance has been increasingly recommended (G. T. Brown, Harris, O'Quin, & Lane, 2015).

Following Kline’s (2010) guidelines, measurement invariance in this research was checked through sequential tests of configural invariance (the same factorial configuration across groups), metric invariance (the same factor loadings across groups), and scalar invariance (the same item intercepts across groups).

If the models are statistically equivalent across groups in configural invariance tests, it can be assumed that the same factorial structure holds across groups, that is, there exist the same factors and paths across groups. If the models are statistically equivalent across groups
in metric invariance tests, it can be assumed that the same strengths of the relations between factors and specific items exist across groups. In other words, the regression slope values differ only by chance between the two groups. If the models are statistically equivalent across groups in scalar invariance tests, it can be assumed that the start values for each item within each factor are equivalent across groups. This means that participants have responded to the instrument in statistically equivalent ways, even if their mean level of responding has changed. It also means that the two groups can be considered for further latent mean comparison (Wu, Li, & Zumbo, 2007).

According to Cheung and Rensvold (2002), metric and scalar invariances are essential prerequisites before comparisons across group or time are made. Measurement invariance is determined via comparisons of fit indices between these hierarchically constrained models, with changes in fit within chance suggesting the presence of invariance between groups.

Specifically, RMSEA ≤ .05 was used to detect the presence of configural invariance, and a difference in CFI greater than .01 (ΔCFI > .01) was adopted to determine whether there was a significant drop in fit between models in the sequential tests (Cheung & Rensvold, 2002).

4.7 Qualitative Data Analysis

Denscombe (2007) suggested that after qualitative data have been collected, researchers’ familiarity with the data is of key importance to qualitative data analysis. This usually involves the examination and re-examination of textual, photographic, audio, or video data.

All interviews were verbatim transcribed by the author. This process allowed the author to become intensely familiar with the details of participants’ comments. After the transcription was done, all transcripts were imported into NVivo 10 (2012), a data
management system for qualitative analysis. In view of the goal of the study, directed content analysis was employed to analyse the transcripts (Hsieh & Shannon, 2005). According to Hsieh and Shannon (2005), directed content analysis is a deductive method that uses prior categories to organise and group the data in order to validate and extend existing theory. Therefore, an initial code template was developed on the basis of the proposed research model. The seven broad categories were included to the code template (see Appendix F). The coding process involved segmenting text passages and labelling them with these codes. The units of coding were linguistic segments ranging from a phrase or clause to multiple paragraphs. During this process, similar codes were coded into the pre-determined categories. Those that could not be directly coded into one of the seven major categories were coded with new labels. After the preliminary coding, the researcher checked the data carefully to determine whether subcategories should be added. After coding all the transcripts, each category was re-examined to check the common patterns and their frequencies of expression.

With regard to the language issue, because all interviews were conducted in Chinese, both the transcription and analysis were carried out in the source language to minimise any loss of meaning during the analysis phase that could have occurred if the data were translated into English. However, after the analysis in Chinese, quotes from the interviews were translated into English for the purposes of discussion and presentation. The translation of these transcript excerpts was completed in the same procedure as described in Section 4.4.3.

4.8 Ethical Considerations

Ary, Jacobs, Razavieh, and Sorensen (2010) pointed out that “strict adherence to ethical standards in planning and conducting both qualitative and quantitative [educational] research is most important” (p. 590). Ethics application for the research was submitted to the
University of Auckland Human Participants Ethics Committee for approval. The major ethical issues involved in this research were informed consent, data-related issues, privacy (confidentiality and anonymity), and participants’ right to withdraw. Further details related to the related ethical topics in the research are outlined below.

4.8.1 Consent form. In order to avoid coercion in recruitment, the researcher initially contacted the head of the School of Foreign Languages through e-mail, with the Project Information Sheet and Consent Form (Appendix G) attached. In the Project Information Sheet, the objective of the study, the time commitment, participation requirement, and the obligations of both the participants and the researcher were clearly described.

After the signed consent form was returned by the Dean, the researcher then met staff at a faculty meeting, which was arranged by the school, to explain the research and ask the teaching staff to circulate the invitation. Pre-service EFL teachers who were interested could obtain questionnaires from their teachers and return completed anonymous questionnaires with their contact information if they were willing to participate in a follow-up interview. Two weeks later, after the questionnaire survey, the researcher then contacted participants for the follow-up interview.

4.8.2 Data storage/retention/destruction/future use. Hard copy data (consent forms, questionnaires and transcripts) were securely stored in a locked cabinet at the University of Auckland and electronic data were stored in encrypted files on the researcher’s computer, which was password protected, at the School of Learning, Development and Professional Practice, Faculty of Education and Social Work, The University of Auckland, with only the researcher and his supervisors having access to these files. The data is to be destroyed after a period of six years. This will be done by shredding/deleting according to whether the data has
been stored as electronic or hard copy. The data collected from the research may be used for the author’s PhD thesis in the University of Auckland, academic publications, and conference presentations. All these purposes were communicated in the consent form. If a participant wished to have a copy of the research findings, and indicated this intention on the signed consent form, it was sent to them at the end of the study.

4.8.3 Privacy (anonymity and confidentiality). To ensure the participants’ anonymity, the participants’ names were not asked as part of the survey. All the information obtained for the thesis was kept confidential and available only to the researcher and his supervisors.

4.8.4 Rights to withdraw. For the two questionnaire surveys, participants had the right to withdraw at any time, without being asked the reason, before returning the completed questionnaire. With regard to the interview, participants were assured of the right to withdraw at any time or not to answer any specific question during the interview. All participants were given full assurance that participation or non-participation would not affect their normal courses, grades, or relationship with their teachers.

4.8.5 Power relations. Power refers to “the possession of control, authority or influence over others” (Avison, Baskerville, & Myers, 2007, p. 20). In research, it may cause biased despondence from the participants in the case of power struggles arising. Considering this potential threat, the researcher’s past working experience at this particular university was not disclosed to the participants. Furthermore, in the information sheets prepared for the pre-service EFL teachers (Appendix D), participants were informed of the purpose of the research and guaranteed that their participation would neither incur awards nor punishments.
Chapter 5 Phase-1 Study

This chapter presents the data analysis procedures and results of the Phase-1 study, which consists of a questionnaire survey and a concurrent semi-structured interview. In the next two major sections, details including demographic information of the sample, relevant data analysis procedures, and results of the survey study and the interview study are presented accordingly.

5.1 Survey Study

5.1.1 Demographics of the questionnaire survey participants. A total of 331 pre-service EFL teachers enrolled in the EFL teacher-training programme participated in the Phase-1 paper-and-pencil questionnaire survey. However, considering the ML estimation method’s incompatibility with missing value (Kline, 2010) and the insignificant difference suggested by Little’s (1988) missing completely at random (MCAR) test, a list-wise deletion was performed after the data input. This resulted in a final sample of 295 participants.

Among them, 27 were male (9%) and 268 were female (91%). This was not a surprising result, due to the historical tradition in mainland China of more female students choosing EFL teaching as their major for their future career (Research Team of National Teacher Education Institution Surveys, 2014). Among the final sample, 106 were from Year 1 (36%); 98 from Year 2 (33%); 67 from Year 3 (23%); and 24 from Year 4 (8%). The small number of Year 4 students was due to the fact that most of them were on practicum when the questionnaire survey was carried out. Demographics of the participants are summarised in Table 8.
Table 8

Demographic Information about the Participants in Phase 1 Study (N = 295)

<table>
<thead>
<tr>
<th>Year of Study</th>
<th>Gender</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>SD</td>
</tr>
<tr>
<td>Year 1</td>
<td>9</td>
<td>19.71</td>
</tr>
<tr>
<td>Year 2</td>
<td>7</td>
<td>20.88</td>
</tr>
<tr>
<td>Year 3</td>
<td>10</td>
<td>21.94</td>
</tr>
<tr>
<td>Year 4</td>
<td>1</td>
<td>23.00</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
<td>20.87</td>
</tr>
</tbody>
</table>

The average responses to the questions about their familiarity with CALL 2.0 practices (Note: 1 = very unfamiliar, 2 = unfamiliar, 3 = neutral, 4 = familiar, 5 = very familiar) suggested that these participants were generally familiar to very familiar with online learning tools, social networking sites, and instant messenger. Closer to neutral familiarity was found for wiki, MOOC, and blogs, while low familiarity was reported for file-sharing services and knowledge management tools, as is shown in Table 9.

Table 9

Pre-Service EFL Teachers’ Familiarity with CALL 2.0

<table>
<thead>
<tr>
<th>CALL 2.0 practices</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online learning tools (e.g., online dictionary, Prezi)</td>
<td>4.42</td>
<td>0.72</td>
</tr>
<tr>
<td>Social networking sites (e.g., Weibo)</td>
<td>4.33</td>
<td>0.72</td>
</tr>
<tr>
<td>Instant messenger (e.g., WeChat)</td>
<td>3.82</td>
<td>0.90</td>
</tr>
<tr>
<td>Wiki (e.g., Wikipedia)</td>
<td>3.59</td>
<td>1.02</td>
</tr>
<tr>
<td>Massive online open courseware (e.g., Coursera)</td>
<td>3.08</td>
<td>1.01</td>
</tr>
<tr>
<td>Blog (e.g., Sina)</td>
<td>3.02</td>
<td>1.07</td>
</tr>
<tr>
<td>File-sharing services (e.g., Baiduyunpan)</td>
<td>2.64</td>
<td>1.09</td>
</tr>
<tr>
<td>Knowledge management tools (e.g., Zotera, Evernote)</td>
<td>1.92</td>
<td>0.92</td>
</tr>
</tbody>
</table>
Students self-reported owning a high number of digital devices, with nearly universal possession of smartphones. Computer ownership was more moderate, with more desktop computers than laptop computers and tablet computers, as is shown in Table 10.

Table 10

*Self-Reported Ownership of Digital Devices*

<table>
<thead>
<tr>
<th>Year of study</th>
<th>Smartphones</th>
<th>Desktop computers</th>
<th>Laptop computers</th>
<th>Tablet computers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>99</td>
<td>50</td>
<td>21</td>
<td>10</td>
<td>180</td>
</tr>
<tr>
<td>Year 2</td>
<td>94</td>
<td>76</td>
<td>33</td>
<td>20</td>
<td>223</td>
</tr>
<tr>
<td>Year 3</td>
<td>63</td>
<td>55</td>
<td>52</td>
<td>35</td>
<td>205</td>
</tr>
<tr>
<td>Year 4</td>
<td>22</td>
<td>22</td>
<td>10</td>
<td>18</td>
<td>72</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>278 (94%)</td>
<td>203 (69%)</td>
<td>116 (39%)</td>
<td>83 (28%)</td>
<td></td>
</tr>
</tbody>
</table>

5.1.2 **Statistical analysis.** The statistical analyses presented in this section include examining the descriptive statistics of the items, assessing the measurement model, and testing alternative structural models in order to identify the model with the most empirical plausibility.

5.1.2.1 **Descriptive statistics.** Descriptive statistics for the questionnaire items are presented in Table 11. All means were above 2.75, ranging from 2.75 to 4.26 (Note: 1 = *strongly disagree*, 2 = *mostly disagree*, 3 = *slightly agree*, 4 = *moderately agree*, 5 = *mostly agree*, and 6 = *strongly agree*). The standard deviations ranged from 0.95 to 1.25, which indicated a large spread around the mean.

The inspection of the univariate normality of these items showed that univariate skew and kurtosis indices were from -0.84 to 0.54 and -0.62 to 0.65 respectively, well below the
cut-off values of [3.00] for skewness and [8.00] for kurtosis suggested by Kline (2010). Hence, the variables were deemed sufficiently normal for the next-step analysis.

Table 11

Descriptive Statistics for the Questionnaire Items

<table>
<thead>
<tr>
<th>Code</th>
<th>Items</th>
<th>M</th>
<th>SD</th>
<th>Skew</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU</td>
<td>Using CALL 2.0 will enhance my teaching effectiveness.</td>
<td>4.26</td>
<td>0.95</td>
<td>0.33</td>
<td>-0.60</td>
</tr>
<tr>
<td>PU</td>
<td>Using CALL 2.0 will increase my productivity in teaching.</td>
<td>4.16</td>
<td>0.97</td>
<td>0.20</td>
<td>-0.39</td>
</tr>
<tr>
<td>PU</td>
<td>Using CALL 2.0 will be useful for my teaching.</td>
<td>4.10</td>
<td>1.04</td>
<td>0.20</td>
<td>-0.62</td>
</tr>
<tr>
<td>PEU</td>
<td>Learning to use CALL 2.0 in teaching will be easy.</td>
<td>3.25</td>
<td>1.25</td>
<td>0.25</td>
<td>-0.36</td>
</tr>
<tr>
<td>PEU</td>
<td>It will be easy to get CALL 2.0 to carry out my teaching plan.</td>
<td>3.64</td>
<td>0.98</td>
<td>0.34</td>
<td>0.07</td>
</tr>
<tr>
<td>PEU</td>
<td>Using CALL 2.0 in teaching will be clear and understandable.</td>
<td>3.10</td>
<td>1.05</td>
<td>0.47</td>
<td>0.11</td>
</tr>
<tr>
<td>CSE</td>
<td>I would feel nervous using CALL 2.0. (R)</td>
<td>2.75</td>
<td>1.11</td>
<td>0.45</td>
<td>-0.18</td>
</tr>
<tr>
<td>CSE</td>
<td>I know enough to use CALL 2.0 technologies.</td>
<td>3.11</td>
<td>1.06</td>
<td>0.35</td>
<td>0.04</td>
</tr>
<tr>
<td>CSE</td>
<td>I could easily use CALL 2.0 technologies on my own.</td>
<td>3.30</td>
<td>0.97</td>
<td>-0.84</td>
<td>0.66</td>
</tr>
<tr>
<td>TPACK</td>
<td>I can teach lessons that appropriately combine content, CALL 2.0, and teaching approaches.</td>
<td>3.41</td>
<td>1.12</td>
<td>0.19</td>
<td>-0.10</td>
</tr>
<tr>
<td>TPACK</td>
<td>I can select CALL 2.0 applications to use in my classroom that enhance what I teach, how I teach, and what students learn.</td>
<td>3.39</td>
<td>1.07</td>
<td>0.13</td>
<td>-0.10</td>
</tr>
<tr>
<td>TPACK</td>
<td>I can use strategies that combine content knowledge, CALL 2.0, and teaching approaches that I learned about in my coursework in my classroom.</td>
<td>3.38</td>
<td>1.07</td>
<td>0.20</td>
<td>0.08</td>
</tr>
<tr>
<td>TPACK</td>
<td>I can provide leadership in helping others to coordinate the use of content, CALL 2.0 applications, and teaching approaches at my school.</td>
<td>3.36</td>
<td>1.06</td>
<td>0.20</td>
<td>-0.01</td>
</tr>
<tr>
<td>Code</td>
<td>Items</td>
<td>M</td>
<td>SD</td>
<td>Skew</td>
<td>Kurtosis</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------------------</td>
<td>-------</td>
<td>-----</td>
<td>-------</td>
<td>----------</td>
</tr>
<tr>
<td>TPACK5</td>
<td>I can choose CALL 2.0 applications that enhance the content for a lesson.</td>
<td>3.55</td>
<td>1.07</td>
<td>0.04</td>
<td>-0.03</td>
</tr>
<tr>
<td>SN scale (α = .89)</td>
<td>People whose opinions I value will encourage me to use CALL 2.0 in teaching.</td>
<td>3.37</td>
<td>1.07</td>
<td>0.13</td>
<td>0.05</td>
</tr>
<tr>
<td>SN1</td>
<td>People who influence my behaviour think that I should use CALL 2.0 in teaching.</td>
<td>3.32</td>
<td>1.08</td>
<td>0.19</td>
<td>-0.02</td>
</tr>
<tr>
<td>SN2</td>
<td>People expect me to use CALL 2.0.</td>
<td>3.49</td>
<td>0.99</td>
<td>0.10</td>
<td>-0.02</td>
</tr>
<tr>
<td>FC scale (α = .79)</td>
<td>When I need help to learn to use CALL 2.0, someone will be there to teach me.</td>
<td>3.52</td>
<td>1.10</td>
<td>0.36</td>
<td>-0.07</td>
</tr>
<tr>
<td>FC1</td>
<td>When I encounter difficulties in using CALL 2.0 in my future teaching, I will know from whom I can seek advice.</td>
<td>3.55</td>
<td>1.14</td>
<td>0.05</td>
<td>-0.41</td>
</tr>
<tr>
<td>FC2</td>
<td>I will have the resources necessary to teach with CALL 2.0.</td>
<td>2.99</td>
<td>1.22</td>
<td>0.54</td>
<td>0.01</td>
</tr>
<tr>
<td>IU scale (α = .90)</td>
<td>I will use CALL 2.0 in the future.</td>
<td>4.02</td>
<td>1.00</td>
<td>0.18</td>
<td>-0.25</td>
</tr>
<tr>
<td>IU1</td>
<td>I plan to use CALL 2.0 often.</td>
<td>3.73</td>
<td>1.10</td>
<td>0.23</td>
<td>-0.33</td>
</tr>
<tr>
<td>IU2</td>
<td>I intend to use CALL 2.0 as much as possible in my teaching.</td>
<td>4.01</td>
<td>1.13</td>
<td>0.12</td>
<td>-0.23</td>
</tr>
</tbody>
</table>

Note. CSE = CALL 2.0 self-efficacy; PU = perceived usefulness; PEU = perceived ease of use; SN = subjective norm; FC = facilitating conditions; IU = intention to use; TPACK = technological pedagogical and content knowledge. CSE1 was reverse coded.

5.1.2.2 Test of the measurement model. Before testing the hypothesised model, the validity of the measurement model for all constructs was assessed through confirmatory factor analysis. An inter-correlated model consisting of the seven factors and 23 items was tested in Amos. The schematic figure for this model is presented in Figure 14. Following the SEM notation convention, observed variables are characterised by rectangles and latent factors are
depicted with ellipses. Consistent with CFA conventions, each item is loaded solely on the factor it intends to measure, and all measurement errors remain uncorrelated.

Figure 14. The measurement model for the seven latent factors.
The model fit indices of the initial measurement model test revealed that it had a good fit to the sample data ($\chi^2 = 498.33; \chi^2/df = 2.38, p = .12; CFI = .94; \text{gamma hat} = .92; \text{RMSEA} = .07; \text{SRMR} = .05$). However, the loading of item CSE1 on factor CSE was small ($\lambda = .10$), as shown in Figure 15. A further examination revealed that this item was the only reverse-coded item, and this low loading indicated a different response tendency compared to the other two items (CSE2 and CSE3) supposedly measuring the same construct. The statistic suggested a high possibility of misinterpretation for this reverse-coded item, a common problem caused by reverse coding (Sauro & Lewis, 2011). Considering the compatibility of two indicator items for SEM analysis (Bollen, 1989), this reverse-coded item (CSE1) was excluded from further analysis.
Figure 15. Test results of the 23-item measurement model.

Next, Figure 16 presents the parameter estimate results of the 22-item measurement model, which showed an adequate fit to the sample data ($\chi^2 = 447.42; \chi^2/df = 2.38, p = .12; CFI = .95$;
gamma hat = .92; RMSEA = .07; SRMR = .05). All factor loadings were above the recommended threshold value of .60 (Kline, 2010).

Figure 16. Test results of the 22-item measurement model.

Next, the convergent validity of the measurement model was checked by examining the factor loadings, AVE, and composite reliability (CR) of the seven factors. The results
suggested that they all met the threshold values discussed in Section 4.6.5, except the AVE for perceived ease of use (.49) was slightly below the threshold value of .50. In view of Malhotra and Dash’s (2011) findings on the relative conservative nature of the AVE and the fact that the other two indices (factor loadings and CR) for PE were both above the recommended threshold value, convergent validity was deemed established for this study. Table 12 lists the results of convergent validity.

Table 12

Results of Convergent Validity

<table>
<thead>
<tr>
<th>Factor</th>
<th>Item</th>
<th>Standardised factor loading ($\lambda &gt; .60)^*$</th>
<th>Composite reliability ($&gt; .70)^*$</th>
<th>Average variance extracted ($&gt; .50)^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE</td>
<td>CSE2</td>
<td>.86</td>
<td>.85</td>
<td>.73</td>
</tr>
<tr>
<td></td>
<td>CSE3</td>
<td>.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU</td>
<td>PU1</td>
<td>.90</td>
<td>.91</td>
<td>.77</td>
</tr>
<tr>
<td></td>
<td>PU2</td>
<td>.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PU3</td>
<td>.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PE</td>
<td>PE1</td>
<td>.74</td>
<td>.74</td>
<td>.49</td>
</tr>
<tr>
<td></td>
<td>PE2</td>
<td>.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PE3</td>
<td>.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SN</td>
<td>SN1</td>
<td>.89</td>
<td>.89</td>
<td>.73</td>
</tr>
<tr>
<td></td>
<td>SN2</td>
<td>.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SN3</td>
<td>.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FC</td>
<td>FC1</td>
<td>.81</td>
<td>.79</td>
<td>.57</td>
</tr>
<tr>
<td></td>
<td>FC2</td>
<td>.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FC3</td>
<td>.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPACK</td>
<td>TPCK1</td>
<td>.81</td>
<td>.95</td>
<td>.77</td>
</tr>
<tr>
<td></td>
<td>TPCK2</td>
<td>.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TPCK3</td>
<td>.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TPCK4</td>
<td>.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TPCK5</td>
<td>.87</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discriminant validity was checked next. The correlation matrix in Table 13 indicates that the square roots of the AVE of five constructs (CSE, PU, SN, IU, and TPACK) were higher than their corresponding correlation values, while the square roots of AVE of the other two constructs (PE and FC) were slightly below their corresponding correlation values.

Table 13

Factor Inter-Correlation Matrix

<table>
<thead>
<tr>
<th>Factor</th>
<th>CSE</th>
<th>PU</th>
<th>PEU</th>
<th>SN</th>
<th>FC</th>
<th>IU</th>
<th>TPACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE</td>
<td>.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU</td>
<td></td>
<td>.31</td>
<td>(.88)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEU</td>
<td></td>
<td></td>
<td>.56</td>
<td>(.70)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SN</td>
<td></td>
<td></td>
<td></td>
<td>.69</td>
<td>(.86)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.71</td>
<td>.77</td>
<td>(.75)</td>
</tr>
<tr>
<td>IU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.77</td>
<td>(.86)</td>
</tr>
<tr>
<td>TPACK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.67</td>
</tr>
</tbody>
</table>

Since the items for PE and FC had consistently shown reliability and validity in prior research, an additional screening for cross-loading recommended in Chin (1998, 2010) was carried out. No evidence of cross-loadings was found, indicating each item loaded highly only with the factor it was meant to measure. It is noteworthy that high correlation coefficients were present among the predictor variables; however the criterion ($r > .85$) for
determining poor discriminant validity suggested by T. A. Brown (2015) was not exceeded. Therefore, discriminant validity of the measurement model was also deemed achieved. Nevertheless, the multicollinearity of the predictors (mean $r = .64$) may have an impact on the size of regression effects of individual predictors in subsequent structural modelling. Indeed, regression values under multicollinearity may have moderate size (e.g., $\beta = .30$) but not be statistically significant because of the shared variance with correlated predictors.

In conclusion, acceptable model fit indices of the measurement model and the presence of convergent and discriminant validity within the model validated the next step structural model test.

5.1.2.3 Test of the proposed structural model and alternative models. Given the measurement model test results, the proposed structural model containing 12 hypotheses (see Figure 17) was first tested in Amos using the ML estimation method. The results showed the proposed model possessed adequate model fit to the sample data ($\chi^2 = 465.26; \chi^2/df = 2.44, p = .12; CFI = .95; \hat{\gamma} = .92; \text{RMSEA} = .07; \text{SRMR} = .05$). The resulting path diagram is presented in Figure 17.
Figure 17. Test results of the original hypothesised structural model. In the figure, black lines stand for statistically significant paths ($p < .05$), red lines indicate effects that fail to reach statistical significance, and standardised estimates of path coefficients are also provided.

As discussed in Section 4.6.4, a structural model with acceptable fit indices does not guarantee its validity, and possible alternative models should be taken into account to ascertain the final best-fit conceptual model. Following Kline’s (2010) suggestion, a model-trimming strategy was adopted to verify TPACK’s relationship with PU, PEU, and IU. The original structural path model (OM) and six alternative models (AM₁ to AM₆) were compared with each other. Among these alternative models, AM₁ and AM₂ were partial mediation models (either PEU or PU partially mediated the effect of TPACK upon IU); AM₃a to AM₃c were full mediation models, meaning the effect of TPACK upon IU was fully mediated.
through either both PEU and PU or only one of the two; and AM₄ was a zero-mediation model, meaning no mediation effect through PEU and PU existed from TPACK to IU.

In AM₁ (Figure 18), TPACK was treated as a common antecedent of both PEU and IU. The overall model fit was satisfactory, as supported by the fit indices ($\chi^2 = 465.36; \chi^2/df = 2.42, p = .12; CFI = .95; \gamma hat = .92; RMSEA = .07; SRMR = .05$).

Figure 18. Alternative model 1 (AM₁). In the figure, black lines stand for statistically significant paths ($p < .05$), red lines indicate effects that fail to reach statistical significance, and standardised estimates of path coefficients are also provided.
In AM$_2$ (Figure 19), TPACK was treated as a common antecedent of both PU and IU. The overall model fit was satisfactory, as supported by the fit indices ($\chi^2 = 468.05; \chi^2/df = 2.43, p = .12; \text{CFI} = .95; \gamma\hat{=} = .92; \text{RMSEA} = .07; \text{SRMR} = .05$).

![Path diagram](image)

*Figure 19. Alternative model 2 (AM$_2$). In the figure, black lines stand for statistically significant paths ($p < .05$), red lines indicate effects that fail to reach statistical significance, and standardised estimates of path coefficients are also provided.*
In AM\textsubscript{3a} (Figure 20), the effect of TPACK upon IU was fully mediated by PU and PEU simultaneously. The overall model fit was satisfactory, as supported by the fit indices ($\chi^2 = 470.65; \chi^2/df = 2.45$, $p = .12; \text{CFI} = .95; \text{gamma hat} = .92; \text{RMSEA} = .07; \text{SRMR} = .05$).

*Figure 20. Alternative model 3a (AM\textsubscript{3a}).* In the figure, black lines stand for statistically significant paths ($p < .05$), red lines indicate effects that fail to reach statistical significance, and standardised estimates of path coefficients are also provided.
In AM3b (Figure 21), the effect of TPACK upon IU was fully mediated by PEU. The overall model fit was satisfactory, as supported by the fit indices ($\chi^2 = 470.75$; $\chi^2/df = 2.43$, $p = .12$; CFI = .95; gamma hat = .92; RMSEA = .07; SRMR = .05).

*Figure 21.* Alternative model 3b (AM3b). In the figure, black lines stand for statistically significant paths ($p < .05$), red lines indicate effects that fail to reach statistical significance, and standardised estimates of path coefficients are also provided.
In AM$_{3c}$ (Figure 22), the effect of TPACK upon IU was fully mediated by PU. The overall model fit was satisfactory, as supported by the fit indices ($\chi^2 = 473.16; \chi^2/df = 2.45, p = .12; CFI = .95; \text{gamma hat} = .92; \text{RMSEA} = .07; \text{SRMR} = .05$).

![Diagram](image)

*Figure 22. Alternative model 3c (AM$_{3c}$). In the figure, black lines stand for statistically significant paths ($p < .05$), red lines indicate effects that fail to reach statistical significance, and standardised estimates of path coefficients are also provided.*
In AM$_4$ (Figure 23), there was no mediation effect from PU and PEU and TPACK exerted direct influence upon IU. The overall model fit was satisfactory, as supported by the fit indices ($\chi^2 = 468.05; \chi^2/df = 2.43, p = .12; CFI = .95; \gamma_{hat} = .92; \text{RMSEA} = .07; \text{SRMR} = .05$).

**Figure 23.** Alternative model 4 (AM$_4$). In the figure, black lines stand for statistically significant paths ($p < .05$), red lines indicate effects that fail to reach statistical significance, and standardised estimates of path coefficients are also provided.

To sum up, all models were similar in fit to the sample data. Furthermore, AM$_{3b}$ and AM$_4$ appeared to have best fit since the reduced mediational paths did not seem to result in significant changes. Next, these models were subject to the AIC difference tests and chi-square difference tests to identify the best candidate among them. Table 14 lists the model fit indices for these seven competitive models.
### Table 14

*Summary of Model Fit Indices for the Original Model and Alternative Models*

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2/df$</th>
<th>p</th>
<th>CFI</th>
<th>Gamma</th>
<th>RMSEA</th>
<th>SRMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>OM (Figure 17)</td>
<td>Original structural model</td>
<td>465.255</td>
<td>191</td>
<td>2.436</td>
<td>.12</td>
<td>.946</td>
<td>.92</td>
<td>.070</td>
<td>.053</td>
</tr>
<tr>
<td>AM₁ (Figure 18)</td>
<td>Partial mediation; path from TPACK to PU removed</td>
<td>465.362</td>
<td>192</td>
<td>2.423</td>
<td>.12</td>
<td>.947</td>
<td>.92</td>
<td>.070</td>
<td>.053</td>
</tr>
<tr>
<td>AM₂ (Figure 19)</td>
<td>Partial mediation; path from TPACK to PEU removed</td>
<td>468.050</td>
<td>192</td>
<td>2.437</td>
<td>.12</td>
<td>.946</td>
<td>.92</td>
<td>.070</td>
<td>.054</td>
</tr>
<tr>
<td>AM₃a (Figure 20)</td>
<td>Full mediation; path from TPACK to IU removed</td>
<td>470.650</td>
<td>192</td>
<td>2.451</td>
<td>.12</td>
<td>.946</td>
<td>.92</td>
<td>.070</td>
<td>.053</td>
</tr>
<tr>
<td>AM₃b (Figure 21)</td>
<td>Full mediation; paths from TPACK to PU and IU removed</td>
<td>470.746</td>
<td>193</td>
<td>2.439</td>
<td>.12</td>
<td>.946</td>
<td>.92</td>
<td>.070</td>
<td>.053</td>
</tr>
<tr>
<td>AM₃c (Figure 22)</td>
<td>Full mediation; paths from TPACK to PEU and IU removed</td>
<td>473.161</td>
<td>193</td>
<td>2.451</td>
<td>.12</td>
<td>.945</td>
<td>.92</td>
<td>.069</td>
<td>.054</td>
</tr>
<tr>
<td>AM₄ (Figure 23)</td>
<td>Zero mediation; paths from TPACK to PEU and PU removed</td>
<td>468.056</td>
<td>193</td>
<td>2.425</td>
<td>.12</td>
<td>.946</td>
<td>.92</td>
<td>.069</td>
<td>.054</td>
</tr>
</tbody>
</table>

*Note.* OM = original model; AM = alternative model; CSE = CALL 2.0 self-efficacy; PU = perceived usefulness; PEU = perceived ease of use; SN = subjective norm; FC = facilitating conditions; IU = intention to use; TPACK = technological pedagogical and content knowledge.
When listed together, these seven models formed a hybrid of both nested models and non-nested models. Following Kline’s (2010) suggestion, the AIC difference test was first adopted in accordance with the convention of $\Delta i < 2$ rule (Burnham & Anderson, 2004).

Table 15 lists the results of the AIC difference tests.

Table 15

*Results of AIC Difference Tests*

<table>
<thead>
<tr>
<th>Models</th>
<th>AIC</th>
<th>$\Delta i$</th>
<th>Weight AIC</th>
<th>Akaike Weights ($w_i$)</th>
<th>Sum of $w_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM$_1$</td>
<td>587.36</td>
<td>0.00</td>
<td>1.000</td>
<td>.375</td>
<td>.3751</td>
</tr>
<tr>
<td>AM$_4$</td>
<td>588.06</td>
<td>0.694</td>
<td>.707</td>
<td>.265</td>
<td>.6402</td>
</tr>
<tr>
<td>OM</td>
<td>589.26</td>
<td>1.893</td>
<td>.388</td>
<td>.146</td>
<td>.7858</td>
</tr>
<tr>
<td>AM$_2$</td>
<td>590.05</td>
<td>2.688</td>
<td>.261</td>
<td>.098</td>
<td>.8836</td>
</tr>
<tr>
<td>AM$_{3b}$</td>
<td>590.75</td>
<td>3.384</td>
<td>.184</td>
<td>.069</td>
<td>.9527</td>
</tr>
<tr>
<td>AM$_{3a}$</td>
<td>592.65</td>
<td>5.288</td>
<td>.071</td>
<td>.027</td>
<td>.9794</td>
</tr>
<tr>
<td>AM$_{3c}$</td>
<td>593.16</td>
<td>5.799</td>
<td>.055</td>
<td>.021</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

*Note.* OM = original model; AM = alternative model; AIC = Akaike information criteria.

The AIC difference tests ($\Delta i < 2$) showed that, of the six alternative non-nested models, only AM$_1$ and AM$_4$ were as equally well-fitting as the OM. Next, given that OM, AM$_1$, and AM$_4$ constituted nested models, the $p$ value for the difference ratio of $\Delta \chi^2/\Delta df$ was examined (Table 16).
Table 16

Results of $\chi^2$ Difference Tests

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\Delta\chi^2$</th>
<th>$\Delta df$</th>
<th>$\Delta\chi^2/\Delta df$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>OM</td>
<td>465.255</td>
<td>191</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM$_1$</td>
<td>465.362</td>
<td>192</td>
<td>0.107</td>
<td>1</td>
<td>0.107</td>
<td>.74</td>
</tr>
<tr>
<td>AM$_4$</td>
<td>468.056</td>
<td>193</td>
<td>2.801</td>
<td>2</td>
<td>1.401</td>
<td>.25</td>
</tr>
</tbody>
</table>

*Note.* OM = original model; AM = alternative model.

These tests demonstrated that AM$_1$ and AM$_4$ were as equally well-fitting as the OM. However, on the principle of simplicity, AM$_4$ was preferred since after removing the necessity of any mediating paths, it still remained not statistically significantly different from the other two models. Thus the more parsimonious AM$_4$ was retained.

Moreover, given the moderately high correlations among factors specified in the measurement model and their possible multicollinearity, four exogenous predictors were first tested individually in the final structural model, and changes of path coefficients were compared to ascertain the possible influence of multicollinearity. Table 17 shows the comparison results.

Table 17

Comparison of Standardised Path Coefficients

<table>
<thead>
<tr>
<th>Path</th>
<th>Standardised path coefficients for exogenous predictors in AM$_1$</th>
<th>Standardised path coefficients for exogenous predictors tested individually</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE $\rightarrow$ PEU</td>
<td>.65 **</td>
<td>.83 **</td>
</tr>
<tr>
<td>CSE $\rightarrow$ IU</td>
<td>-.09</td>
<td>-.04</td>
</tr>
<tr>
<td>SN $\rightarrow$ PU</td>
<td>.33 **</td>
<td>.32**</td>
</tr>
<tr>
<td>SN $\rightarrow$ IU</td>
<td>.13</td>
<td>.49**</td>
</tr>
<tr>
<td>FC $\rightarrow$ PEU</td>
<td>.36 **</td>
<td>.69**</td>
</tr>
<tr>
<td>FC $\rightarrow$ IU</td>
<td>.42 **</td>
<td>.49**</td>
</tr>
</tbody>
</table>
TPACK $\rightarrow$ IU \hspace{2cm} .18 * \hspace{2cm} .31**

Note. CSE = CALL 2.0 self-efficacy; PU = perceived usefulness; PEU = perceived ease of use; SN = subjective norm; FC = facilitating conditions; IU = intention to use; TPACK = technological pedagogical and content knowledge.

* $p < .05$; ** $p < .01$

As is shown in Table 17, results were generally in line with each other except for the standardised path coefficient from SN to IU, which changed from .13 to .49. Considering the high correlation ($r = .77$) between SN and FC, the strategy of collapsing these two factors into one factor and constraining the correlation coefficient to 1 recommended by T. A. Brown (2015) was adopted to determine whether these constructs were distinct. Chi square difference test results, as is shown in Table 18, supported the original specification. Thus, the original factorial configuration was retained in the research model.

Nevertheless, the large change in effect ($\beta = .13^* \text{ to } \beta = .49^{**}$) when inspected in a univariate condition indicated considerable shared variance. The impact of multicollinearity in structural equation modelling is most noticed when inter-correlations are $r > .90$, measure reliabilities are $< .70$, and sample size is small relative to variable count (i.e., $< 3:1$) (Grewal, Cote, & Baumgartner, 2004). Hence, the use of simultaneous structural equation modelling in this study was deemed to be a suitable procedure for addressing the impact of collinearity (Maruyama, 1998).

Table 18

Results of $\chi^2$ Difference Tests

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>$df$</th>
<th>$\Delta\chi^2$</th>
<th>$\Delta df$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seven-factor model</td>
<td>448.95</td>
<td>188</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seven-factor model with correlation</td>
<td>480.06</td>
<td>194</td>
<td>31.1</td>
<td>6</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>coefficient between CSE and FC constrained to 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Six-factor model with CSE and FC collapsed as one factor</td>
<td>668.55</td>
<td>196</td>
<td>219.6</td>
<td>8</td>
<td>&lt; .05</td>
</tr>
</tbody>
</table>
5.1.2.4 Results of the survey study. In the final model AM4, three endogenous constructs were tested. IU was determined by PU, FC, and TPACK, producing $R^2 = .75$, meaning these three factors explained 75% of the variation in IU. The variances of the other two endogenous constructs (PEU and PU) explained by their determinants were $R^2 = .82$ and $R^2 = .29$, respectively. In addition, FC had the strongest effect on IU, followed by PU, and the weakest contributor was TPACK. PEU, which did not have a statistically significant loading on IU, was predicted strongly by CSE and moderately by FC. PU was moderately predicted by SN, and weakly by PEU. These predictors had strong effects on two dependencies (i.e., IU and PEU) and a much weaker effect on PU. Table 19 lists the final hypotheses testing results.

Table 19

Hypothesis Testing Results

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Path</th>
<th>Standardised path coefficient</th>
<th>$t$ value</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>PU $\rightarrow$ IU</td>
<td>.31</td>
<td>6.46**</td>
<td>Supported</td>
</tr>
<tr>
<td>H2</td>
<td>PEU $\rightarrow$ PU</td>
<td>.26</td>
<td>3.21**</td>
<td>Supported</td>
</tr>
<tr>
<td>H4</td>
<td>CSE $\rightarrow$ PEU</td>
<td>.65</td>
<td>8.45**</td>
<td>Supported</td>
</tr>
<tr>
<td>H6</td>
<td>SN $\rightarrow$ PU</td>
<td>.33</td>
<td>4.27**</td>
<td>Supported</td>
</tr>
<tr>
<td>H8</td>
<td>FC $\rightarrow$ PE</td>
<td>.36</td>
<td>5.13**</td>
<td>Supported</td>
</tr>
<tr>
<td>H9</td>
<td>FC $\rightarrow$ IU</td>
<td>.42</td>
<td>3.47**</td>
<td>Supported</td>
</tr>
<tr>
<td>H12</td>
<td>TPACK $\rightarrow$ IU</td>
<td>.18</td>
<td>2.28*</td>
<td>Supported</td>
</tr>
<tr>
<td>H3</td>
<td>PEU $\rightarrow$ IU</td>
<td>.08</td>
<td>.47</td>
<td>Not supported</td>
</tr>
<tr>
<td>H5</td>
<td>CSE $\rightarrow$ IU</td>
<td>-.09</td>
<td>-.62</td>
<td>Not supported</td>
</tr>
<tr>
<td>H7</td>
<td>SN $\rightarrow$ IU</td>
<td>.13</td>
<td>1.61</td>
<td>Not supported</td>
</tr>
<tr>
<td>H10</td>
<td>TPACK $\rightarrow$ PU</td>
<td></td>
<td></td>
<td>Not supported</td>
</tr>
<tr>
<td>H11</td>
<td>TPACK $\rightarrow$ PE</td>
<td></td>
<td></td>
<td>Not supported</td>
</tr>
</tbody>
</table>

Note. CSE = CALL 2.0 self-efficacy; PU = perceived usefulness; PEU = perceived ease of use; SN = subjective norm; FC = facilitating conditions; IU = intention to use; TPACK = technological pedagogical and content knowledge.

* $p < .05$; ** $p < .01$
In Phase-1 quantitative study, six candidate factors influencing mainland Chinese pre-service EFL teachers’ intention to use CALL 2.0 and the possible underlying relationships between them, derived from prior TAM and TPACK research, were investigated through a series of model tests. Results suggested that there existed a significant positive influence on intention to use from perceived usefulness, facilitating conditions, and technology pedagogical and content knowledge. However, in order to get a better understanding of these factors, a complementary qualitative analysis was also implemented concurrently in this phase.

5.2 Interview Study

5.2.1 Demographics of the interviewees. A total of 31 students, who agreed to participate in the second phase interview, were contacted through multiple ways including e-mails, phone calls, or short messages for the follow-up interviews. Finally, 26 participated in the arranged semi-structured interview. Among them, 5 were male and 21 were female. They came from various year levels (ranging from Year 1 to Year 4). To protect their identity, they were coded as PST1–PST26 (PST = pre-service teacher). At the beginning of the interview, interviewees were asked about their possession of digital devices, their access to the Internet, and their daily use of Web 2.0 applications. Twenty participants indicated that they had computers, while 23 participants indicated they owned mobile devices. All confirmed that they had mobile access to the Internet.

When asked about their daily use of CALL 2.0, most (19 out 26) self-reported high frequency of using CALL 2.0 in their language learning, with three reporting moderate frequency and three reporting low frequency. The demographics of these interviewees are provided in Table 20.
Table 20

Profiles of the Interviewees

<table>
<thead>
<tr>
<th>Code</th>
<th>Gender</th>
<th>Year of study</th>
<th>Age</th>
<th>Frequency of using CALL 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>PST6</td>
<td>Female</td>
<td>Year 1</td>
<td>19</td>
<td>High</td>
</tr>
<tr>
<td>PST7</td>
<td>Female</td>
<td>Year 1</td>
<td>20</td>
<td>High</td>
</tr>
<tr>
<td>PST1</td>
<td>Male</td>
<td>Year 2</td>
<td>19</td>
<td>High</td>
</tr>
<tr>
<td>PST11</td>
<td>Female</td>
<td>Year 2</td>
<td>21</td>
<td>High</td>
</tr>
<tr>
<td>PST14</td>
<td>Female</td>
<td>Year 2</td>
<td>20</td>
<td>High</td>
</tr>
<tr>
<td>PST22</td>
<td>Female</td>
<td>Year 2</td>
<td>21</td>
<td>High</td>
</tr>
<tr>
<td>PST5</td>
<td>Male</td>
<td>Year 2</td>
<td>20</td>
<td>High</td>
</tr>
<tr>
<td>PST10</td>
<td>Female</td>
<td>Year 3</td>
<td>22</td>
<td>High</td>
</tr>
<tr>
<td>PST12</td>
<td>Female</td>
<td>Year 3</td>
<td>21</td>
<td>High</td>
</tr>
<tr>
<td>PST13</td>
<td>Female</td>
<td>Year 3</td>
<td>22</td>
<td>High</td>
</tr>
<tr>
<td>PST15</td>
<td>Female</td>
<td>Year 3</td>
<td>23</td>
<td>High</td>
</tr>
<tr>
<td>PST16</td>
<td>Female</td>
<td>Year 3</td>
<td>22</td>
<td>High</td>
</tr>
<tr>
<td>PST17</td>
<td>Female</td>
<td>Year 3</td>
<td>21</td>
<td>High</td>
</tr>
<tr>
<td>PST24</td>
<td>Female</td>
<td>Year 3</td>
<td>21</td>
<td>High</td>
</tr>
<tr>
<td>PST26</td>
<td>Female</td>
<td>Year 3</td>
<td>21</td>
<td>High</td>
</tr>
<tr>
<td>PST3</td>
<td>Male</td>
<td>Year 3</td>
<td>21</td>
<td>High</td>
</tr>
<tr>
<td>PST9</td>
<td>Female</td>
<td>Year 3</td>
<td>22</td>
<td>High</td>
</tr>
<tr>
<td>PST19</td>
<td>Female</td>
<td>Year 4</td>
<td>23</td>
<td>High</td>
</tr>
<tr>
<td>PST20</td>
<td>Female</td>
<td>Year 4</td>
<td>22</td>
<td>High</td>
</tr>
<tr>
<td>PST21</td>
<td>Female</td>
<td>Year 4</td>
<td>23</td>
<td>High</td>
</tr>
<tr>
<td>PST18</td>
<td>Female</td>
<td>Year 3</td>
<td>20</td>
<td>Medium</td>
</tr>
<tr>
<td>PST2</td>
<td>Male</td>
<td>Year 3</td>
<td>20</td>
<td>Medium</td>
</tr>
<tr>
<td>PST8</td>
<td>Female</td>
<td>Year 3</td>
<td>21</td>
<td>Medium</td>
</tr>
<tr>
<td>PST23</td>
<td>Female</td>
<td>Year 3</td>
<td>22</td>
<td>Low</td>
</tr>
<tr>
<td>PST25</td>
<td>Female</td>
<td>Year 2</td>
<td>20</td>
<td>Low</td>
</tr>
<tr>
<td>PST4</td>
<td>Male</td>
<td>Year 3</td>
<td>20</td>
<td>Low</td>
</tr>
</tbody>
</table>
5.2.2 Results of qualitative analysis. Taken together, the qualitative content analysis results corroborated and extended the proposed research model. All seven constructs in the proposed model were talked about without being prompted. Moreover, these data provided a richer and wider understanding of these constructs. Detailed information pertaining to each construct is listed below. Details relating to some specific Web 2.0 tools mentioned below can be found in Appendix H.

5.2.1.1 Perceived usefulness. One of the first constant themes that emerged from the interview transcripts was the emphasis on the usefulness of CALL 2.0. A total of 24 out of 26 interviewees expressed their agreement as to the usefulness of CALL 2.0 and indicated it was an important factor to consider when planning for language learning. The results revealed that these pre-service EFL teachers believed that CALL 2.0 could have a positive impact on students’ language learning in the following ways: a) information retrieval, b) productivity, and c) communication. Each aspect is further explained below with relevant remarks from the interviewees.

These pre-service teachers perceived CALL 2.0 to be predominantly useful because, by using Web 2.0 technologies, they could find reliable and helpful information related to their own language learning.

*CALL 2.0 is very useful in terms of getting the authentic audio and video material from the foreign websites such as CNN, BBC and the video channel from Sohuyingyn and Leshi…. These materials are very helpful in improving my oral English and listening comprehension ….I can also learn the latest vocabulary from these websites. (PST1)*

*I find CALL 2.0 applications are particularly useful in helping me look up new words on the electronic dictionaries. It is quick, convenient, and time-saving. When used with other applications like Baicizhan, new incentives are provided. I am stimulated to compete with my friends in memorising new words - as many as possible. (PST7)*
With the help of CALL 2.0, I can surf the Internet, get course relevant information and prepare adequately for the scheduled class. (PST9)

CALL 2.0 opens a window to the outside for me. Since the first day studying here at the university, I have realised how different tertiary education is from secondary education. It almost completely depends on our own initiatives. By subscribing to some public accounts through WeChat, I can get beneficial information pushed to my iPhone directly. And I can read it without any time or place limits. (PST15)

It can be seen that these pre-service teachers enjoyed the benefits and power of CALL 2.0. Using readily available mobile devices, they could access authentic English-medium multimedia content and find resources to accommodate their individual learning needs. Participants generally agreed that CALL 2.0 provided them with more communicative opportunities with the outside world.

CALL 2.0 affords me many opportunities to communicate with native English speakers. I can now use WeChat to talk to my foreign teacher, who has returned to the US. (PST5)

I do not like my mind to be only confined to the classroom. CALL 2.0 gives me a platform where I can communicate with and learn from others. (PST16)

I really feel the power of Web 2.0, for it opened a whole new world for me, making me easily stay connected with and learn from others. It saved me a lot of time and effort. (PST18)

It can break those constraints such as space and time and increases students’ engagement in the classroom, making dull subject content more interesting. (PST21)

While most participants focused on communication with native English speakers, one participant talked about how CALL 2.0 was used effectively for teacher-student communication.
With the help of technologies, our teachers can easily communicate with us. Previously, we mainly count on short messages to disseminate information related to the assignment or announcements. Now, we have our own WeChat groups. Whenever the lecturer wants to send us extra-curricular reading or assignments, several swipes on the phone will send the information to everyone who is in that group. (PST3)

Most participants shared their own CALL 2.0 practices and gave positive feedback on how CALL 2.0 helped them with their language learning. Some useful Web 2.0 tools they used for language learning and their benefits were mentioned.

It facilitates our collaboration. I used to finish a group assignment with my classmates. Therefore, we used the WeChat to create a group to discuss the assignment together. And I found this collaborative experience very efficient and productive. (PST6)

You can study at your convenience. You can study on the go. Students are allowed more options than the past. With the help of those apps, you can also visualise your progress, e.g., how many new words I have mastered and at which stage I am right now. (PST7)

I use it to organise my learning. It keeps things tidy. I like it. (PST11)

Now with my phone, I can easily take notes. If I see something good and useful, I can take photos first and get them organised later. (PST13)

As pre-service EFL teachers, some of them held that CALL 2.0 might be helpful in improving the overall EFL education level across mainland China.

CALL 2.0 can be very helpful in coping with the issue of education equity. As you can see, in the past, the better educational resources were usually allocated to the urban students ... rural students usually did not get the same treatment as their rural counterparts. With CALL 2.0, I believe it can help alleviate the situation to some extent. For everyone can get the same content under this situation. (PST2)

Though most of the pre-service EFL teachers perceived CALL 2.0 to be useful and felt motivated to adopt it in their future classroom, two student teachers, however, admitted
that they preferred a traditional teaching approach instead of CALL 2.0. One believed that the usefulness of CALL 2.0 was limited, while the other one mentioned concern for the leakage of privacy.

\[\text{I don’t like using electronic dictionaries because it can’t give you as detailed information as a real dictionary and it deprives me of the pleasure of reading a real book. In addition, there are too many games, which are not good for our study. (PST3)}\]

\[\text{I don’t feel at ease to expose myself completely online. It made me feel kidnapped and people are getting addicted to their phones. It devours every bit of available time that we used to spend on communicating with friends around us. And what is even worse is that your information and privacy can’t be protected. (PST9)}\]

5.2.1.2 Perceived ease of use. The content analysis of the interview transcripts uncovered that most participants \((n = 20)\) thought that the technological threshold had been significantly lowered. Overall, they perceived CALL 2.0 to be easy to use, which can be further grouped into the following two subthemes: a) ease of operation and b) ease of access. Some illustrative comments are listed below.

With the increasing popularity of mobile devices among younger generations, participants admitted that they had become, in an unprecedented manner, reliant on their smartphones, and therefore got used to the intuitive operation of their smart devices.

\[\text{In the past, it may have required a lot of effort to learn how to use the technology. But things have changed. I can easily use my phone to complete a lot of tasks, which might [previously] require specialised knowledge and skills. (PST4)}\]

\[\text{Take the app I am using for example, its design is very engaging, full of guidance and tips, which make using it to record and share my progress very straightforward. (PST8)}\]

\[\text{Due to the streamlined design, I can apply my knowledge of the previous apps into the new apps. This has made the new apps pretty easy to use. (PST14)}\]
Nowadays, technologies are generally easy to use. People around me all use these tools in their daily lives. We learn from each other. There is no technological threshold as long as you decide to learn how to use them in my opinion. (PST18)

With the rapid development of network infrastructure in mainland China, most participants could access the Internet through their smartphones, which they deemed to be extremely handy.

*Compared to a paperback dictionary, my phone is way lighter to carry around and it is also faster in looking for a new word. It is a great helper.* (PST4)

*Almost everyone has his/her own cellular phones. And using them is really easy and intuitive.* (PST7)

*With my phone, I can stay online anytime. Whenever I meet a problem, I just take out my phone and search the answer.* (PST15)

While there was a clear consensus among participants that CALL 2.0 might be easy to use, perceived ease of use may not be decisive in their choice of using CALL 2.0. The following quotes are illustrative:

*All technologies are easy to learn now. They need to have something else to attract us. It may be because of the content, the design, or the closeness to our life. Anyway, merely being easy to use is far from being enough.* (PST2)

*If it can improve my students’ performance or my productivity, though it may be time-consuming to learn, still I am willing to use it.* (PST9)

**5.2.1.3 CALL 2.0 self-efficacy.** Due to the increasing popularisation of digital devices and the ICT training courses they were taking, a high proportion of the pre-service EFL teachers \((n = 20)\) reported high CALL 2.0 self-efficacy. They also mentioned how they were using CALL 2.0 to assist their own language learning. This suggested that for them, CALL 2.0 was not
optional, but an essential medium for language learning. Most showed adequate confidence in their choice and implementation of CALL 2.0, as reflected in the following comments.

*I believe I know enough about using Web 2.0 to help my language learning. I can download the latest popular American TV series such as The Big Bang Theory or The Game of the Thrones and watch that on my phone.* (PST3)

*Most of my classmates and I are heavy Weibo users. We used this channel to help us get additional information besides textbooks. We think English used in the textbook is too old. I have subscribed to several Weibo accounts, which provide regular updates of latest English.* (PST5)

*I have Shanbeidaka on my phone and I will post my daily results on my Moments so I can compete with my friends.* (PST7)

*Nowadays, we use our mobile phones to take notes and share with each other. Everyone is doing this.* (PST10)

*I am pretty confident with my ICT knowledge and actually proud of that. Sometimes I help my teacher solve the technical problems in the classrooms.* (PST13)

*When teachers mention something new in the classroom, most of us will try to Baidu the answer.* (PST16)

*I grew up with the Internet. I am quite used to it. I can’t afford to live without the Internet.* (PST17)

*Using Microsoft Word, PowerPoint, Excel is not a problem for me.* (PST18)

*I use resources from different channels to enrich my language-learning experience, which include the video channel by Sohu.com, the microblog from the Weibo platform by Sina.com, and the public account from the WeChat platform by Tencent.com.* (PST20)

It was quite clear from these comments that as a generation growing up with the Internet, most of them were technology savvy and experienced in using CALL 2.0 for themselves.
5.2.1.4 Technological pedagogical and content knowledge. Although most pre-service teachers expressed high self-efficacy in using CALL 2.0, most of them (n = 19) reported their TPACK to be lower than their own expectations. They agreed that they were digital natives and generally familiar with technologies; however, their intimacy with Web 2.0 technologies did not mean that they knew how to effectively and appropriately use these technologies for language teaching. Participants expressed a strong desire to enhance their technological pedagogical content knowledge, for they believe this was important for their future effective use of CALL 2.0.

The TPACK you are talking about is exactly what is missing in our training. We are only taught how to use some basic computer programs but not how to use them to assist our teaching in the future. (PST7)

I do think the TPACK is very important for us pre-service EFL teachers. Technology, for sure, is very useful, but we need to know how to use it. What I can see now is it completely depends on teachers’ initiatives. We don’t have a unified criterion to standardise the teaching practice. (PST9)

I once was required to teach a lesson by my teacher.... I planned to use PowerPoint to present my lesson. However, it took me a long time to get the computer ready. The effect was not good to me. I think I need more training about how to use technology effectively in the classroom. (PST12)

Some participants even openly expressed their dissatisfaction with the current pre-service EFL teaching training that they received.

I can see the lack of TPACK is a common problem in our training. Even my teachers don’t know how to operate the projectors in the classroom. For example, I can see that most of PPTs prepared by them are the same as the content of the textbook, which disappoints us. (PST15)

I don’t think we have received enough training dedicated to the improvement of our TPACK. I can see a lot of effort in giving us enough content knowledge, but I believe as a future teacher, we deserve to be taught more about how to teach with ICT, for I can see how important ICT is for future language learning. (PST21)
I am not so sure what course I am taking here will improve my TPACK. (PST23)

These comments suggested that although a majority of pre-service EFL teachers perceived CALL 2.0 to be easy to use, its integration with language teaching would be still challenging and require more skills and training.

5.2.1.5 Subjective norm. From the interviews, there were mixed responses to subjective norms. It seemed that a large portion of these pre-service EFL teachers (n = 17) endorsed positive influence but this was not universal. Several participants gave the following comments.

  My teacher would introduce some useful websites to us so we could practice by ourselves after class. (PST5)

  Our teacher would tell us that in order to learn English well, we need to be able to use the Internet properly to apply what we have learned in a book into practice. (PST16)

  Though our teacher doesn’t use technology himself and he only uses the blackboard in the classroom, he encourages us to use ICT to assist language learning. (PST17)

Despite a general acknowledgement of the positive influence from their teachers, some interviewees also expressed different views. These views were generally indicative of greater independent judgements.

  I know my teacher’s intention is good, but the apps adopted by her do not suit my needs. (PST3)

  As for the apps I use, I usually choose them by myself. I search online for language-learning tips. (PST11)

However, it should also be pointed out that these participants held that if they believed CALL 2.0 to be worthwhile, they would adopt it despite facing negative opinions from their teachers.
My teacher always compares us to his former students and reminds us of the importance of staying away from electronic dictionaries for he believes that they would make us lazy. But I still choose to use electronic dictionaries as I believe it to be helpful. (PST1)

5.2.1.6 Facilitating conditions. Another strong theme running through the transcripts was facilitating conditions. Most pre-service teachers indicated that their use of CALL 2.0 would be influenced by the following seven different aspects of facilitating conditions, which include: 1) digital devices, 2) Internet connection, 3) technical support, 4) ICT training, 5) technical and pedagogical advice, 6) school environment, and 7) access to mainstream English-medium Web 2.0 websites. These seven aspects centred around two themes: the ICT infrastructure availability and the accessibility of English-medium Web 2.0 resources.

A large portion of the participants discussed how the lack of ICT infrastructure at the school level would increase the difficulty in their future adoption of CALL 2.0.

The schools don’t have the equipment I need to implement my teaching design. (PST2)

To increase admission rate, some schools ban the use of ICT devices in classroom for fear that it distracts students. (PST4)

I know great progress has been made during the past several years, but the condition is still unsatisfactory. Take our university for example, the Wi-Fi signal coverage is quite limited and the speed is really slow. (PST7)

Though most schools in our province have ICT equipment, the computers are located in teachers’ offices or computer labs, but not in the classrooms. To access the Internet in the classroom is really complicated. (PST9)

Nowadays, it is quite common for students to have their own smartphones. However, schools usually ban the use of smartphones in class for teachers are worried that that would distract students’ attention. (PST10)

My technical knowledge is limited, so I would like to have more technical
support from the school. I have a lot of ideas. I need someone to help me turn them into reality. (PST12)

Teachers should be provided with more chances for training and the training should be relevant to the context and the course. (PST14)

School should create favourable environments for teachers to explore the best CALL 2.0 practices. For example, some paid apps are very useful. Schools should provide funding for the teacher to download and experiment with these apps. (PST15)

Workload is too heavy, and teachers have no time to explore the effective CALL 2.0 practice. (PST18)

There should be a change in the operational culture of educational institutions in China. (PST20)

Although ICT infrastructure availability was a common aspect of facilitating conditions, some participants talked about the inaccessibility of English-medium Web 2.0 resources as a strong barrier to their intention to use CALL 2.0. Some participants reported the inaccessibility of some well-known English-medium Web 2.0 resources (e.g., Facebook, Google, Twitter, YouTube, etc.) and how that impacted on their intention to use CALL 2.0.

Google is inaccessible. Sometimes, it’s hard to find a certain topic. The webpages I found can’t be opened properly. (PST3)

Wikipedia is inaccessible. It’s really a pity. (PST5)

Some useful English websites are very slow to load. (PST8)

And many well-known English websites are blocked. I really want to have access to Facebook so I can have a taste of native speakers’ daily life. (PST11)

Some websites are very difficult to open. In the end, I have to give up. (PST13)

One big problem is that we do not have access to the major English Web 2.0 websites. I have heard of Facebook and Twitter, but I have never got a chance to use them. (PST16)
5.2.1.7 Intention to use CALL 2.0. In view of the rapid development of ICT and the benefits afforded by the Web 2.0 technologies, the participants showed a strong desire to adopt CALL 2.0 in their future teaching practice.

*I will definitely use the available Web 2.0 technologies in my future classrooms. I want to give my students a larger horizon of the world.* (PST9)

*Though there are many disagreements in terms of the integration of Web 2.0 technologies in the classroom, I can tell the trend is irreversible. No one can afford to ignore its impact. It will be better to learn how to embrace it rather than to refuse it blindly.* (PST11)

*At this stage, I am only a pre-service EFL teacher. To be honest, I would like to give it a try to see how things go. Yes, I want to try it.* (PST13)

*CALL 2.0 is the future.* (PST14)

*I hope that one day I can help my students communicate with native speakers via CALL 2.0.* (PST23)

There was consensus on the positive role of perceived usefulness and technological pedagogical and content knowledge. However, mixed responses towards perceived ease of use, CALL 2.0 self-efficacy, and subjective norm were also revealed. In addition, a context-relevant aspect of facilitating conditions (access to English-medium Web 2.0 resources) was identified, which has been largely overlooked in prior studies, perhaps due to the unique Web 2.0 environment of mainland China.

5.3 Summary

The research in this phase was focused on testing the proposed research model. Using the theoretical model as the guide, both quantitative and qualitative data were collected and analysed. It was found that intention to use CALL 2.0 was under the direct influence of perceived usefulness, facilitating conditions, and technological pedagogical and content
knowledge. Facilitating conditions had the strongest effect on intention to use CALL 2.0, followed by perceived usefulness; and the weakest contributor was technological pedagogical and content knowledge. Perceived ease of use, which did not have a statistically significant loading on intention to use CALL 2.0, was predicted strongly by CALL 2.0 self-efficacy, and moderately by facilitating conditions. Perceived usefulness was moderately predicted by subjective norm and weakly by perceived ease of use. These predictors had strong effects on intention to use CALL 2.0 and perceived ease of use but a much weaker effect on perceived usefulness.

Results also uncovered that both the interview findings and survey findings were generally in line with each other. However, an important but heretofore overlooked aspect of facilitating conditions—English-medium Web 2.0 resources accessibility—was identified. It appeared that this was another important aspect of facilitating conditions. Yet, due to contextual differences, this aspect was not touched upon in prior studies. Thus findings pertaining to the newly identified aspect of facilitating conditions were furthered in the Phase-2 study, which involved another questionnaire survey to seek additional clarification of facilitating conditions and further validation of the retained research model in the Phase-1 study.
Chapter 6 Phase-2 Study

This chapter presents the data analysis results of the Phase-2 quantitative study. Section 6.1 reports the data collection procedure and the demographic profile of the participants in the Phase-2 study. Section 6.2 presents the procedure and results of the invariances testing of the Phase-1 research model. Section 6.3 provides the test results of the measurement model for the expanded facilitating conditions. Section 6.4 assesses the structural model with the expanded facilitating conditions. Section 6.5 summarises the results of the Phase-2 study.

6.1 Demographics

In the Phase-2 study, the survey questionnaire was administered in a limited time frame via a commercial online survey platform. This approach guaranteed respondents’ anonymity and facilitated the data collection process due to the ubiquity of smart devices among mainland Chinese university students. A link to the online questionnaire was sent to the WeChat groups of different year levels. A total of 498 students responded to the survey. IP addresses recorded when submitting the questionnaires were checked to ensure that the respondents were from the expected region. In addition, in view of the potential threat posed by missing data to the ML estimation method (Kline, 2010) and the insignificant difference suggested by Little’s (1988) MCAR test, a subsequent list wise deletion was performed to remove cases with missing values. Finally, those with completely the same responses were also excluded from further analysis. After all these checks, a final sample of 440 participants was attained.

Profiles of the Phase-2 sample are presented in Table 21. The majority of participants were female (70%); 117 were from Year 1 (27%); 73 were from Year 2 (17%); 91 were from Year 3 (21%); 92 were from Year 4 (21%), and 67 were postgraduate students (15%).
Table 21

Demographic Information about the Participants (N = 440)

<table>
<thead>
<tr>
<th>Year of Study</th>
<th>Gender</th>
<th>Age</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>M</td>
</tr>
<tr>
<td>Year 1</td>
<td>31</td>
<td>86</td>
<td>22.57</td>
</tr>
<tr>
<td>Year 2</td>
<td>25</td>
<td>48</td>
<td>21.89</td>
</tr>
<tr>
<td>Year 3</td>
<td>28</td>
<td>63</td>
<td>22.79</td>
</tr>
<tr>
<td>Year 4</td>
<td>28</td>
<td>64</td>
<td>23.13</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>22</td>
<td>45</td>
<td>25.58</td>
</tr>
<tr>
<td>Total</td>
<td>134</td>
<td>306</td>
<td>23.08</td>
</tr>
</tbody>
</table>

Similar to the findings from Phase 1, the mean responses to the questions about their familiarity with CALL 2.0 practices (Note: 1 = very unfamiliar, 2 = unfamiliar, 3 = neutral, 4 = familiar, 5 = very familiar) suggested that these participants were generally familiar to very familiar with social networking tools, instant messengers, and online learning tools. Closer to neutral familiarity was found for file-sharing services and wikis, while low familiarity was reported for blogs, MOOC, and knowledge management tools, as is shown in Table 22.

Table 22

Pre-Service Teachers’ Familiarity with CALL 2.0

<table>
<thead>
<tr>
<th>CALL 2.0 practices</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social networking sites (e.g., Weibo)</td>
<td>3.67</td>
<td>1.12</td>
</tr>
<tr>
<td>Instant messengers (e.g., WeChat)</td>
<td>3.56</td>
<td>1.09</td>
</tr>
<tr>
<td>Online learning kits (e.g., online dictionary, Prezi)</td>
<td>3.43</td>
<td>1.02</td>
</tr>
<tr>
<td>File-sharing services (e.g., Baidu Wangpan)</td>
<td>3.18</td>
<td>1.06</td>
</tr>
<tr>
<td>Wiki (e.g., Wikipedia)</td>
<td>3.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Blog (e.g., Sina)</td>
<td>2.92</td>
<td>1.03</td>
</tr>
<tr>
<td>Massive online open courseware (e.g., Coursera)</td>
<td>2.92</td>
<td>0.99</td>
</tr>
</tbody>
</table>
Self-reported questions relating to the self-reported ownership of digital devices revealed that among them, all owned smartphones. Computer ownership was moderate with more laptop computers than desktop computers and tablet computers, as is shown in Table 23. This reflected the increasing popularity of mobile handheld digital devices among young university students in mainland China (CNNIC, 2016).

Table 23

<table>
<thead>
<tr>
<th>Digital devices</th>
<th>Year of study</th>
<th>Smartphones</th>
<th>Laptop computers</th>
<th>Desktop computers</th>
<th>Tablet computers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 1</td>
<td>117</td>
<td>36</td>
<td>52</td>
<td>18</td>
<td>223</td>
</tr>
<tr>
<td></td>
<td>Year 2</td>
<td>73</td>
<td>29</td>
<td>33</td>
<td>20</td>
<td>155</td>
</tr>
<tr>
<td></td>
<td>Year 3</td>
<td>91</td>
<td>33</td>
<td>45</td>
<td>35</td>
<td>204</td>
</tr>
<tr>
<td></td>
<td>Year 4</td>
<td>92</td>
<td>55</td>
<td>30</td>
<td>37</td>
<td>214</td>
</tr>
<tr>
<td></td>
<td>Postgraduate</td>
<td>67</td>
<td>55</td>
<td>10</td>
<td>30</td>
<td>162</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>440 (100%)</td>
<td>208 (47%)</td>
<td>170 (39%)</td>
<td>140 (32%)</td>
<td></td>
</tr>
</tbody>
</table>

6.2 Analyses

The statistical analyses in this section followed the procedures and methods described in Chapter 5. In addition, two new procedures were conducted. These were tests of invariance for the models developed in Chapter 5 with the new data collected in Phase 2 and the extended model with the new items related to facilitating conditions. Only details of the new procedures are reported here.
6.2.1 Descriptive statistics. Descriptive statistics for the questionnaire items used in Phase 2 showed that all means were ranging from 3.87 to 4.28 (Note: 1 = strongly disagree, 2 = mostly disagree, 3 = slightly agree, 4 = moderately agree, 5 = mostly agree, and 6 = strongly agree). The standard deviations ranged from 1.09 to 1.32, which indicated adequate spread around the mean. The inspection of the univariate normality of these items showed that univariate skew and kurtosis indices were from -0.21 to 0.05 and -0.16 to -0.55 respectively, well below the cut-off values of |3.00| for skewness and |8.00| for kurtosis suggested by Kline (2010). Hence, the variables were sufficiently normal to proceed to the next-step analysis.

Detailed information with regard to these items is presented in Table 24.

Table 24

Descriptive Statistics for the Questionnaire Items

<table>
<thead>
<tr>
<th>Code</th>
<th>Items</th>
<th>M</th>
<th>SD</th>
<th>Skew</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU Scale (α = .77)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU1</td>
<td>Using CALL 2.0 will improve my work.</td>
<td>4.28</td>
<td>1.13</td>
<td>-0.14</td>
<td>-0.36</td>
</tr>
<tr>
<td>PU2</td>
<td>Using CALL 2.0 will enhance my effectiveness.</td>
<td>4.21</td>
<td>1.19</td>
<td>-0.16</td>
<td>-0.43</td>
</tr>
<tr>
<td>PU3</td>
<td>Using CALL 2.0 will increase my productivity.</td>
<td>4.23</td>
<td>1.20</td>
<td>-0.17</td>
<td>-0.45</td>
</tr>
<tr>
<td>PEU Scale (α = .79)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEU1</td>
<td>My interaction with CALL 2.0 is clear and understandable.</td>
<td>3.95</td>
<td>1.22</td>
<td>0.01</td>
<td>-0.47</td>
</tr>
<tr>
<td>PEU2</td>
<td>I find it easy to get CALL 2.0 to do what I want it to do.</td>
<td>4.06</td>
<td>1.20</td>
<td>-0.08</td>
<td>-0.37</td>
</tr>
<tr>
<td>PEU3</td>
<td>I find CALL 2.0 easy to use.</td>
<td>4.00</td>
<td>1.21</td>
<td>-0.06</td>
<td>-0.36</td>
</tr>
<tr>
<td>CSE Scale (α = .79)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSE2</td>
<td>I know enough to use CALL 2.0 technologies.</td>
<td>3.89</td>
<td>1.28</td>
<td>-0.05</td>
<td>-0.55</td>
</tr>
<tr>
<td>CSE3</td>
<td>I could easily use CALL 2.0 technologies on my own.</td>
<td>3.98</td>
<td>1.17</td>
<td>-0.05</td>
<td>-0.28</td>
</tr>
<tr>
<td>TPACK Scale (α = .86)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPACK1</td>
<td>I can teach lessons that appropriately combine</td>
<td>3.98</td>
<td>1.21</td>
<td>-0.12</td>
<td>-0.27</td>
</tr>
<tr>
<td>Code</td>
<td>Items</td>
<td>$M$</td>
<td>$SD$</td>
<td>Skew</td>
<td>Kurtosis</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>------</td>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td></td>
<td>content, Web 2.0 applications, and teaching approaches.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPACK2</td>
<td>I can select Web 2.0 applications to use in my classroom that enhance what I teach, how I teach, and what students learn.</td>
<td>3.93</td>
<td>1.15</td>
<td>0.05</td>
<td>-0.24</td>
</tr>
<tr>
<td>TPACK3</td>
<td>I can use strategies that combine content knowledge, Web 2.0 applications, and teaching approaches that I learned about in my coursework in my classroom.</td>
<td>3.96</td>
<td>1.20</td>
<td>-0.03</td>
<td>-0.26</td>
</tr>
<tr>
<td>TPACK4</td>
<td>I can provide leadership in helping others to coordinate the use of content, Web 2.0 applications, and teaching approaches at my school.</td>
<td>3.96</td>
<td>1.22</td>
<td>-0.07</td>
<td>-0.23</td>
</tr>
<tr>
<td>TPACK5</td>
<td>I can choose technologies that enhance the content for a lesson.</td>
<td>3.93</td>
<td>1.23</td>
<td>-0.04</td>
<td>-0.38</td>
</tr>
<tr>
<td></td>
<td><strong>SN Scale (α = .81)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SN1</td>
<td>People whose opinions I value will encourage me to use CALL 2.0.</td>
<td>4.06</td>
<td>1.20</td>
<td>-0.20</td>
<td>-0.24</td>
</tr>
<tr>
<td>SN2</td>
<td>People who are important to me will support me to use CALL 2.0.</td>
<td>4.02</td>
<td>1.23</td>
<td>-0.02</td>
<td>-0.49</td>
</tr>
<tr>
<td>SN3</td>
<td>People look forward to my use of CALL 2.0.</td>
<td>4.00</td>
<td>1.22</td>
<td>-0.18</td>
<td>-0.17</td>
</tr>
<tr>
<td></td>
<td><strong>FC1 Scale (α = .89)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FC1_1</td>
<td>When I need help to use CALL 2.0, guidance is available to me.</td>
<td>3.99</td>
<td>1.26</td>
<td>-0.15</td>
<td>-0.30</td>
</tr>
<tr>
<td>FC1_2</td>
<td>When I need help to use CALL 2.0, specialised instruction is available to help me</td>
<td>3.99</td>
<td>1.22</td>
<td>-0.09</td>
<td>-0.46</td>
</tr>
<tr>
<td>FC1_3</td>
<td>When I need help to use CALL 2.0, someone is available to help me.</td>
<td>3.99</td>
<td>1.24</td>
<td>-0.17</td>
<td>-0.25</td>
</tr>
<tr>
<td>FC1_4</td>
<td>Schools have the hardware needed to use CALL 2.0 in teaching English.</td>
<td>3.95</td>
<td>1.27</td>
<td>-0.08</td>
<td>-0.38</td>
</tr>
<tr>
<td>FC1_5</td>
<td>Schools have the software needed to use CALL 2.0</td>
<td>4.03</td>
<td>1.24</td>
<td>-0.08</td>
<td>-0.43</td>
</tr>
</tbody>
</table>

149
<table>
<thead>
<tr>
<th>Code</th>
<th>Items</th>
<th>$M$</th>
<th>$SD$</th>
<th>Skew</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC1_6</td>
<td>Schools have the necessary peripheral equipment to use CALL 2.0 in teaching English.</td>
<td>3.96</td>
<td>1.21</td>
<td>0.01</td>
<td>-0.35</td>
</tr>
<tr>
<td>FC1_7</td>
<td>Schools have the necessary Internet access to use CALL 2.0 in teaching English.</td>
<td>3.92</td>
<td>1.32</td>
<td>-0.22</td>
<td>-0.38</td>
</tr>
<tr>
<td>FC1_8</td>
<td>Schools allow me enough time to find and develop CALL 2.0 materials for teaching English.</td>
<td>3.95</td>
<td>1.22</td>
<td>-0.09</td>
<td>-0.22</td>
</tr>
<tr>
<td>FC1_9</td>
<td>Examination pressures get in the way of developing and using CALL 2.0 materials when teaching English.</td>
<td>4.00</td>
<td>1.25</td>
<td>-0.16</td>
<td>-0.25</td>
</tr>
<tr>
<td>FC1_10</td>
<td>School policy and resources allow me easy access to English-language CALL 2.0 resources.</td>
<td>3.95</td>
<td>1.25</td>
<td>-0.07</td>
<td>-0.41</td>
</tr>
</tbody>
</table>

**FC2 Scale ($\alpha = .89$)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Items</th>
<th>$M$</th>
<th>$SD$</th>
<th>Skew</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC2_1</td>
<td>I am able to access English-language social networking sites/tools for CALL 2.0 in teaching English.</td>
<td>4.01</td>
<td>1.19</td>
<td>-0.10</td>
<td>-0.36</td>
</tr>
<tr>
<td>FC2_2</td>
<td>I am able to access English-language collaborative sites/tools for CALL 2.0 in teaching English.</td>
<td>3.92</td>
<td>1.23</td>
<td>-0.05</td>
<td>-0.31</td>
</tr>
<tr>
<td>FC2_3</td>
<td>I am able to access major English-language sharing websites/tools as part of CALL 2.0 in teaching English.</td>
<td>3.94</td>
<td>1.20</td>
<td>-0.11</td>
<td>-0.23</td>
</tr>
<tr>
<td>FC2_4</td>
<td>I am able to access major English-language search engines as part of CALL 2.0 in teaching English.</td>
<td>3.87</td>
<td>1.25</td>
<td>-0.07</td>
<td>-0.39</td>
</tr>
<tr>
<td>FC2_5</td>
<td>I am able to access major English-language educational sites/tools as part of CALL 2.0 in teaching English.</td>
<td>3.93</td>
<td>1.23</td>
<td>-0.12</td>
<td>-0.32</td>
</tr>
</tbody>
</table>

**IU Scale ($\alpha = .71$)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Items</th>
<th>$M$</th>
<th>$SD$</th>
<th>Skew</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>IU1</td>
<td>I will use CALL 2.0 in the future.</td>
<td>4.14</td>
<td>1.09</td>
<td>-0.05</td>
<td>-0.16</td>
</tr>
<tr>
<td>Code</td>
<td>Items</td>
<td>$M$</td>
<td>$SD$</td>
<td>Skew</td>
<td>Kurtosis</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------------------------</td>
<td>-----</td>
<td>------</td>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>IU2</td>
<td>I plan to use CALL 2.0 often.</td>
<td>4.08</td>
<td>1.25</td>
<td>-0.13</td>
<td>-0.40</td>
</tr>
<tr>
<td>IU3</td>
<td>I will recommend CALL 2.0 to my future colleagues.</td>
<td>4.28</td>
<td>1.13</td>
<td>-0.14</td>
<td>-0.36</td>
</tr>
</tbody>
</table>

*Note.* CSE = CALL 2.0 self-efficacy; PU = perceived usefulness; PEU = perceived ease of use; SN = subjective norm; TPACK = technological pedagogical and content knowledge; FC1 = facilitating conditions (ICT infrastructure); FC2 = facilitating conditions (access to English CALL 2.0 resources); IU = intention to use.

### 6.2.2 Measurement invariance assessment.

In accordance with the discussion in Section 4.6.6, a measurement invariance test was first performed to test the factorial validity of the Phase-1 measurement model and to check whether the same factorial structure can be held for the Phase-2 sample. Since new items were developed for facilitating conditions in Phase 2, the newly added items were excluded in this step to test the invariance of measurement and structural characteristics between the two groups. Figure 24 provides a graphic presentation of the measurement invariance test.
Figure 24. Phase-1 sample

Phase-2 sample.

Before testing the two groups as a whole, the model fit indices of the two groups were checked respectively. The results listed in Table 23 suggested the presence of good model fit for Group 1 tested with Phase-1 sample ($\chi^2 = 447.42; \chi^2/df = 2.38, p = .12; CFI = .95; \gammahat = .92; \text{RMSEA} = .07; \text{SRMR} = .05$) and Group 2 tested with Phase-2 sample ($\chi^2 = 469.80; \chi^2/df = 2.50; CFI = .94; \gammahat = .92; \text{RMSEA} = .06; \text{SRMR} = .04$), which paved the way for further invariance testing.
Next, the configural invariance was tested with a baseline model consisting of these two groups with the identical indicator-factor structures. The model fit indices, as listed in Table 23, suggested that a good model fit was attained. On the basis of the established configural invariance, subsequent invariance tests were carried out respectively by (a) imposing equal factor loading constraints across both groups to test metric invariance; (b) imposing equal factor loading and equal intercept constraints to test scalar invariance; and (c) imposing equal factor loading, equal intercept, and equal residuals to test residual invariance. Table 25 presents the results of these invariance tests.

Table 25

Results of Measurement Invariance Tests

<table>
<thead>
<tr>
<th>Measurement model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2/df$</th>
<th>RMSEA</th>
<th>SRMR</th>
<th>CFI</th>
<th>$\Delta$CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>447.42</td>
<td>188</td>
<td>2.38</td>
<td>.07</td>
<td>.05</td>
<td>.95</td>
<td>--</td>
</tr>
<tr>
<td>Group 2</td>
<td>469.80</td>
<td>188</td>
<td>2.50</td>
<td>.06</td>
<td>.04</td>
<td>.94</td>
<td>--</td>
</tr>
<tr>
<td>Configural equivalence</td>
<td>917.31</td>
<td>376</td>
<td>2.44</td>
<td>.04</td>
<td>.05</td>
<td>.946</td>
<td>--</td>
</tr>
<tr>
<td>Metric equivalence</td>
<td>960.32</td>
<td>391</td>
<td>2.46</td>
<td>.05</td>
<td>.05</td>
<td>.944</td>
<td>.002</td>
</tr>
<tr>
<td>Scalar equivalence</td>
<td>1324.61</td>
<td>413</td>
<td>3.21</td>
<td>.06</td>
<td>.07</td>
<td>.910</td>
<td>.034</td>
</tr>
<tr>
<td>Residual equivalence</td>
<td>2230.07</td>
<td>463</td>
<td>4.81</td>
<td>.07</td>
<td>.08</td>
<td>.825</td>
<td>.085</td>
</tr>
</tbody>
</table>

Results showed that the two groups met the requirements for configural invariance (RMSEA ≤ .05) and metric invariance ($\Delta$CFI ≤ .01), which suggested the same factorial structure held across the two groups, but they failed the more strict scalar invariance ($\Delta$CFI = .034), and residual invariance test ($\Delta$CFI = .085), which indicated they had different start values. Hence, it was concluded that the two samples were not from the same population since they responded differently to the questionnaire items, with the Phase-2 sample showing higher start values. This may be attributed to the fact that the Phase-1 questionnaire survey was
paper-based, while the Phase-2 questionnaire survey was Internet-based. It is likely that the
different data collection methods might have influenced the responses to the items. This also
meant that results from the subsequent analyses might not be applicable to the Phase-1
sample for uncontrolled reasons. Nonetheless, the metric invariance established did afford an
opportunity to delve into more proficient Web 2.0 participants.

6.2.3 Structural invariance assessment. Given the fact that only metric equivalence for the
measurement model between Phase-1 and -2 samples was established, it was likely that the
structural model would function differently across groups (G. T. Brown & Harris, 2012).
Therefore, the preferred structural model was further tested with Phase-1 and -2 samples as
two separated groups. Table 26 lists the test results.

Table 26
Results of Structural Invariance Tests

<table>
<thead>
<tr>
<th>Measurement model</th>
<th>Fit statistics</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>ΔCFI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>χ²</td>
<td>df</td>
<td>χ²/df</td>
<td>RMSEA</td>
<td>SRMR</td>
<td>CFI</td>
<td></td>
</tr>
<tr>
<td>Group 1</td>
<td>468.15</td>
<td>193</td>
<td>2.38</td>
<td>.07</td>
<td>.05</td>
<td>.946</td>
<td>--</td>
</tr>
<tr>
<td>Group 2</td>
<td>487.46</td>
<td>193</td>
<td>2.53</td>
<td>.06</td>
<td>.04</td>
<td>.941</td>
<td>--</td>
</tr>
<tr>
<td>Configural equivalence</td>
<td>955.61</td>
<td>386</td>
<td>2.476</td>
<td>.05</td>
<td>.05</td>
<td>.944</td>
<td>--</td>
</tr>
<tr>
<td>Metric equivalence</td>
<td>996.59</td>
<td>401</td>
<td>2.485</td>
<td>.05</td>
<td>.05</td>
<td>.941</td>
<td>.003</td>
</tr>
<tr>
<td>Scalar equivalence</td>
<td>1360.92</td>
<td>423</td>
<td>3.217</td>
<td>.06</td>
<td>.07</td>
<td>.907</td>
<td>.034</td>
</tr>
<tr>
<td>Structural equivalence</td>
<td>1402.97</td>
<td>433</td>
<td>3.24</td>
<td>.06</td>
<td>.08</td>
<td>.904</td>
<td>-.003</td>
</tr>
</tbody>
</table>

As presented in Table 24, the model fit statistics showed that the Phase-1 structural model
possessed adequate model fit to the Phase-2 sample data ($\chi^2 = 487.46; \chi^2/df = 2.53, p = .11;$
CFI = .94; gamma hat = .92; RMSEA = .06; SRMR = .04) and that configural invariance
(RMSEA ≤ .05) and metric invariance (ΔCFI ≤ .01) were achieved. However, no evidence of scalar equivalence (ΔCFI = .034) was identified.

Next, to examine the differences in path coefficients, a two-group structural model test with metric invariances was performed. Figure 25 presents the test results.

Phase 1 sample

Phase 2 sample

*Figure 25. Results of the multi-group structural model test based on metric invariance.*
To sum up, Phase-2 results further confirmed that IU was under the direct influence of PU and TPACK, resulting in an $R^2$ of .83, which meant the two factors together explained 83% of the variation in IU. The variances of the other two endogenous constructs—PEU and PU—explained by their determinants, were 52% and 62% respectively. In addition, TPACK exerted a significant positive effect on IU. Similar to the statistical results reported in the Phase-1 study (see Section 5.1.2.4), PEU did not have a statistically significant loading on IU and was predicted strongly by CSE and moderately by FC. PU was strongly predicted by PEU and moderately by SN. The test results were mostly in alignment with the results of the Phase-1 study, except for the missing of the significant influence of FC upon IU. This may be caused by the inclusion of more items measuring other possible aspects of FC, which would be further tested later. Nonetheless, the results supported the validity of the Phase-1 model.

Next, efforts were made to clarify the nature of facilitating conditions, testing an interrelated two-factor measurement model for the expanded facilitating conditions.

### 6.2.4 Measurement model test for the expanded facilitating conditions

On the basis of the Phase-1 study, the latent construct of facilitating conditions was expanded as facilitating conditions (ICT infrastructure) and facilitating conditions (access to English-medium Web 2.0 sites). Since these two facilitating conditions were newly added, a measurement model test was performed to verify their validity and reliability.
In accordance with recommended cut-off model fit indices discussed in Section 4.6.4, results suggested that the measurement model possessed acceptable model fit to the sample data ($\chi^2 = 340.24; \chi^2/df = 3.8, p = .05; CFI = .93; \text{gamma hat} = .92; \text{RMSEA} = .08; \text{SRMR} = .05$).

6.2.5 **Structural test with the expanded facilitating conditions.** Given the establishment of the measurement model for the expanded facilitating conditions, these two types of
facilitating conditions were added into the preferred Phase-1 structural model. Specifically, in line with the proposed hypotheses related to facilitating conditions, four paths, from facilitating conditions (ICT infrastructure) and facilitating conditions (access to English-medium Web 2.0 sites), to perceived ease of use and intention to use CALL 2.0, were added to the structural model and tested.

**Figure 27.** Test results of Phase 2 structural model.

The results suggested that the expanded structural model possessed acceptable model fit to the sample data ($\chi^2 = 1280.27; \chi^2/df = 2.54, p = .11; CFI = .91; \gammahat = .92; \text{RMSEA} = .06; \text{SRMR} = .04$).
6.3 Results

In the expanded structural model, statistics suggested that IU was determined by TPACK, PU and FC (access to English-medium Web 2.0 sites), with an $R^2$ of .93, which meant these three factors together explained 93% of the variation in IU. The variances of the other two endogenous constructs—PEU and PU—explained by their determinants, were 53% and 61% respectively. In addition, FC (access to English-medium Web 2.0 sites) had the strongest effect on IU. Similar to the statistical results in the Phase-1 study, PEU did not have a statistically significant loading on IU and was predicted strongly by CSE and FC (ICT infrastructure). PU was strongly predicted by PEU and moderately by SN. Table 27 lists the hypothesis testing results. Among the 12 hypotheses, seven were supported, yet these seven hypotheses were in line with the results of Phase-1 study. Furthermore, it revealed that a dichotomy of facilitating conditions into ICT infrastructure and access to English-medium Web 2.0 resources was necessary.

Table 27

Hypothesis Testing Results

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Path</th>
<th>Standardised path coefficient</th>
<th>$t$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1</td>
<td>PU $\rightarrow$ IU</td>
<td>.24</td>
<td>2.95**</td>
</tr>
<tr>
<td>H2</td>
<td>PEU $\rightarrow$ PU</td>
<td>.69</td>
<td>8.76**</td>
</tr>
<tr>
<td>H4</td>
<td>CSE $\rightarrow$ PEU</td>
<td>.43</td>
<td>4.30**</td>
</tr>
<tr>
<td>H6</td>
<td>SN $\rightarrow$ PU</td>
<td>.14</td>
<td>2.17</td>
</tr>
<tr>
<td>H8</td>
<td>FC_IT $\rightarrow$ PEU</td>
<td>.34</td>
<td>3.04**</td>
</tr>
<tr>
<td>H9</td>
<td>FC_ACCESS $\rightarrow$ IU</td>
<td>.64</td>
<td>5.39**</td>
</tr>
<tr>
<td>H12</td>
<td>TPACK $\rightarrow$ IU</td>
<td>.46</td>
<td>2.24*</td>
</tr>
<tr>
<td>Not Supported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3</td>
<td>PEU → IU</td>
<td>.04</td>
<td>0.43</td>
</tr>
<tr>
<td>--------</td>
<td>------------</td>
<td>-----</td>
<td>------</td>
</tr>
<tr>
<td>H5</td>
<td>CSE → IU</td>
<td>-.32</td>
<td>-1.72</td>
</tr>
<tr>
<td>H7</td>
<td>SN → IU</td>
<td>.06</td>
<td>0.56</td>
</tr>
<tr>
<td>H8</td>
<td>FC_ACCESS → PEU</td>
<td>.00</td>
<td>-0.02</td>
</tr>
<tr>
<td>H9</td>
<td>FC_IT → PEU</td>
<td>-.05</td>
<td>-0.35</td>
</tr>
</tbody>
</table>

*Note. CSE = CALL 2.0 self-efficacy; PU = perceived usefulness; PEU = perceived ease of use; SN = subjective norm; FC_IT = facilitating conditions (ICT infrastructure); FC_ACCESS = facilitating conditions (access to English-medium Web 2.0 sites); IU = intention to use; TPACK = technological pedagogical and content knowledge.*

The important new finding from this study was the dual nature of facilitating conditions and their different but strong impact upon intention and perceived ease of use. Environmental technology resources constraints supported perceptions that CALL 2.0 was easy to use, while access to useful resources contributed to the actual increase of intention to use CALL 2.0.

Clearly, knowing where to go and being able to access such resources functions as a sine qua non of intentionality in adopting CALL 2.0.
Chapter 7 Conclusion

The results of this thesis suggest that the landscape of computer assisted language learning in mainland China is undergoing some change. Though positive results and findings have been constantly reported in the current CALL 2.0 research, the uptake of CALL 2.0 practices by EFL teachers in mainland China remains relatively low. Prior research (G. T. Brown, 2008) has identified that while contextual factors matter, educational users’ behaviour also depends upon their beliefs, which means that EFL teachers’ engagement level with CALL 2.0 should be influenced by both contextual factors and their beliefs around CALL 2.0. Therefore, a broad approach is needed to identify factors influencing CALL 2.0 acceptance by EFL teachers in mainland China and to investigate the complex relationships between these factors.

Against this backdrop, this thesis set out to investigate factors influencing mainland Chinese pre-service EFL teachers’ intention to use CALL 2.0. In the light of prior technology acceptance and technological pedagogical content knowledge research, six independent factors pertinent to teachers’ intentions to use technologies were identified, and a research model was proposed to investigate and determine the potential interrelationships among these factors. In addition, the research examined the applicability of technology acceptance research models for mainland China.

Specifically, a mixed methods research approach was adopted and an explanatory sequential mixed methods research design (Phase-1 QUAN + qual study and Phase-2 QUAN study) was implemented to answer the following two research questions:

- What factors are influencing mainland Chinese pre-service EFL teachers’ intention to use CALL 2.0?
- What are the potential relationships between these factors?
In Phase 1, a questionnaire-based survey and semi-structured interview were employed to collect data from pre-service EFL teachers enrolled at a representative case university in mainland China. A two-step structural equation modelling test provided strong empirical support for the original proposed research model, and directed content analysis revealed an overlooked aspect pertaining to facilitating conditions (access to English-medium Web 2.0 resources). On the basis of Phase-1 findings, a Phase-2 questionnaire was extended to include more items pertaining to facilitating conditions. Follow-up structural equation modelling tests were also conducted to validate the Phase-1 findings and to provide further clarification of the nature of facilitating conditions.

Next, the rest of this chapter presents summaries of the main findings, discusses implications, and outlines possible future research directions.

### 7.1 Findings

A summary of the research findings is provided first. On the whole, this study advanced the understanding of factors influencing mainland Chinese pre-service EFL teachers’ intention to use CALL 2.0. In Phase-1 and Phase-2 studies, a total of 12 hypotheses between six independent variables and one dependent variable were rigorously tested. It was found that there existed a significant, direct positive influence on intention to use CALL 2.0 from perceived usefulness, facilitating conditions (access to English-medium Web 2.0 resources), and technological pedagogical content knowledge. However, contrary to our expectation, perceived ease of use, social norms, CALL 2.0 self-efficacy, and facilitating conditions (access to English-medium Web 2.0 resources) did not have significant direct positive influence on intention to use CALL 2.0. The obtained model accounted for 70% of the variance (adjusted $R^2$) in teachers’ intention to use CALL 2.0.
7.1.1 Perceived usefulness. The statistical modelling indicated that the more pre-service EFL teachers in mainland China are aware of the potentials and benefits of CALL 2.0, the more likely they are to use CALL 2.0 in their future classrooms. This parallels the general findings in prior TAM studies (e.g., Davis, 1989, 1993; Davis et al., 1992; Kiraz & Ozdemir, 2006; Sadaf et al., 2013; Sang, Valcke, van Braak, & Tondeur, 2010). This is also in line with recent TAM research findings on the integration of Web 2.0 technologies into other educational sectors (e.g., Abdullah & Ward, 2016; H.-M. Huang, Liaw, & Lai, 2016; Shiau & Chau, 2016; Yeou, 2016).

Furthermore, the qualitative findings of the Phase-1 study suggests that at present, among mainland Chinese pre-service EFL teachers, CALL 2.0 is perceived to be useful for (a) information retrieval, (b) productivity, and (c) communication. Overall, participants had favourable responses with regard to the usefulness of CALL 2.0, which is an encouraging sign for their future acceptance of CALL 2.0.

7.1.2 Perceived ease of use. The classic notion in TAM that intention to use technology is under the direct influence of perceived ease of use is challenged in this study. The statistical results indicate that perceived ease of use had significant positive influence upon perceived usefulness, but no significant direct influence upon intention to use CALL 2.0. Thus ease of using technology is imperative in predicting the usefulness of CALL 2.0, and teacher perceptions of greater usefulness of educational technology probably depend upon perceived ease of use (e.g., Arpaci, 2016; Cigdem & Ozturk, 2016).

However, the lack of direct influence from perceived ease of use upon intention to use CALL 2.0 differs from previous research (e.g., Davis, 1989; Venkatesh & Davis, 1996). This disparity may be attributed to the mainland China context where current Web 2.0 technologies, such as digital devices and social media, have decreased the technical threshold
of CALL 2.0 practices. With the increasing use and influence of Web 2.0 technologies in every aspect of these mainland Chinese pre-service EFL teachers’ daily lives, it is reasonable to speculate that perceived ease of use would be irrelevant towards intention to use CALL 2.0. In other words, because Web 2.0 technologies are generally easy to use in everyday life, this factor no longer relates to intentionality as it once did.

7.1.3 CALL 2.0 self-efficacy. Both surveys suggest that that increasing CALL 2.0 self-efficacy could result in significant positive influence upon perceived ease of use, echoing other studies (e.g., Ariff et al., 2012). Therefore, it can be inferred that as their CALL 2.0 self-efficacy grows, mainland Chinese pre-service EFL teachers would perceive CALL 2.0 to be easier to use, leading to greater perceived usefulness. Qualitative analysis results suggest most participants rated their CALL 2.0 self-efficacy as high. This may stem from the ICT education these mainland Chinese pre-service EFL teachers have received. Against this backdrop, it is reasonable to believe that they would perceive CALL 2.0 to be technically easy to use.

However, contrary to common expectations, CALL 2.0 self-efficacy did not have a direct positive influence upon intention to use CALL 2.0. A plausible explanation is that the three items measuring CALL 2.0 self-efficacy focused on a relatively general level, instead of an application-specific level. Alternately, the high penetration of digital technologies and mobile devices in China could mean that mainland Chinese pre-service EFL teachers already feel comfortable and confident in using Web 2.0 technologies. However, everyday technical competence does not necessarily result in knowing how to select or use language-learning technologies appropriately (Hubbard, 2008; Hubbard & Levy, 2006; Kessler, 2007; Levy & Stockwell, 2006). Teaching future EFL teachers needs to focus on knowing how to use Web
2.0 technologies to foster language proficiency, which is different to knowing how to use Web 2.0 technologies.

7.1.4 Subjective norms. In this thesis, significant positive effect from subjective norms upon perceived usefulness was confirmed in both surveys, echoing prior research, which highlights the influence of an authority or a superior’s opinion or judgement on the usefulness of a technology. However, perceived subjective norms had no significant influence upon intention to use CALL 2.0, consistent with research into mainland Chinese university students’ intention to use MOOCs (M. Zhou, 2016). Although other studies have argued that subjective norms in collective societies such as China are influential (P. Lee & Wan, 2010), the current result might be attributable to the age of the participants. It is generally accepted that the post-90s generation in mainland China is much less constrained by social norms because of greater opportunities for individual self-development (Xie, Wu, & Yang, 2010). Alternately, as revealed in the qualitative interviews in Phase 1, despite instructors recommending the use of CALL 2.0 to the students, there was little use of CALL 2.0 in classes. Hence, the influence of the social norm can lack power to persuade greater use of CALL 2.0 if the social norm is not demonstrated in teacher education practice.

7.1.5 Facilitating conditions. Facilitating conditions were found to be the strongest predictor of mainland Chinese pre-service EFL teachers’ intention to use CALL 2.0. This is consistent with research on Singaporean pre-service teachers (Teo, 2009). However, when generic facilitating conditions were decomposed into ICT infrastructure and access to English-language Web 2.0 sites, it was found that the latter was the stronger predictor of intention to use CALL 2.0, while the former influenced perceived ease of use. Thus, under contemporary conditions in mainland China, access to English-language Web 2.0 resources seems to be the essential prerequisite for greater CALL 2.0 usage. This advance in understanding the nature
of facilitating conditions has also recently been found in a study on tele-collaboration (Fuchs, 2016).

7.1.6 Technological pedagogical and content knowledge. With regard to technological pedagogical content knowledge, it was found that TPACK had direct significant positive influence upon intention to use CALL 2.0, with no mediation from either perceived usefulness or perceived ease of use. This is a relatively new consideration within technology acceptance research, with little empirical research done to date. The positive aspect here is that both surveys showed that mainland Chinese pre-service EFL teachers were aware of the important interface between pedagogy, technology, and content knowledge as an important component of intending to use CALL 2.0. Use of CALL 2.0 is not the penicillin to the challenges in the language-learning process, and the key is knowing how to use these opportunities afforded by CALL 2.0 to create better language-learning practices.

7.2 Limitations

The results of this study need to be evaluated in light of limitations inherent in its design and implementation. First, though theoretically distinct constructs and robust statistical measures were employed in this study, it should be pointed out that the multicollinearity indicated by high correlations among factors may limit the generalisability of the findings of the present study. Nonetheless, the instability of regression weight estimates (esp. noticed in CSE to IU) remained consistently statistically non-significant, suggesting that the SEM approach taken correctly identified that these two factors are consistently independent of each other. The exclusion of one reverse coded item from the CSE factor may also have contributed to the observed instability in effect size. Future research should aim to increase the number of valid indicators for Call 2.0 self-efficacy as a construct or alternately, remove it as a potential
predictor of intention to use in favour of greater emphasis on technology pedagogical content knowledge and facilitating conditions.

Next, the data were collected in a single academic institution in mainland China, and thus may not be representative of the Chinese pre-service EFL teacher population in general. This possibility needs to be addressed in future studies. The convenience sampling strategy employed may also have decreased the generalisability of the research findings. Therefore, its generalisability and depth is to some extent limited. Finally, although technology acceptance intentions have been proven to be reliable indicators of actual technology acceptance, the intentions of these participants may change after they begin to teach. Thus the current cross-sectional studies do not expose how intentions to use CALL 2.0 play out in real teaching practice under differing facilitating conditions. Future research involving larger sample sizes and longitudinal designs would be useful in determining the relationship between the intention to use CALL 2.0 and the actual use of CALL 2.0 when teaching. It would also be useful in detecting effective intervention programmes for implementation during teacher-training and in the transition to employment as practicing teachers.

Further, the technology acceptance attitudes, intentions, and behaviours of in-service EFL teachers under different facilitating conditions should be examined. An inevitable consequence of conducting the quantitative dominant study in one site means that future mixed methods research across multiple EFL teacher-preparation sites is needed to validate and deepen the current results. Additionally, it would be interesting to examine whether the impact of facilitating conditions plays an equally important role for teachers (both pre- and in-service) in domains other than English-language teaching and learning. Cross-jurisdictional studies in Chinese-speaking societies (e.g., Taiwan, Hong Kong, Macau, or Singapore) may also be conducted to identify the impact of different policy frameworks upon
the nature of facilitating conditions. Nonetheless, assuming the current results are applicable beyond the case, they do suggest implications for research and practice.

7.3 Theoretical Implications

From a theoretical perspective, this study contributes to existing technology acceptance literature and may have implications for the field of computer assisted language learning.

7.3.1 Technology acceptance modelling. TAM research has long claimed that perceived ease of use and perceived usefulness would mediate other factors influencing intentions to use technologies. The lack of significant perceived ease of use upon intention to use CALL 2.0, found in this thesis, contradicts these classic core TAM claims. This may arise because of the developments in current Web 2.0 technologies. Many aspects of the technologies have changed fundamentally, such as easy-to-operate hardware and software, increasing penetration of such technologies in the population, and expanding capacities of digital devices. Therefore, changes to the classic TAM models need to be introduced because of the very different state of digital technologies relative to the time period when TAM research was initially launched. Since developing nations are unlikely to take the same route to technology implementation in society and schools as seen in Western nations (i.e., implementation begins with Web 2.0, jumping over early generation text-based computing and Internet interfaces), it seems highly likely that technology acceptance research will have to move with the times, a conclusion supported by this thesis against the backdrop of a high-technology use mainland China.

The decomposition of facilitating conditions into technical support and access in this thesis provides further insights into the way in which environmental and contextual factors need to be considered within TAM research.
Well-planned lessons can easily be subverted by sudden drop-off of the Internet, failure of software to launch properly, or a hardware system not working. Timely technical support for use of technology in a classroom setting is important to avoid panic or chaos in classroom usage of CALL 2.0. Such support includes training to operate the version or instantiation of the technology deployed in a specific school. It is possible that the teacher can operate version X of a language-learning application or machine but the school operates version Y, which is not familiar to the teacher. Hence, technical advice, device management, support and training, and other logistic issues are essential facilitating conditions. Administrative support for the use of CALL 2.0 in teaching English is also essential. Integrating technology into language learning is more complex than using paper-based documents and so extra time allowance is required.

The importance of access to English-medium Web 2.0 resources as a predictor of mainland Chinese pre-service EFL teachers’ intentions to use CALL 2.0 suggests that the social and political environment matters greatly. This is an area that has generally been overlooked in previous technology acceptance research and certainly needs to be taken note of in societies where free, open access is not the norm. China is not alone in limiting open access to all content on the Internet; indeed, the Committee to Protect Journalists (2015) has placed mainland China at number 8 on the list of the 10 most repressive countries that restrict Internet access, all of which do not have English as a first language. Thus the issues around access encountered by Chinese EFL teachers are not unique to their context. Hence, access and control policies will distort assumptions in TAM that will hold true among users who have free and open access to all Internet content.

7.3.2 Computer assisted language learning. Furthermore, this study applied technology acceptance research on a domain-specific construct (i.e., computer assisted language learning)
in accordance with calls for more domain-specific research in technology acceptance research (Legris et al., 2003). Hence, the lack of mediation effects of technological pedagogical and content knowledge upon intention to use CALL 2.0 via perceived usefulness and perceived ease of use may imply that within some specific domains the general technology acceptance model is not supported. Technology acceptance research in educational contexts needs to incorporate insights related to the pedagogical functions of technology. Future technology acceptance research for teaching needs to integrate the pedagogical application of technologies rather than focus on the teacher simply using technology as an end in itself. The point of CALL 2.0 is that it is about using technology for teaching, not using technology for itself. The results suggest that an intention to use CALL 2.0 might be quite different to an intention to use Web 2.0 technologies themselves. Keeping an eye on the specific purpose for technology will change results and non-consistency should be expected.

This thesis also enriches the research perspectives for the multi-disciplinary field of CALL by borrowing insights from technology acceptance and technological pedagogical and content knowledge research to explore the predictive power of a conceptual model. Through statistical modelling, factors influencing mainland Chinese pre-service EFL teachers’ intention to use CALL 2.0 and their interrelationships were revealed. Specifically, this vein of research fits within the broader CALL normalisation research and responds to the increasing call for more empirical evidence to make informed decisions to solve the longstanding problem of low uptake of CALL by EFL teachers.

7.4 Practical Implications

A number of practical implications related to EFL teacher education, school leaders, and policy makers in mainland China can also be tentatively drawn from this thesis.
7.4.1. EFL teacher education. From the data, it is apparent that the mere presence of an introductory course of general technology does not guarantee pre-service EFL teachers’ CALL 2.0 intentionality (Kessler, 2007). Therefore, in order to achieve the expected goals of using CALL 2.0 in future EFL classrooms, a number of changes to teacher education can be considered. Teacher education should aim to integrate existing subject content knowledge and technological knowledge into the educational process. Additionally, EFL teacher educators in mainland China may seek ways to support the development of student pedagogical abilities with Web 2.0 technology and encourage the habitual integration of technology into the teaching of language. That is, EFL teacher training might benefit by developing prospective teachers’ technological pedagogical and content knowledge.

To be successful in increasing use of CALL 2.0 in EFL classrooms, teacher education needs to focus on knowing how to use technology for language learning, not on learning to use technology. Courses aiming at fostering TPACK for CALL 2.0 would have to be designed and tested within the EFL teacher-training curricula to establish their merit and value. Within these courses, teacher educators would set clear learning goals that should be accomplished with appropriate Web 2.0 technologies, and create a favourable learning environment for pre-service EFL teachers to develop their TPACK knowledge and reduce their reliance on ICT technical support. During this process, pre-service EFL teachers would need opportunities to explore innovative CALL 2.0 practices independently and be offered more coursework workshops and opportunities for them to showcase mock lessons and acquire specialised knowledge. Teachers educators might consider functioning as role models to guide these pre-service teachers by fostering their practical CALL 2.0 skills (e.g., advice on how to plan a lesson with the support of CALL 2.0, how to integrate CALL 2.0 for different kinds of formal tests, how to gain access to English-medium web resources under certain circumstances, and how to prepare for unexpected technical failures in teaching). All
of these efforts should be evaluated for their potential benefit to the pre-service EFL teachers’ future classroom practice to ensure they lead to positive outcomes for students.

In addition, during their training, it may be helpful for pre-service teachers to be advised of the latest benefits and positive research findings of CALL 2.0 to engender robust beliefs in the usefulness of CALL 2.0. Teachers who do not realise the advantages of CALL 2.0 are less likely to change their prior beliefs. In view of the heavy workload pressure EFL teachers in mainland China have to face, this type of information should include not only the benefits to learners (e.g., authentic experience and real-time feedback) but also the benefits to teachers (e.g., improvement of efficiency and productivity).

7.4.2 School leaders. As regards the implications for school leaders, assuming these results generalise, it would be necessary for leaders to ensure that schools have reliable infrastructure for CALL 2.0, including stable and affordable Internet connectivity, adequate hardware, and timely technical support. Furthermore, given the high cost of technology investment and the high penetration of mobile devices among younger Chinese, more creative and effective measures such as the bring-your-own-device strategy could also be adopted to appropriately organise ICT resources.

School leaders need to understand that ICT availability and Internet accessibility does not necessarily transform classroom practice into CALL 2.0 implementation. For school leaders, more emphasis would need to be attached to highlighting the relevant aspects of perceived usefulness (e.g., content and function) instead of the technical features relating to perceived ease of use (e.g., interface). It may be practical for leaders to support several core technologies to the school so that teachers and students experience consistency, competence, and confidence in the ICT environment. Leaders are responsible for the creation of a favourable technology-friendly environment to support in-service EFL teachers’ collaborative
exploration of effective use of CALL 2.0. In this environment, EFL teachers within a school could connect with each other, and the content and successful classroom experience could be shared and disseminated in order to highlight the usefulness and relevance of CALL 2.0. Nonetheless, research evidence that these policy priorities are effective in Chinese school settings is yet to be provided.

7.4.3 Policy makers. The results of this research also imply that for educational policy makers, with the rapid development of Web 2.0 technologies and large investment in ICT in schools, there is a need for corresponding policy support to create a consistent plan that promotes effective CALL 2.0 practices. For governmental policy makers, the results of this thesis clearly suggest that it is not the lack of technologies but rather the lack of access to English-medium Web 2.0 resources that influences intentions to use CALL 2.0. This facet of facilitating conditions is a substantial roadblock in English-language learning as compared to other curricular areas in China, where many affordances of Web 2.0 are rendered possible by making use of the extensive social media infrastructure within mainland China. Indeed, it may be the lack of ease of access to communicate in English with correspondents outside China is a small contributor to the ‘silent English’ phenomenon of China. Hence, modifying the impact of the Great Firewall so non-controversial topics are available may allow EFL teachers the opportunity to implement their intention to use CALL 2.0.

By doing so, exemplary demonstrations, well-prepared digital content, favourable conditions, and successful CALL 2.0 experiences can be promoted at a national level. In addition, the form and content of ongoing professional development organised by the educational administration agencies could be adjusted from focusing on ICT skills to fostering more appropriate pedagogical use of ICT. Furthermore, given the importance of better examination results and the pressure to achieve those results in the Chinese education system, policy support should also be ready to encourage EFL teachers’ use of CALL 2.0 for
this purpose, though it may be seen as a deviation from the traditional path of ensuring high
scores at the beginning stage.

7.5 Contribution

This thesis has contributed to the fields of computer assisted language learning and
technology acceptance by identifying new and important insights into factors constraining
future teachers’ intentions to use CALL 2.0. This thesis shows clearly that in contemporary
Web 2.0 conditions, greater attention to the context of technology matters much more than
technology itself. The thesis shows that technology acceptance research that only focuses on
hardware and software misses the important constraints on educational technology adoption.
Specifically, the pedagogical purpose and functions embedded in using technology for
language learning matter more than the technology proper. Current technologies are so
intuitive and relatively easy to master that ease of use is of little consequence in a country
such as mainland China, which has launched a wide spectrum of powerful Web 2.0

technologies.

Most importantly, the empirical evidence outlined in this thesis indicates that Chinese
pre-service EFL teachers’ CALL 2.0 intentions are faced with a dilemma. On the one hand,
educational policies encourage the use of the Internet in learning English, while other policies
to do with access to certain information significantly constrain the feasibility and
effectiveness of the educational policies. When it comes to promoting CALL 2.0 acceptance
among mainland Chinese pre-service EFL teachers, and no doubt other nations with
restrictive policies, it should be noted that only when hardware, software, and policy are
combined effectively with developing technological pedagogical content knowledge in EFL
teachers, can the promise of CALL 2.0 be fulfilled and the benefits from the investment in
ICT be maximised. These findings point to substantial challenges for CALL 2.0 and, at the same time, point to possible solutions.

It is hoped that this thesis can be helpful in leading to the expected better use of ICT investment in the educational system, especially in terms of CALL 2.0, and instrumental in bringing about more social, cultural, and economic benefits for the country.
Appendix A: Draft Questionnaire for Translation

Chinese Pre-service EFL Teacher Questionnaire: Intention to Use Computer Assisted Language Learning 2.0 (CALL 2.0)

This survey is to help us learn more about factors influencing Chinese pre-service EFL teachers’ intention to use CALL 2.0 which is defined as the exploration, sometimes coherent, sometimes disparate, of all aspects of the human–computer axis, with the primary goal of enhancing the process of second-language teaching and learning, be it in curriculum design, delivery, testing, feedback, monitoring of evaluation, by means of Web 2.0 technologies. We need your assistance in reviewing the content of the following statements. Please read the English and Chinese versions of each statement and indicate how close each pair of statements is IN MEANING by circling the appropriate number as follows:

“4” very close
“3” close
“2” little bit close
“1” not close

Please focus on the meaning not the exact wording.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Rating</th>
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<tr>
<td>1. Using CALL 2.0 will enhance my teaching effectiveness.</td>
<td>4 3 2 1</td>
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<tr>
<td>2. Using CALL 2.0 will increase my productivity in my teaching.</td>
<td>4 3 2 1</td>
</tr>
<tr>
<td>3. Using CALL 2.0 will be useful for my teaching.</td>
<td>4 3 2 1</td>
</tr>
<tr>
<td>4. Learning to use CALL 2.0 in teaching will be easy.</td>
<td>4 3 2 1</td>
</tr>
<tr>
<td>5. It will be easy to get CALL 2.0 to carry out my teaching plan.</td>
<td>4 3 2 1</td>
</tr>
<tr>
<td>6. Using CALL 2.0 in teaching will be clear and understandable.</td>
<td>4 3 2 1</td>
</tr>
<tr>
<td>7. I could easily use CALL 2.0 technologies on my own.</td>
<td>4 3 2 1</td>
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<th>Statement</th>
<th>Rating</th>
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<tr>
<td>8. I would feel nervous using CALL 2.0. (R)</td>
<td>4 3 2 1</td>
</tr>
<tr>
<td>9. I know enough to use CALL 2.0 technologies.</td>
<td>4 3 2 1</td>
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<tr>
<td>10. I can teach lessons that appropriately combine content, CALL 2.0, and teaching approaches.</td>
<td>4 3 2 1</td>
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<tr>
<td>11. I can select CALL 2.0 applications to use in my classroom that enhance what I teach, how I teach, and what students learn.</td>
<td>4 3 2 1</td>
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<tr>
<td>12. I can use strategies that combine content knowledge, CALL 2.0, and teaching approaches that I learned about in my coursework in my classroom.</td>
<td>4 3 2 1</td>
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<tr>
<td>13. I can provide leadership in helping others to coordinate the use of content, CALL 2.0 applications, and teaching approaches at my school.</td>
<td>4 3 2 1</td>
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<tr>
<td>14. I can choose CALL 2.0 applications that enhance the content for a lesson.</td>
<td>4 3 2 1</td>
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<tr>
<td>15. People whose opinions I value will encourage me to use CALL 2.0 in teaching.</td>
<td>4 3 2 1</td>
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<td>16. People who influence my behaviour think that I should use CALL 2.0 in teaching.</td>
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<td>17. People expect me to use CALL 2.0.</td>
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<tr>
<td>18. When I need help to learn to use CALL 2.0, someone will be there to teach me.</td>
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<tr>
<td>19. When I encounter difficulties in using CALL 2.0 in my future teaching, I will know from whom I can seek advice.</td>
<td>4 3 2 1</td>
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<tr>
<td>20. I will have the resources necessary to teach with CALL 2.0.</td>
<td>4 3 2 1</td>
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<td>21. I will use CALL 2.0 in the future.</td>
<td>4 3 2 1</td>
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<tr>
<td>22. I plan to use CALL 2.0 often in my teaching.</td>
<td>4 3 2 1</td>
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<tr>
<td>23. I intend to use CALL 2.0 as much as possible in my teaching.</td>
<td>4 3 2 1</td>
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道从谁那里获得建议。
Appendix B: Phase-1 Questionnaire (Chinese)

中国职前英语教师调查问卷：使用Web 2.0应用辅助英语教学的意愿

非常感谢您同意完成此份调查问卷，本问卷旨在调查影响中国职前英语教师使用Web 2.0应用辅助英语教学的意愿的相关因素。

Web 2.0应用辅助教学指利用具备社交网络特质的相关应用（Apps）辅助英语教学的实践活动。它具体包括，但不限于下述实例：

1) 利用社交工具或网站进行英语教学（例如：QQ，人人，微信，微博等）；
2) 利用云存储服务分享文档，方便英语教学（例如：百度网盘，华为网盘，Dropbox，谷歌云端硬盘等）；
3) 利用视频网站分享视频，方便英语教学（例如：搜狐视频，爱奇艺，优酷等）；
4) 利用基于网络的知识管理工具，方便英语教学（例如：印象笔记，Prezi，Zotera等）；
5) 利用合作创制的网络百科全书，方便英语教学（例如：维基百科，百度百科等）；
6) 利用大型开放式网络课程（MOOC），方便英语教学（例如：网易公开课，Ted演讲，Coursera等）；
7) 利用平板电视或智能手机与互联网连线，方便英语教学（例如：苹果设备，安卓设备等）。

您填写完毕的问卷将会被进行编号，以便确定下一步研究的访谈对象。本次调研数据将只应用于学术研究，我们不会向任何人透漏您的相关信息。
第一部分
请填写相关信息，或在相应的选项上划圈。

姓名：_______________________
性别： 男  女
出生日期：_____________________(月份／年)
年级：
  • 大一
  • 大二
  • 大三
  • 大四
  • 研究生
班级：_______________________

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<td>网络知识管理工具（例如：印象笔记，Prezi，Zotera 等）</td>
<td>□</td>
<td>□</td>
<td>□</td>
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<tr>
<td>大型开放式网络课程（MOOC）（例如：网易公开课，Ted 演讲，Coursera 等）</td>
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<td>□</td>
<td>□</td>
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<tr>
<td>网络电子词典（例如：有道词典，金山词霸等）</td>
<td>□</td>
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</tr>
</tbody>
</table>

第二部分:
请在您认同的选项下标注，表明您对该表述的认同程度。

- 非常不认同
- 基本不认同
- 有些认同
- 认同
- 很很大程度上认同
- 非常认同

请注意对表述的认同程度自左至右逐步递增，最左侧为最不认同，最右侧为最认同。
<table>
<thead>
<tr>
<th>表述</th>
<th>非常不认同</th>
<th>基本不认同</th>
<th>有些认同</th>
<th>认同</th>
<th>很大程度上认同</th>
<th>非常认同</th>
</tr>
</thead>
<tbody>
<tr>
<td>1、使用计算机辅助外语教学 2.0 会提升我的教学效果。</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>2、使用计算机辅助外语教学 2.0 会提高我的教学效率。</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>3、计算机辅助外语教学 2.0 会对我教学很有用处。</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>4、学习在教学中使用计算机辅助外语教学 2.0 会是一件简单任务。</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>5、使用计算机辅助外语教学 2.0 实现我的教学计划会是容易的。</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>6、在教学中使用计算机辅助外语教学 2.0 是一件过程明确而且容易掌握的任务。</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>7、使用计算机辅助外语教学 2.0 让我紧张。</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>8、我对使用计算机辅助外语教学 2.0 有足够的了解。</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>9、我能够轻松独立地使用计算机辅助外语教学 2.0。</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>10、我能够恰当地将计算机辅助语言教学 2.0，课程内容和教学手段结合在一起。</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>11、我能够选择合适的计算机辅助语言教学 2.0 应用，来促进我的课程内</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>表述</td>
<td>非常不认同</td>
<td>基本不认同</td>
<td>有些认同</td>
<td>认同</td>
<td>很大程度上认同</td>
<td>非常认同</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------</td>
<td>------------</td>
<td>----------</td>
<td>------</td>
<td>----------------</td>
<td>---------</td>
</tr>
<tr>
<td>容、教学手段和学生的学习效果。</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12、我能够利用我所学的策略整合计算机辅助语言教学 2.0，课程内容和教学手段。</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13、我能够在帮助我的学生协调课程内容、计算机辅助外语教学 2.0 和教学手段上发挥主导作用。</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14、我能够选择合适的能提升教学效果的计算机辅助外语教学 2.0 应用。</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15、意见对我很重要的人支持我在教学中使用计算机辅助外语教学 2.0。</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16、对我的行为有影响力的人认为我应当在教学中使用计算机辅助外语教学 2.0。</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17、人们期望我使用计算机辅助外语教学 2.0。</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18、当我需要学习如何在教学中使用计算机辅助外语教学 2.0 时，有人会在我那里教导我。</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19、当我在在教学中使用计算机辅助外语教学 2.0 遇到困难时，我会知道从谁那里获得建议。</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20、我会有必要的资源去在教学中使用计算机辅助外语教学 2.0。</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>表述</td>
<td>非常不认同</td>
<td>基本不认同</td>
<td>有些认同</td>
<td>认同</td>
<td>很大程度上认同</td>
<td>非常认同</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------</td>
<td>------------</td>
<td>----------</td>
<td>------</td>
<td>----------------</td>
<td>----------</td>
</tr>
<tr>
<td>21、我会在我的教学中使用计算机辅助外语教学 2.0。</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>22、我计划在我的教学中经常使用计算机辅助外语教学 2.0。</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>23、我会在我的教学中尽可能多的使用计算机辅助外语教学 2.0。</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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</tr>
</tbody>
</table>

结束
Appendix C: Interview Protocol

**Project:** Factors influencing intention to use CALL 2.0

**Time of Interview:**

**Date:**
**Place:**
**Interviewer:**
**Interviewee:**

Describe the project and inform the interviewee of
(a) the purpose of the study,
(b) the individuals and sources of data being collected,
(c) what will be done with the recorded data to protect the confidentiality of the interviewee, and
(d) how long the interview will take.

Turn on the audio recording device and test it.

**Bullet Questions:**
1. Please describe your interaction with Web 2.0 applications (e.g. blogs, wikis, WeChat, Weibo, Facebook, YouTube, bookmarking tools, etc.).
2. To what extent are you using the Web 2.0 applications to supplement your language learning?
3. What motivates or hinders you from using Web 2.0 applications for language learning?
4. What is your opinion of using CALL 2.0 in your future teaching career?

(Thank the individuals for their cooperation and participation in this interview. Assure them of the confidentiality of the responses and the potential for future interviews.)
PARTICIPANT INFORMATION SHEET
Pre-service EFL Teachers

Project title: Towards an understanding of Chinese pre-service EFL teachers’ intention to use CALL 2.0

Researcher introduction
My name is Bing Mei. As a PhD student in the Faculty of Education at the University of Auckland, I wish to investigate Chinese pre-service EFL teachers’ intention to use CALL 2.0 and identify the fundamental determinants of their intention to use CALL 2.0 for my PhD study.

Project description and invitation
Computer Assisted Language Learning (CALL) has proved its value in the field of language education. But one prerequisite to its success is teachers’ willingness to adopt it. Though teachers’ reluctance and refusal to adopt CALL is not a rare phenomenon, as indicated in the extant research on CALL normalisation, the fact remains that there still exists a paucity of research on factors influencing teachers’ adoption of CALL.

You are invited to take part in this research project, which aims to understand more about what factors may influence Chinese pre-service EFL teachers’ intention to use CALL 2.0 in their future classroom. The Head of your School has given an assurance that your participation or non-participation in this study will not affect their relationship with your school or your grades. In my research, you will be asked to complete a self-report questionnaire and you may be selected to do a one-on-one interview with me. This research will be independent of the marking carried out for any course. Your participation and assistance would be appreciated.

Project Procedures
This research project consists of two stages. Firstly, you will be asked to complete a self-report questionnaire about intention to use CALL 2.0 which is presumably to be finished within 30 minutes. Secondly, selected students will be invited to participate in further interview on factors influencing intention to use CALL 2.0. It is anticipated that the interview will take a maximum of 60 minutes and be audio-taped by Digital Voice Recorder. The transcripts of the interview audio recordings will be used for research purposes only. Both stages will be conducted out of course hours. In addition, to facilitate the study, the researcher will ask you for permission to access your Test for English Majors (TEM) scores.

**Data storage/retention/destruction/future use**
The electronic data (recording files and data files) gathered in this research will be stored with all coding information removed. The files will be kept confidential on a password-protected computer at the University of Auckland. The signed consent form, completed questionnaires and written transcripts will be kept separately in locked cupboards on the premises of University of Auckland. All data will be stored for six years and then destroyed. Paper data will be shredded and the electronic deleted. A brief summary report of findings will be sent to you upon completion of the analyses, if you indicate you want this, by giving us your e-mail address. Results will also be disseminated in scholarly journals and conferences internationally and within China.

**Voluntary Participation**
This research project has been approved by the Head of the School of Foreign Languages, but you are under no obligation to participate and you have the right not to participate. If you are willing to participate, please indicate this on the attached consent form. Please also indicate if you are willing to participate in an interview and allow us to access your TEM score on the Consent Form. Your participation or non-participation will be kept confidential from the course lecturers and/or markers and will have no impact on any marks or grades awarded.

**Right to Withdraw from Participation**
For Phase 1, without having to give a reason, you may withdraw your consent for me to analyse your completed questionnaire before May 1, 2014; after that, your consent cannot be revoked. For Phase 2, interview participants have the right to withdraw from participation within two weeks after receiving the transcripts for editing; after that, your consent cannot be revoked.

**Anonymity and Confidentiality**
Questionnaires are not anonymous but your names will be replaced by code numbers and the code for individual participants will be accessible to the researcher alone.

As participants of the interview, you will not be able to be identified in any reporting from this study. All data from the interview will be anonymised and kept confidential to the researchers. The information gathered in this study will be secured so that it is accessible only to the researcher. The analysis and findings will be reported in a way that prevents the identification of individuals.

**Contact Details and Approval Wording**
Thank you very much for your time and help in making this project possible. Please take time to read and sign the consent form attached. I hope you will agree to participate in this research project under the conditions set out on the Participant Information Sheet. I look forward to your response.

Yours sincerely

________________________

University of Auckland contacts:

<table>
<thead>
<tr>
<th>Researcher</th>
<th>Supervisor</th>
<th>Co-Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bing Mei</td>
<td>Assoc. Prof. Gavin Brown</td>
<td>Dr Mark Gan Joo Seng</td>
</tr>
<tr>
<td>PhD Candidate</td>
<td>School of Learning, Development and Professional Practice, Faculty of Education, The University of Auckland</td>
<td>School of Learning, Development and Professional Practice, Faculty of Education, The University of Auckland</td>
</tr>
<tr>
<td><a href="mailto:b.mei@auckland.ac.nz">b.mei@auckland.ac.nz</a></td>
<td><a href="mailto:gt.brown@auckland.ac.nz">gt.brown@auckland.ac.nz</a></td>
<td><a href="mailto:m.gan@auckland.ac.nz">m.gan@auckland.ac.nz</a></td>
</tr>
<tr>
<td>13781176966</td>
<td>+64 9 623 8899 ext. 48602</td>
<td>+64 9 623 8899 ext. 46419</td>
</tr>
</tbody>
</table>

Local contact:

| Bing Mei | 4#3-6-1, xuefuyuan, shunhe, Kaifeng, China | Mobile: 13781176966 |

You may also contact the Head of School of Learning, Development and Professional Practice, Associate Professor Christine Rubie-Davies at c.rubie@auckland.ac.nz or +64 09 623 8899 ext. 82974.

For any queries regarding ethical concerns you may contact the Chair, The University of Auckland Human Participants Ethics Committee, The University of Auckland, Office of the Vice Chancellor, Private Bag 92019, Auckland 1142. Telephone 09 373-7599 ext. 83711.

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 18/11/2013 FOR 3 YEARS, Reference Number 010687
CONSENT FORM
Pre-service EFL Teachers

THIS FORM WILL BE HELD FOR A PERIOD OF 6 YEARS

Project title: Towards an understanding of Chinese pre-service EFL teachers’ intention to use CALL 2.0

Name of Researcher: Mr. Bing Mei (University of Auckland PhD student); Associate Professor Gavin Brown (Supervisor); Dr Mark Gan Joo Seng (Co-supervisor).

I have read the Participant Information Sheet and have understood the nature of the research. I have had the opportunity to ask questions and have had them answered to my satisfaction.

I agree to take part in this research as follows: (select one option)
- Participation in an interview if selected: YES NO
- Access to my Test for English Majors (TEM) Score YES NO

- I understand that whether or not I agree to take part in this project, the Head of School has given an assurance that my decision will not impact on my relationship with the school or my grades.
- I agree that the interview will be audio-taped.
- I understand that I am free to withdraw any interview data within two weeks after finishing the interview.
- I understand that the data will be stored securely for six years so that it can be used for further analysis. After this time the data will be destroyed by shredding.
- I request a report of findings after the data are analysed be sent to me at: ___________________________________________________________________ (insert e-mail address).

Full Name ___________________________

Signature ___________________________ Date _________________

- For interview purposes, I can be contacted:
  - E-MAIL: ____________________________________________________________
  - Telephone: ________________________________________________________

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 18/11/2013 FOR 3 Years, Reference Number 010687
## Appendix E: Common Parameter Notations in SEM

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Meaning</th>
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</thead>
<tbody>
<tr>
<td>η</td>
<td>eta</td>
<td>latent endogenous variables</td>
</tr>
<tr>
<td>ξ</td>
<td>xi</td>
<td>latent exogenous variables</td>
</tr>
<tr>
<td>ζ</td>
<td>zeta</td>
<td>latent error in equations</td>
</tr>
<tr>
<td>y</td>
<td>_</td>
<td>indicator items for latent endogenous variables</td>
</tr>
<tr>
<td>x</td>
<td>_</td>
<td>indicator items for latent exogenous variables</td>
</tr>
<tr>
<td>ε</td>
<td>epsilon</td>
<td>measurement errors for y indicator items</td>
</tr>
<tr>
<td>δ</td>
<td>delta</td>
<td>measurement errors for x indicator items</td>
</tr>
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<td>λ&lt;sub&gt;y&lt;/sub&gt;</td>
<td>lambda y</td>
<td>factor loadings from y to t</td>
</tr>
<tr>
<td>λ&lt;sub&gt;x&lt;/sub&gt;</td>
<td>lambda x</td>
<td>factor loadings from x to t</td>
</tr>
<tr>
<td>Β</td>
<td>beta</td>
<td>coefficient matrix for latent endogenous variables</td>
</tr>
<tr>
<td>Γ</td>
<td>gamma</td>
<td>coefficient matrix for latent endogenous variables</td>
</tr>
<tr>
<td>Φ</td>
<td>phi</td>
<td>covariance matrix for latent exogenous variables</td>
</tr>
<tr>
<td>Ψ</td>
<td>psi</td>
<td>covariance matrix for the errors of latent endogenous variables</td>
</tr>
<tr>
<td>Θ&lt;sub&gt;ε&lt;/sub&gt;</td>
<td>theta epsilon</td>
<td>covariance matrix for measurement errors for the y indicator items</td>
</tr>
<tr>
<td>Θ&lt;sub&gt;δ&lt;/sub&gt;</td>
<td>theta delta</td>
<td>covariance matrix for measurement errors for the x indicator items</td>
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</table>
## Appendix F: Coding Book

<table>
<thead>
<tr>
<th>Code</th>
<th>Label</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived usefulness</td>
<td>PU</td>
<td>The degree to which a participant believes that engaging with CALL 2.0 will enhance language learning</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>PEU</td>
<td>The degree to which a participant believes that engaging with CALL 2.0 would be free from effort</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>SN</td>
<td>A participant’s perception that most people, who are important to him or her, think he or she should or should not engage with CALL 2.0.</td>
</tr>
<tr>
<td>Facilitating conditions</td>
<td>FC</td>
<td>Conditions that a participant perceives to be important in facilitating his or her engagement with CALL 2.0.</td>
</tr>
<tr>
<td>CALL 2.0 self-efficacy</td>
<td>CSE</td>
<td>A participant’s beliefs about his or her capabilities to engage with CALL 2.0.</td>
</tr>
<tr>
<td>Technological pedagogical content knowledge</td>
<td>TPACK</td>
<td>The knowledge necessary for teachers’ to integrate technology in their classrooms.</td>
</tr>
<tr>
<td>Intention to use CALL 2.0</td>
<td>IU</td>
<td>Their self-reported willingness to integrate CALL 2.0 in their future classrooms.</td>
</tr>
</tbody>
</table>
Appendix G PIS and CF for Head of the School

PARTICIPANT INFORMATION SHEET
Head of the School

Project title: Towards an understanding of Chinese pre-service EFL teachers’ intention to use CALL 2.0

Researcher introduction
My name is Bing Mei. As a PhD student in the Faculty of Education at the University of Auckland, I wish to investigate Chinese pre-service EFL teachers’ intention to use CALL 2.0 and identify the fundamental determinants of their intention to use CALL 2.0 for my PhD study.

Project description and invitation
Computer Assisted Language Learning (CALL) has proved its value in the field of language education. But one prerequisite to its success is teachers’ willingness to adopt it. Though teachers’ reluctance and refusal to adopt CALL is not a rare phenomenon, as is indicated in the extant research on CALL normalisation, the fact remains that there still exists a paucity of research on factors influencing teachers’ adoption of CALL.

The School of Foreign Languages at Henan University is chosen to participate in this research project because of its reputable pre-service EFL teacher-training program. If you give consent to this research, I will recruit participants from your school. Your assistance would be much appreciated.

Project Procedures
This research project consists of two stages. Firstly, the participants will be asked to complete a self-report questionnaire about intention to use CALL 2.0 which is to be finished with 30 minutes. Secondly, selected students will be invited to participate in a further interview on factors influencing intention to use CALL 2.0. It is anticipated that the interview will take a maximum of 60 minutes and be audio-taped by digital voice recorder. The transcripts of the
interview audio recordings will be used for research purposes only. Both stages will be conducted out of course hours.

**Data storage/retention/destruction/future use**
The electronic data (recording files and data files) gathered in this research will be stored with all coding information removed. The files will be kept confidential on a password-protected computer at the University of Auckland. The signed consent form, completed questionnaires and written transcripts will be kept separately in locked cupboards on the premises of University of Auckland. All data will be stored for six years and then destroyed. Paper data will be shredded and the electronic deleted. A brief summary report of findings will be sent to you upon completion of the analyses, if you indicate you want this, by giving us your e-mail address. Results will also be disseminated in scholarly journals and conferences internationally and within China.

**Voluntary Participation**
The pre-service EFL teachers enrolled in the School of Foreign Languages at Henan University who have taken the audiovisual English listening comprehension course are all eligible for the study. They are under no obligation to participate and they have the right not to participate. They will be informed that participation or non-participation will not affect their relationship with the school or their grades.

**Right to Withdraw from Participation**
For Phase 1, without having to give a reason, participants may withdraw their consent for me to analyse their completed questionnaire before May 1, 2014; after that, their consent cannot be revoked. For Phase 2, interview participants have the right to withdraw from participation within two weeks after receiving the transcripts for editing; after that, their consent cannot be revoked.

**Anonymity and Confidentiality**
The questionnaire survey will not be anonymous. However, names will be replaced by code numbers and the code for individual participants will be accessible to the researcher alone. All data from the interview will be anonymised and kept confidential to the researcher. All reports I write will not contain any information that could lead to the participant being identified. The information from the interview will not be used for any purpose other than for this research project.

**Ethical issues**
If you do agree with their participation, I seek your assurance that the decision of the students from your class to participate or not participate in this study will not affect their relationship with the school or their grades.

**Contact Details and Approval Wording**
Thank you very much for your time and help in making this project possible. Please take time to read and sign the consent form attached. I hope you will agree to participate in this research project under the conditions set out on the Participant Information Sheet. I look forward to your response.
Yours sincerely

________________________

University of Auckland contacts:

<table>
<thead>
<tr>
<th>Researcher</th>
<th>Supervisor</th>
<th>Co-Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bing Mei</td>
<td>Assoc. Prof. Gavin Brown</td>
<td>Dr Mark Gan Joo Seng</td>
</tr>
<tr>
<td>PhD Candidate</td>
<td>School of Learning, Development and Professional Practice, Faculty of Education, The University of Auckland</td>
<td>School of Learning, Development and Professional Practice, Faculty of Education, The University of Auckland</td>
</tr>
<tr>
<td><a href="mailto:b.mei@auckland.ac.nz">b.mei@auckland.ac.nz</a></td>
<td><a href="mailto:gt.brown@auckland.ac.nz">gt.brown@auckland.ac.nz</a></td>
<td><a href="mailto:m.gan@auckland.ac.nz">m.gan@auckland.ac.nz</a></td>
</tr>
<tr>
<td>13781176966</td>
<td>+64 9 623 8899 ext. 48602</td>
<td>+64 9 623 8899 ext. 46419</td>
</tr>
</tbody>
</table>

Local contact:

| Bing Mei            | 4#3-6-1, Xuefuyuan, Shunhe, Kaifeng, China     | Mobile: 13781176966 |

You may also contact the Head of School of Learning, Development and Professional Practice, Associate Professor Christine Rubie-Davies at c.rubie@auckland.ac.nz or +64 09 623 8899 ext. 82974.

For any queries regarding ethical concerns you may contact the Chair, The University of Auckland Human Participants Ethics Committee, The University of Auckland, Office of the Vice Chancellor, Private Bag 92019, Auckland 1142. Telephone 09 373-7599 ext. 83711.

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 18/11/2013 FOR 3 YEARS, Reference Number 010687
CONSENT FORM
Head of the School

THIS FORM WILL BE HELD FOR A PERIOD OF 6 YEARS

Project title: Towards an understanding of Chinese pre-service EFL teachers’ intention to use CALL 2.0

Name of Researcher: Mr. Bing Mei (University of Auckland PhD student); Associate Professor Gavin Brown (Supervisor); Dr Mark Gan Joo Seng (Co-supervisor).

I have read the Participant Information Sheet, have understood the nature of the research. I have had the opportunity to ask questions and have had them answered to my satisfaction.

• I give permission for the researcher to have access to our school and students.
• I give permission for this research to be carried out as outlined in the Participant Information Sheets.
• I give permission for the researcher to survey and interview pre-service EFL teachers from the School of Foreign Languages at Henan University.
• I understand that participants will not be identified in any written report or oral presentation arising from this research.
• I give the assurance that the participants will not be disadvantaged or advantaged by participation or non-participation in this research.
• I understand that any data collected related to this school and its students will be kept safely at the University of Auckland and will be destroyed after six years.
• Generalised findings of the study may be published in research journals and presented at conferences.
• I request a report of findings after the data are analysed be sent to me at: ______________________________________________________ (insert e-mail address).

Full Name _______________________

Signature ________________________ Date ____________________

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 18/11/2013 FOR 3 YEARS, Reference Number 010687
Appendix H: Some Common Web 2.0 Tools in Mainland China

**Baicizhan**: An indigenous language learning application with a specific aim to help language learners memorise new words.

**Baidu**: The currently most frequently used search engine by mainland Chinese Internet users.

**Baiduyunpan**: A cloud-based file-sharing service from Baidu.com.

**Leshi**: A major online video content platform with similar function as Netflix.

**QQ**: A popular chat app among mainland Chinese netizens, from the same company releasing WeChat — Tencent.com.

**Shaibeidaka**: An indigenous language learning application with a specific aim to help language learners memorise new words.

**Souhuboke**: A blog platform provided by Sohu.Com.

**Wangyiyunketang**: A cloud-based massive online open course site from 163.com.

**Wechat**: A popular all-purpose social media app from Tencent.com. It combines the features and functions of WhatsApp, Facebook, Twitter, Skype, Instagram, Tinder, Amazon, and Paypal.

**Youdaocidian**: An across-platform electronic dictionary service with similar functions as Google Translate.

**Youdaoyunbiji**: A cloud-based note-taking application with similar functions as Evernote.

**Youku**: A video sharing platform with similar functions as YouTube.
非常感谢您同意作答此份调查问卷。本问卷旨在调查影响中国职前英语教师使用 Web 2.0 应用辅助教学的意愿感知（perception）因素。

利用 Web 2.0 应用辅助教学指利用具备社交网络特质的相关工具辅助教学的实践活动。它具体包括，但不限于下述实例：1）利用社交工具或网站，促进英语教学（例如：QQ，人人，微信，微博等）；2）利用云存储服务分享文档，促进英语教学（例如：百度网盘，华为网盘，Dropbox，谷歌云端硬盘等）；3）利用视频网站分享视频，促进英语教学（例如：搜狐视频，爱奇艺，优酷等）；4）利用基于网络的知识管理工具，促进英语教学（例如：印象笔记，Prezi，Zotera 等）；5）利用合作创作的网络百科全书，促进英语教学（例如：维基百科，百度百科等）；6）利用大型开放式网络课程（MOOC），促进英语教学（例如：网易公开课，TED 演讲，Coursera 等）；7）利用平板电脑或智能手机与互联网连线，促进英语教学（例如：苹果设备，安卓设备等）。

本问卷实行匿名制，所有数据只用于统计分析，我们不会向任何人透露您的相关信息，请您放心填写。题目选项无对错之分，请您按自己的实际情况填写。再次感谢您的协助（本项研究已通过 2013 年 11 月 27 日获得奥克兰大学人类伦理委员会的审批，参照码：010687）。

1、你的性别？（单选题 *必答）
   ○ 男
   ○ 女

2、您的年龄？（填空题 *必答）

________________________

3、您所在年级？（单选题 *必答）
   ○ 大一
   ○ 大二
○ 大三
○ 大四
○ 研究生

4. 您此前是否参加过此项问卷调查？(单选题 *必答)
   ○ 是
   ○ 否

5. 请选择您对下列应用类型的熟悉程度。（矩阵单选题 *必答）

<table>
<thead>
<tr>
<th>应用类型</th>
<th>很不熟悉</th>
<th>不熟悉</th>
<th>一般</th>
<th>熟悉</th>
<th>很熟悉</th>
</tr>
</thead>
<tbody>
<tr>
<td>博客（例如：新浪博客，搜狐博客，Wordpress等）</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>维基（例如：维基百科，百度百科等）</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>社交网络（例如：QQ，人人，微博等）</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>即时通讯软件（例如：微信，Skype，Viber等）</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>文档分享服务（例如：百度网盘，华为网盘，Dropbox）</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
6. 请选择您在学习过程中使用下列应用的频率。（矩阵单选题*必答）

<table>
<thead>
<tr>
<th>应用描述</th>
<th>从未</th>
<th>很少</th>
<th>有时</th>
<th>经常</th>
</tr>
</thead>
<tbody>
<tr>
<td>谷歌云端硬盘等</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>云端知识管理工具（例如：印象笔记, Prezi, Zotera 等）</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>大型开放式网络课程（MOOC）（例如：网易公开课, Ted 讲演, Coursera 等）</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>网络学习工具（例如：有道词典, 金山词霸等）</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>博客（例如：新浪博客, 搜狐博客, Wordpress 等）</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>维基（例如：维基百科, 百度百科等）</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>社交网络（例如：QQ, 人人, 微博等）</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
即时通讯软件（例如：微信，Skype，Viber等）
文档分享服务（例如：百度网盘，华为网盘，Dropbox，谷歌云端硬盘等）
云端知识管理工具（例如：印象笔记，Prezi，Zotera等）
大型开放式网络课程（MOOC）（例如：网易公开课，Ted演讲，Coursera等）
网络学习工具（例如：有道词典，金山词霸等）

7、请选择您在使用Web 2.0应用时使用的电子设备（可多选）。（矩阵多选题 *必答）

<table>
<thead>
<tr>
<th>设备类型</th>
<th>公共电脑</th>
<th>个人电脑</th>
<th>平板电脑</th>
<th>智能手机</th>
<th>其他设备</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

8、使用计算机辅助外语教学2.0会提升我的教学效果。（单选题 *必答）

- 非常认同
- 很大程度上认同
- 认同
- 有些认同
- 基本不认同
9、使用计算机辅助外语教学2.0会提高我的教学效率。

10、计算机辅助外语教学2.0会对外语教学很有用。

11、学习在教学中使用计算机辅助外语教学2.0是一件简单任务。

12、使用计算机辅助外语教学2.0实现我的教学计划会是容易的。

13、在教学中使用计算机辅助外语教学2.0是一件过程明确而且容易掌握的任务。
14. 使用计算机辅助外语教学 2.0 让我紧张。（单选题 *必答）
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

15. 我对使用计算机辅助外语教学 2.0 有足够的了解。（单选题 *必答）
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

16. 我能够轻松独立地使用计算机辅助外语教学 2.0。（单选题 *必答）
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

17. 我能够恰当地将计算机辅助语言教学 2.0，课程内容和教学手段结合在一起。（单选题 *必答）
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
18. 我能够选择合适的计算机辅助语言教学 2.0 应用，来促进我的课程内容，教学手段和学生的学习效果。（单选题 *必答）
   ○ 非常认同
   ○ 很大程序上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

19. 我能够利用我所学的策略整合计算机辅助语言教学 2.0，课程内容和教学手段。（单选题 *必答）
   ○ 非常认同
   ○ 很大程序上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

20. 我能够在帮助我的学生协调课程内容、计算机辅助外语教学 2.0 和教学手段上发挥主导作用。（单选题 *必答）
   ○ 非常认同
   ○ 很大程序上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

21. 我能够选择合适的能提升教学效果的计算机辅助外语教学 2.0 应用。（单选题 *必答）
   ○ 非常认同
   ○ 很大程序上认同
   ○ 认同
   ○ 有些认同
○ 基本不认同
○ 非常不认同

22. 意见对我很重要的人支持我在教学中使用计算机辅助外语教学 2.0。（单选题 *必答）
○ 非常认同
○ 很大程度上认同
○ 认同
○ 有些认同
○ 基本不认同
○ 非常不认同

23. 对我的行为有影响力的人认为我应当在教学中使用计算机辅助外语教学 2.0。（单选题 *必答）
○ 非常认同
○ 很大程度上认同
○ 认同
○ 有些认同
○ 基本不认同
○ 非常不认同

24. 人们期望我使用计算机辅助外语教学 2.0。（单选题 *必答）
○ 非常认同
○ 很大程度上认同
○ 认同
○ 有些认同
○ 基本不认同
○ 非常不认同

25. 学校具有实施计算机辅助外语教学 2.0 的硬件设施。（单选题 *必答）
○ 非常认同
○ 很大程度上认同
○ 认同
○ 有些认同
○ 基本不认同
○ 非常不认同
26. 学校具备实施计算机辅助外语教学 2.0 的必需软件。 (单选题 * 必答)
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

27. 学校具备实施计算机辅助外语教学 2.0 的外置设备。 (单选题 * 必答)
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

28. 学校具备实施计算机辅助外语教学 2.0 的互联网条件。 (单选题 * 必答)
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

29. 学校会对我实施计算机辅助外语教学 2.0 提供技术与教学指导。 (单选题 * 必答)
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

30. 当在实施计算机辅助外语教学 2.0 遇到技术问题时，学校会提供必要的技术支持。 (单选题 * 必答)
   ○ 非常认同
31. 学校会给我提供足够的时间去探索实施计算机辅助外语教学 2.0。 (单选题 *必答)
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

32. 考试的压力会阻碍我去探索实施计算机辅助外语教学 2.0。 (单选题 *必答)
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

33. 我觉得我能够自如的运用学校现有的技术条件去实施计算机辅助外语教学 2.0。 (单选题 *必答)
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

34. 学校的政策和现有资源能够让我轻松地接触到以英语为媒介语言的计算机辅助外语教学 2.0 资源。 (单选题 *必答)
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
35. 我能够接触到以英语为媒介语言的社交网站或工具，促进实施计算机辅助外语教学 2.0。 (单选题 *必答)
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

36. 我能够接触到以英语为媒介语言的合同协作网站或工具，促进实施计算机辅助外语教学 2.0。 (单选题 *必答)
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

37. 我能够接触到以英语为媒介语言的文档分享网站或工具，促进实施计算机辅助外语教学 2.0。 (单选题 *必答)
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
   ○ 基本不认同
   ○ 非常不认同

38. 我能够接触到以英语为媒介语言的搜索引擎，促进实施计算机辅助外语教学 2.0。 (单选题 *必答)
   ○ 非常认同
   ○ 很大程度上认同
   ○ 认同
   ○ 有些认同
39、我能够接触到以英语为媒介语言的教育类网站或工具，促进实施计算机辅助外语教学 2.0。 (单选题 *必答)
  ○ 非常认同
  ○ 很大程度上认同
  ○ 认同
  ○ 有些认同
  ○ 基本不认同
  ○ 非常不认同

40、我会在今后的教学中经常使用使用计算机辅助外语教学 2.0。 (单选题 *必答)
  ○ 非常认同
  ○ 很大程度上认同
  ○ 认同
  ○ 有些认同
  ○ 基本不认同
  ○ 非常不认同

41、我计划在我的教学中经常使用计算机辅助外语教学 2.0。
  ○ 非常认同
  ○ 很大程度上认同
  ○ 认同
  ○ 有些认同
  ○ 基本不认同
  ○ 非常不认同

42、我会在我的教学中尽可能多的使用计算机辅助外语教学 2.0。 (单选题 *必答)
  ○ 非常认同
  ○ 很大程度上认同
  ○ 认同
  ○ 有些认同
  ○ 基本不认同
  ○ 非常不认同
References


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