A Multiple-Case Study of The Instructor’s Roles in Courseware Development

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Abstract
Past literatures on e-learning system and courseware have focused on the system features and on the technologies employed. To integrate IT well with pedagogical principles, it is important to involve instructors in the courseware development. This study seeks to gain insight on courseware development by investigating instructor’s different roles in each courseware development phase. Using an educational system development model and role theory as theoretical lens, this research conducts multiple case studies involving three sets of language courseware and reveals that courseware development is a gradual process requiring dynamic role playing of the instructor. Lessons are drawn from the case study to improve courseware development efficiency by facilitating instructors’ role transition and reducing their role overload and role ambiguity. Theoretical and practical implications of the process-based role framework are discussed.

Keywords
Courseware development, instructor, role, process

1. Introduction
The importance of education and training to individuals and society has, with very few exceptions, always been recognized in modern civilizations. The introduction of the knowledge economy further underscores this importance. With the rapid advancement of information technologies, technology-mediated learning has received increasing attention in the field of information systems (IS) [1]. It is estimated that worldwide corporate educational technology revenues hit US$23.7 billion in 2006, up almost fourfold from US$6.6 billion in 2002 [15].

To catch up with the trend of e-learning, many educators have begun to look at various aspects of e-learning systems or courseware design [29, 31]. Many of these studies focused on the system features and the different technologies employed. In general software development literature, it is widely acknowledged that design and development teams increasingly include participants from different domains, exploring and integrating their specialized knowledge in order to create innovative and competitive applications while reducing design and development costs [36]. Thus, communication during the integration of specialized knowledge and negotiation among domain specialists has emerged as a fundamental component of the design process [36]. It is therefore important to study different team members’ roles emerged during multidisciplinary design and development process [36]. These roles are expected to support knowledge exploration and integration, collaboration, until task completion by filtering and providing information as well as resolving conflicts across organizational, task, discipline and personal boundaries. This can also be applied to courseware development, where both technology personals and course instructors are involved, and has implications for design methods, tools, and education. In particular, as previous research pointed out, technologies by themselves did not lead to the restructuring of education [34]; rather, “technology forced a re-evaluation of the authoritative instructor role” [11, p.83]. Wyatt [43] also contends that instructor involvement in the development and intelligent use of courseware is essential to its success.

The current study seeks to understand the instructor’s changing roles during courseware development and to establish a preliminary framework of substantial pedagogical importance. We hope this study can provide useful guidance for a more effective courseware development and delivery. Specifically, this study adopts a comparative case study method to investigate courseware development from a process-based view and probes further into dynamic roles of instructor along the development process, based on the principles of both software design and pedagogy. The remainder of the paper is organized as follows: first, we review the relevant literature on education and courseware development informing the current study.
Next, we introduce our research approach, followed by a description of the cases. We analyze the instructor’s different roles in the courseware design process by comparing the similarities and differences among three different courseware. Finally, we conclude by highlighting both theoretical and practical implications, with suggestions for future research.

2. Literature review

2.1. Courseware development

In this e-learning era, educators are devoting increasing amount of time and effort into the design and implementation of effective learning systems [23]. Most research efforts treat e-learning system as an integration of different modules built based on the need [12], and focus on how to use different technology, such as Internet, animation [28], in courseware design. Despite the current efforts, there remains a lack of studies looking at courseware development from a process-based view, although it has been proposed to offer many advantages [26] for activities involving multiple stages. Processes can provide part of the context that is important for interpretation and construction of process-relevant knowledge, i.e., knowledge about a specific design process and knowledge required across different processes. Information from the processes can be used to specify the system design more precisely, e.g., the overall development structure and knowledge maps. By constructing process diagram, we can represent the breakdown of the activities into progressively greater details [32]. Process-based approach usually provides an efficient way to capture and utilize knowledge because information derived from scrutiny of processes is more precise and contextual [26].

Courseware, just as any other software, requires a process-based analysis to understand its design and development. To guide our investigation on courseware development, a hybrid development model (HDM) initially proposed for distance learning using the Internet [33] is used as a general framework, owing to its relevancy in providing a process-based view of project development with specific focus on each sub-phase. The main reason to select this model is because it is proposed based on the review of several design models for educational system or courseware. Thus, it integrates both pedagogical and technical issues.

Following a structured waterfall system development life-cycle model, HDM consists of five major phases, analysis, design, development, evaluation and delivery. In the analysis phase, preliminary content and objectives of the course should be specified, including evaluation procedures and delivery mechanisms [33]. In the design phase, the preferred strategy for developing instructional content needs to be outlined, such as the storylines of the courseware, lesson layout etc. [33]. The development phase generates the lesson plans and lesson materials based on the design phase specifications. During this phase, the media used for instruction are developed and digitized [33]. The evaluation phase includes product review during and after production [33]. The delivery phase refers to the actual delivery of the instruction, whether in the form of classroom-based, laboratory, or computer-based learning. Although HDM provides a guideline on what to do in each phase, it does not mention the players involved in the development process and what their assigned tasks are. The current study looks specifically at instructors’ roles across the phases through case study.

2.2. Roles of the instructor

Role is a dynamic set of recurring behaviors, both expected and enacted, within a particular group context [7, p5]. Role theory presumes that individuals are members of social positions and hold expectations of their own behaviors and those of other persons [5]. Thus, role behaviors are the result of organizational demands, social demands and personal demands [20]. An individual may perform one or more roles and may change roles. However, there are situations where role ambiguity (in which expectations are incomplete or sufficient to complete the behavior), role mal-integration (when roles do not fit well together), role discontinuity (when the person must perform a sequence of mal-integrated roles) and role overload (where the person is faced with too many expectations) [4] occur. As each of these conditions may produce stress for people and reduce the efficiency of the project they are working on, it is important to understand the roles of participants for a project.

Educational environments based on new technology are believed to raise new challenges to the traditional roles of instructors [21]. For example, courseware development process imposes multiple roles on instructors in addition to their instruction role. The successful use of technology in teaching practices also requires more than mastering computer skills – but developing effective teaching tactics enabled by the technology. Researchers have already pointed out that, “for technology to transform teaching and learning,” instructor educators need to help future instructors develop a clear vision of their roles as redefined in this e-learning era and change existing teaching practices [41, p.150]. Hence, in this study, we explore the
courseware development and application process with a particular focus on the dynamic roles of instructors.

3. Research method

Interpretive case study was adopted as the main research strategy. In particular, a multiple comparative case study approach was adopted since more situations can be considered through replication and key aspects can be identified through contrasting [44]. Multiple case designs are considered more compelling and robust than single-case study [22].

The research setting involved three sets of courseware designed to assist German, French, and Chinese course teaching in a large university. The reasons for this selection are twofold. First, while most courses in this university use university-wide integrated e-learning tool provided by its technology centre (TC), only the language modules use their own courseware. Second, instead of relying on external vendor or using commercial courseware, teaching teams from the language department initiated and took part in the courseware development. The unit of analysis for this study is the courseware project.

Data was collected mainly through personal interviews with the instructors involved in the courseware development. University level and faculty level IT staff and selected students were also interviewed. Personal interviews were supplemented by secondary resources, such as the newsletter from TC, to enable mutual verification [17]. Altogether fifteen face-to-face interviews were conducted with an average duration of around ninety minutes. Data analysis was conducted in the following steps First, background documents, publicly available information, and transcripts of interviews were used to create a detailed narrative history of the three courseware development processes. The design and development history was then decomposed into five main phases according to HDM model: initiation, analysis, design, development, evaluation and delivery. Second, the three cases were compared in terms of the design processes, outcomes and instructor’s different roles. Third, the differences in results were explained by identifying the dynamic roles instructors playing throughout the five stages, with theoretical support. The entire analysis was highly iterative and the process terminated when it became impractical to further extract useful information.

4. Case description

4.1. German courseware (GER)

GER is the first virtual self-access and resource centre for German language learning in the region with such a comprehensive coverage. It represents a milestone in applied research in the area of language pedagogy. A vast array of materials can be now found on the website, including relevant notes, interactive web-based exercises, downloadable worksheets, audio-video materials, links to other relevant websites, showcase of students’ projects, and forums. As the initiator of GER indicated, “GER is the most comprehensive web tool for German learning around the world. Many scholars and instructors know GER and create links to us...”

The idea of GER was initiated by the German teaching team in 2000. It has been a huge project, involving all the teaching members in the German department. They clearly recognized the need for such a courseware: “Learning a language is a social activity. You are not just learning the language, but also the culture and mentality. That’s why we want to have our own website for interactive learning...so that students can do something at the computer without having to consult the instructor.”

GER, from its initiation, has been designed to be a self-access center to supplement and complement, but not to replace, classroom learning. It was organized based on the textbook but not exactly the same, since “it is meaningless to have totally replicated the book”. According to the instructors, “It supplements class learning because additional materials are provided to improve students’ listening capability, grammar, and pronunciation. It complements class because many of the materials online are used in class as well, ...so that students will not feel lost.”

Many materials from GER are interactive, pertaining to German culture and life. For example, the interactive situation simulation is designed to train students to react creatively to different real-life situations. The interface of GER is a house with multiple levels, corresponding to multiple functions and levels of courses. According to some students: “The house is quite easy to figure out. You just put the mouse over and find the things you want.”

The German teaching team implemented 70-80% of the online learning tool during their spare time, using the software “Hot potatoes”. They have their reasons for this time and effort: “If you know programming you can come out with all the interactive tools for learning. Since external programmers and technicians have their own work to do as well, relying on them will make it more difficult to achieve our goal in mind.”

An important premise for GER to be really helpful in learning is that students need to find out their personalized study path. Hence, instructors play a crucial role as a guide. Instructors usually introduce
GER to all students in the first class and demonstrate materials in GER frequently. Students were encouraged to collect relevant information and try out the online dialogues at home, and bring them back to share with the class. One instructor illustrated how this helped picking up courseware usage rate: “The use of GER was only about 15, 20 hits per week initially. It then jumped up to 400, 500 hits per week. The maximum we have until tracking stopped was about 2800 hits per week, i.e., 400 hits per day. At that time we had about 250 students in the entire German program. It’s pretty good... Processing becomes more active with exposure so that students can find their own study path...”

According to the feedback from the students, with the online tool, they did significantly better in vocabulary and composition. They were satisfied with the usability as well. Based on the usability survey data, usefulness of the courseware, including usefulness on the whole, as a transmission of cultural information, for developing speaking skill, and for improving vocabulary, all scored largely positive (4 or above out of 5).

4.2. Chinese courseware (CHI)

CHI was launched in 2002 by the Chinese language department (CLD), triggered by the success of the German courseware project. CHI is designed as a virtual centre of Chinese learning which not only supplements and enhances classroom learning, but also motivates and encourages self-learning. This is achieved by introducing various learning materials and interactive exercises in courseware.

CHI courseware was designed to supplement in-class teaching and learning but it allows greater learning autonomy for students. For example, students can download and listen to the audio files anytime and anywhere. The highlight of the courseware is the e-classroom, emphasizing the four language skills – listening, speaking, reading, and writing. Interactive elements such as animation and audio-visual practices are embedded everywhere. Other useful links are also provided, making Chinese language learning more interesting and comprehensive. As mentioned by one instructor, “Our emphasis is the textbook, with CHI offering some elementary assistance in conversation, vocabulary and sentence structure learning...”

The interface of e-classroom looks like a “San He Yuan”, a traditional type of Chinese inhabitancy. The purpose is to provide an overall image and environment of Chinese language study. Indeed, vividness has been the leitmotiv of the courseware design. One instructor explained: “We want to make CHI look vivid and interesting because people tend to regard Chinese language as a very traditional one, with a long and complicated history,... just to show them learning Chinese is also fun.”

The development of CHI involved total commitment from both TC and CLD. TC professionals offered great technical assistance to incorporate online tools into teaching such as digitizing and uploading the audio files to replace traditional in-class radio cassettes exercise. However, due to the unique pictorial nature of the Chinese characters and issues of software compatibility, the development process has not been easy. As a Chinese instructor pointed out: “A lot of coordination was required between us and TC staff. Sometimes we had to compromise as certain ideas might not be feasible to be made online.”

Instructors introduced CHI to all the students in the first class, demonstrated online materials frequently and encourage students to try on their own after class. In addition, there were assignments to be completed online, which were not subject to grading. No usage feedback was collected; as a result, instructors did not know whether or not students had actually done any exercise at home. Students noted that they seldom used it except for listening and tone exercise.

4.3. French courseware (FRE)

As requested by the language faculty, the French teaching team started the idea of FRE in 2003. The initiation of FRE was largely based on the success of the GER and the awareness that some institutes have developed their own French learning websites. Hence, to build an online courseware for French language learning was to a large extent an act of acclimatization.

FRE is a reinforcement-aimed French learning courseware. French learning is conducted in short thematic units, corresponding to chapters of course materials in class but in a more recreational way. Difficulties during French learning are given special attention here. There are grammatical targets for each unit, audio materials that give interactive feedbacks, and dialogue-related and thematic-related exercises. The main interface of FRE is a village, with different shops representing different thematic units of the course. One instructor explained the rationale of this design: “We try to make it not a hard work, but a playing process. The pictures we chose and the outlook of the village are aimed to make the learning process more interesting and less rigid.”

FRE courseware was designed as a supplement of the textbooks. There are many audio and word-matching exercises on FRE. The vocabulary book, which was initiated in German courseware, has been adapted into a French version. As an instructor described: “We have one lecture and three tutorials
corresponding role expectations, to address the above-influential role of instructors as well as the actual teaching. In each phase, we identify the most design, development, evaluation and delivery into by examining and contrasting their process of analysis, this section, we investigate the three courseware cases. These issues apply to courseware development too. In

Fluctuating and conflicting requirements, developers are: the thin spread of application domain knowledge, and communication and coordination breakdowns [14]. In the first class of a French module, the instructor would introduce FRE to all the students. Compulsory exercises and quizzes were given every week for students to complete online, but they were not graded. There was no mechanism on the website for tracking students’ usage of the courseware. As noted by a student: “I basically use it once a week, just for the exercises and materials we are required to do.”

In multidisciplinary software development, the three most salient problems for the designers and developers are: the thin spread of application domain knowledge, fluctuating and conflicting requirements, and communication and coordination breakdowns [14]. These issues apply to courseware development too. In this section, we investigate the three courseware cases by examining and contrasting their process of analysis, design, development, evaluation and delivery into actual teaching. In each phase, we identify the most influential role of instructors as well as the corresponding role expectations, to address the above-mentioned problems in development and to achieve better educational result (see Figure 1).

Analysis Phase: The Role as an Analyst – Identify the Complementary and Supplementary Role of Virtual Activities in Teaching and Learning

Research has pointed out that one of the most crucial prerequisites for successful implementation of e-learning is the need for careful consideration of the underlying pedagogy, or how learning takes place online [19]. Courseware should consist of interlinked learning objects to form a network of learning resources through which learners navigate to build a personalized learning path [3]. Hence, from an analysis perspective, instructors as analysts should aim for courseware with consistent interface, good connection of learning objects, and high navigability, making personalization possible. Although IT staff could solve the technical issues in later stages of courseware development, it is instructors’ responsibility to embed pedagogical components in the design of courseware. Advocates of e-learning have stressed the complementary nature of the virtual and class-based learning [40]. They argue that e-learning cannot replace classroom teaching; however, in many cases, e-learning can significantly complement classroom learning [46]. A similarity of the three language courseware is that they are all designed to be complementary and supplementary to classroom teaching. The courseware was organized based on textbooks so that there was less inconsistency and students would not find the materials disorienting. However, the instructors did notice that it made little sense to just replicate textbook. Hence, it went beyond the textbook to include additional exercises and practices to further strengthen and extend students’ capability. In another word, carefully selecting both in-class and out-class materials determines users’ manner of using the courseware and to what extent they can benefit from it. Therefore, in the analysis phase, instructors should pay attention to planning virtual activities and relating them to the teaching practices.

Design Phase: The Role as a Designer – Planting “Presence” in Virtual Environment

Most courseware are operated in an asynchronous (non face-to-face) way, shifting learning responsibility to the students. Hence, motivating students to use the e-learning tool is of utmost importance for instructors. This consideration is reflected by the effort in making the e-learning experience more fun and attractive, for example, through interface design. For instance, each floor of the house in GER or each side of the “San He Yuan” (which looks like a traditional

Figure 1. Instructor’s role in courseware development

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<th>Analysis</th>
<th>Design</th>
<th>Development</th>
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5. Findings

5.1. Identification of instructors’ role in courseware development

In multidisciplinary software development, the three most salient problems for the designers and developers are: the thin spread of application domain knowledge, fluctuating and conflicting requirements, and communication and coordination breakdowns [14]. These issues apply to courseware development too. In this section, we investigate the three courseware cases by examining and contrasting their process of analysis, design, development, evaluation and delivery into actual teaching. In each phase, we identify the most influential role of instructors as well as the corresponding role expectations, to address the above-influential role of instructors as well as the actual teaching. In each phase, we identify the most

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Chinese habitat building) represents a course level, while each building in the village represents a thematic unit in FRE. These creative designs help to plant a sense of "presence", which likely increases students' engagement in virtual learning environment.

However, design is more than just visual appearance. For an online program, the features that go beyond purely visual ones are those interactive ones. For example, interactive situational dialogues in GER enable users to participate in simulated scenes and control the content of dialogues as in real life. Being able to control is extremely important for users because only in this way can users customize their learning path and benefit maximally from it. The challenge here for the instructors is to act as designers and keep a “creative” and “interactive” mindset – to convey students a feeling of real life learning in online environment, so that they would like to use the tool more often. Hence, planting “presence” in courseware should be bear in mind during the design stage and would directly influence the usability as well as the entertainment value of the courseware.

Development Phase: The Role of Mediator – Bridging Learning Requirements and Online Implementation

Courseware development requires technical knowledge such as how to create graphical and interactive elements. However, technology should never drive the development, but in the service of pedagogy. Hence, developers should be equipped with both the relevant technology and the pedagogical knowledge of how to make use of it, which is more of a tacit type [33]. An ideal situation is that the instructor also plays a role of developer during the implementation. As in GER’s case, teaching staffs developed a large portion of the courseware by themselves. They believe that this is an easier way to put their plans of e-learning activities into action. As German instructors have IT background, they could quickly grasp relevant web-based technology to help realize the course designs, with little help from technology professionals. The development process is also a learning-by-doing process as the instructors can construct and organize the skills needed and apply them to the subsequent process of construction [16]. Hence, GER always has the richest contents and functions. German instructors are also more familiar with the working of the courseware and how to guide students to use it.

However, not every instructor can get on board the technical design skills in a short time. During the case investigation, the instructors did complain about the heavy workloads required for courseware development. They also said that the “technical work distract” them from “everyday teaching”. Overloaded by demanding roles and high expectations, instructors are unlikely to maintain a satisfying level of working performance [13]. Hence, it is recommended that instructors act as mediator of the courseware development instead of developers. Indeed, the development of courseware often requires cooperation between instructors and technicians, where instructors are expected to constantly monitor the development process, raise pedagogical concerns, and communicate with technicians. For example, in the cases of CHI and FRE, the development process involved both technology support personal (i.e., TC professionals) and language instructors who provided content specifications. However, communication with IT staff would be more effective if the instructors possess basic IT skills and jargons. This is also consistent with the fact that teachers training program requires to insure adequate preparation for them to “use computer as a tool in their teaching” [6, p.34]. In summary, acting as a mediator could effectively bridge the gap between IT and pedagogy in courseware development, and at the same times, avoid the negative impact associated with role overload. Moreover, to be an effective mediator, instructors are expected to equip themselves with basic technology knowledge.

Evaluation phase: The Role of Monitor – Collecting Students Behavior Data and Feedback

According to HDM, evaluation consists of an ongoing feedback process undertaken during production [33]. In fact, it occurs at every phase of course development, including the stage after the final version is implemented [33]. Principles of system design suggest an early and continual focus on users and an empirical measurement of system usage, leading to an iterative design. In other words, the system (simulated, prototype, and real) is modified, tested, modified again, tested again, and the cycle is repeated several times [18]. Instructors are thus expected to play the role of monitoring the functioning of courseware, by actively gathering students’ feedback and providing their own feedbacks as well.

Software development literature has also pointed out that communication between users and developers are crucial in achieving a satisfying outcome. GER has incorporated mechanisms such as tracing click-stream data on the website and collecting students’ feedback through both informal (e.g., casual conversations) and formal (e.g., qualitative surveys) channels. For example, the qualitative study used pre- and post-test to assess how students with and without the online learning tool differ in their performance in vocabulary and composition. It also asked students to rate the usefulness of the courseware. GER courseware has thus been open to suggestions and requests for change from users. On the contrary, none of these feedback
mechanisms has been incorporated into the development process of either CHI or FRE. As a result, teaching staffs have no way to monitor students’ use of the tool, examine its effectiveness or propose further improvement, which likely hinders the long-term development of e-learning practices. Therefore, instructors should actively observe students’ behavior and solicit their feedback to bridge courseware development and usage so as to enable continuous improvement.

**Delivery Phase: The Role of Facilitator – Incorporating “Push” and “Pull” Design Mechanisms and Promoting the Usage**

Online tools enable students to practice without instructor’s guidance; it is thus up to the students whether and how often they use it. Hence, the instructor’s role has been shifted from an information dispenser to a coach [36] and from a centralized authority to a decentralized facilitator [11]. Instructors have to think about ways to effectively incorporate the courseware into normal teaching and guide students to make good use of the online personalization learning tools. Educational psychologist finds that students’ mental cognition is very important for their way to use and process IT resources [42]. If students do not have the mental cognitive knowledge about task characteristics and strategy to use it, they will not be able to develop proper strategy to process the task. Studies have also contended that the effectiveness of the virtual tool is related to their “fitness for purpose”, i.e., their alignment with the targeted learning processes [9, 10]. For example, first-time users may require more guidance and efforts to develop the technical skills to properly utilize online tools [27]. Based on our case investigation, we find that instructors generally use two ways to effectively guide and promote the use of courseware – “push” and “pull”.

“Push” mechanisms include incorporating courseware in offline teaching activities and imposing homework assignments done online. For example, German and Chinese language instructors frequently demonstrated the activities designed in the courseware during the class and encouraged students to go back and try out. German instructors have been asking their students to go back recording their customized dialogues and share with the classmates in the next class once or twice every week. The course notes used in the class should be downloaded from the courseware and brought to the class. For French instructors, they gave out compulsory quiz or assignment every week which had to be done online, to ensure that students would at least access the online reading and listening materials once every week. This is consistent with previous studies showing that changes in assessment policy might stimulate greater use of online tools [40].

“Pull” mechanisms, on the other hand, include demonstrating and promoting interesting and useful functionalities of the courseware to students. Pull-based mechanisms are used to promote students’ voluntary learning, and study has shown that students could benefit from “pull-based” learning [8]. For example, the “vocabulary book” function provided by GER and FRE is students’ favorite function and is the main reason for them to use the courseware often.

Research shows that an effective e-learning involve both pull-based learning and push-based learning [25]. Hence, if instructors can adequately highlight and promote attractive functions, it is more likely that the students will find the tools they need, appreciate them, and use them actively. In sum, in order to involve students into the online learning environment, instructors should actively facilitate and promote students’ voluntary or compulsory use of courseware.

The dynamic roles instructors play in courseware development are summarized in Table 1.

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5.2. Lessons learnt

As any other software development, courseware development life cycle does not end in the delivery stage. The process of analysis, design, development, evaluation and delivery is usually well-planned and iterative. “Sometimes the theorists lead and the designers follow. Other times the designers lead and the theorists follow. …educational computing R&D shall help both theorists and designers…” [34, p218].
Thus, the predominant role instructor plays in each stage is not fixed. The boundaries between the roles may not be clear, and instructors may play multiple roles at the same time. However, with the advancement of IT, it is necessary for instructors to be equipped with both technology and pedagogy knowledge. From the cases presented, we summarize the following lessons learnt.

**Lesson 1: Ambiguity in identifying the instructor’s roles will cause inefficiency in courseware development.**

During the interview, we found that FRE and CHI instructors were less clear about the expectation on their roles in courseware development process. This phenomenon, which is called role ambiguity, causes problems in integrating the courseware into the syllabus, and also makes instructors feel that they have high-demanding jobs during courseware development. Studies on role theory show that role ambiguity will affect job satisfaction and job performance [39]. This is because that when an individual experiences a great deal of uncertainty about how he is expected to perform his job (role ambiguity), he may experience more mental anxiety, tension and less job satisfaction [39]. A study on classroom teachers’ role ambiguity shows that it may cause feelings of emotional exhaustion, depersonalization or negative attitudes toward students, and feelings of a lack of personal accomplishment [47]. Role ambiguity usually arises in the role definition process. With dynamic roles, as constant redefining and changing of roles is required, role ambiguity may occur along the whole process. Hence, if instructors do not understand clearly their role expectations and thus do not perform accordingly, they will not be able to efficiently turn the pedagogy ideas in mind into software for use.

**Lesson 2: Role overload of instructor will cause inefficiency in courseware development.**

In the three cases, as instructors were required to develop courseware in addition to their teaching tasks, they complained in the interview about too much workload during courseware construction. Role overload is defined as having too many role demands and too little time to fulfill them [24]. Role overload is believed to affect job satisfaction as well as psychological well-being [13]. When dealing with multiple roles and multiple expectations, instructors may feel distracted and experience impatience, disappointment and even anxiety.

**Lesson 3: The smoothness of the instructors’ role transition is positively related to the effectiveness of courseware development.**

To reduce the problem caused by role overload and role ambiguity, smooth role transitions is necessary. Role transition in work is originally defined as any change in employment status and any major change in job content [45]. In the current study, we are interested in the transition of instructor’s roles during courseware development process. Role transition is believed to be of profound significance for further development of individuals and their organizations [30]. The cases discussed have demonstrated that it is important for instructors to be aware of the continuous change in the roles they play throughout the courseware development process. Smooth transition of roles requires effective role coordination. In other words, it may not be a positive sign to have totally IT-insulated instructors. On the one hand, even technology department in school would not have time to help in every aspect of a specific courseware development. On the other hand, without basic technology knowledge, an instructor can hardly be ready for the new agenda of teaching in e-learning era. Just as the chief German instructor said: “We need IT teachers... many are not up to the level. They can’t even handle the simplest programming. looking at the simplest online exercise they say ‘wow’... they are just not ready for it.” Hence, equipped with professional mind in educational theories, instructors will be more empowered if they further sharpen their IT skills, especially in this era of e-learning.

**6. Conclusions**

The findings of this paper are derived from three case studies of language courseware development. We have looked at the dynamic roles an instructor plays in helping each phase to progress and transit smoothly, based on previous theoretical and empirical work on the courseware development process, role theory research, as well as inferences from our cases. This view serves a dual function. For researchers, this is a useful lens to conduct further empirical studies. For practitioners, it provides a template to guide a particular courseware development. However, only three cases in the same university are reported here. Care was taken internally to improve the validity by using multiple data sources and multiple viewpoints. Nonetheless, we admit the existence of several limitations. Due to limited accessibility, comparative data on student perceptions of the three sites were not collected. Moreover, the findings are only applicable to in-house development of small scale courseware. As the cases investigated all use courseware for a single course or several courses, the findings cannot be applied to commercialized courseware or e-learning product development. Therefore future studies are required to validate or strengthen the findings. More detailed information may be obtained to identify more critical sub-processes as well as their connections.
This research has several theoretical implications. Previous studies in this area tend to focus on specific design features and technologies. This study extends and complements the existing stream by employing a process-based view, showing how an effective courseware is designed and developed by actively involving the instructors. It is based on the HDM and focuses on the instructor’s changing roles facilitating each phase and their transitions. Although design activities are usually idiosyncratic due to differences in intentions, interests and capabilities, with the process-based view, they are no longer complex in any unfathomable way – there are patterns that can help us understand them better. Hence, our purpose is to connect pieces of knowledge together into a complete procedural framework, revealing the patterns and providing guidance for a smoother and more “successful” courseware implementation.

Further, identifying the change in instructor’s predominant roles during courseware development also reveals the flexibility and efficiency issues caused by the instructors’ involvement. Research in role theory has found that motivational orientation, organizational change, as well as role requirement, affect role adjustment and role transition [30]. Future research could build on role theory to conduct in-depth analysis on the factors affecting instructors’ role adjustment and role transition.

This research has several practical implications. In the past decade, researchers and designers in educational technology have been trying to build complex computer-based learning environments. As students interact with these systems, however, questions regarding their effectiveness are raised, i.e., whether multimedia will indeed help students and instructors develop deep conceptual understanding [38]. Designers of educational multimedia prefer to believe that student users are not merely passive "viewers." Nonetheless, developers can often be heard muttering "they come but they don't always use it in the ways we intend." Our study shows how an instructor can play the role of designers and developers to assure that the systems are being used as they envisioned. Instructors are believed to play a decisive role in determining patterns of computer use within classrooms. For example, German courseware GER began as an intentional application of the instructors’ pedagogical consideration, based on the instructors’ prior knowledge and experience of IT and e-learning. CHI and FRE, on the other hand, were brought forward as a response to the advocates of e-learning from the language faculty. The latter two thus have a less active motive due to instructors’ insufficient experience in e-learning, which might be a possible root cause of their less enthusiasm and foresight in the online tool development process as well as less structured approach in teaching with it. Researchers have pointed out that instructors equipped with necessary IT skill would be better prepared and more likely to use computers in their teaching [2]. Hence, it is believed that increasing instructors’ exposure to various e-learning practices can be helpful in promoting e-learning. Instructors are encouraged to learn from other schools’ practices, try to use some tools in their everyday work, or join some training programs in school. Further, school management could facilitate instructors in their role transition during courseware development by reducing role overload and role ambiguity. For example, IT awareness courses and training programs for some design software or tools such as “Hot potatoes” can be helpful.

7. References