Introducing Lean Service to the Blended Learning Educational Environment Structure for Food and Beverage Preparation

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Abstract: The food and beverage industry is now encountering the urgent necessity for industrial upgrade and transformation. Using the concept of lean service, a technological education environment incorporating blended learning and food and beverage preparation can be harnessed to lower costs in education, enhance efficiency and quality and improve industrial competitiveness. In this study, the concept of lean service is applied to food and beverage preparations for the first time. By blending learning with information technology, this study constructs a model of an educational environment that differs from those adopted previously in the hope that students and employees will implement the lean service process in preparation services through a blended learning environment. In the conclusion, this study suggests that schools and companies must harness the benefits of modern information technology and encourage students and employees to learn. The schools and companies must endow these students and employees with sufficient information and response abilities and allow them to become core points of strength that develop with the times.

Keywords: Lean service, food and beverage preparation, blended learning, information technology, educational environment

INTRODUCTION

According to surveys conducted by the Tourism Bureau, Ministry of Transportation and Communications (MOTC), when visiting Taiwan, most international visitors are deeply impressed by the island’s culinary dishes. Consequently, good food is not only a necessity people require for sustenance, it is also an important factor attracting tourists to travel to Taiwan. Previously, food and beverages (F and B) preparation personnel were not required to possess high levels of education if owners of F and B establishments could obtain sufficient capital and talent from these personnel. Now, higher education has become widespread and increasing numbers of students are enrolled in the F and B departments at colleges and universities. This change has transformed F and B preparation personnel in Taiwan from workers with low-levels of education into highly educated employees, prompting a qualitative change in the talent pool for the F and B industry. Consequently, approaches by which to educate “well-trained” and “highly specialized” professional F and B personnel using limited conditions is an important issue scholar’s encounter today.

In this study, limited conditions imply the concept of lean management. Lean management is derived from the manufacturing industry; it is a unique operational model taken from Toyota and developed through a variety of challenges. Processes such as consumer purchase, use, repair and service all compose the lean principle. A member of the Corporate Synergy Development Center in Taiwan, has provided evaluations and counselling for the service industry for several years (Huang, 2011). The application of the lean principle in the F and B service company McDonalds resulted in a 7% increase in employee productivity, a 30% reduction in foodstuff waste and a 15% increase in customer satisfaction with counter service speed. The frequent employee turnover in the F and B industry creates difficulty in communicating work knowledge and maintaining service quality, leading to frequent customer complaints; these complaints, in turn, become issues management has to handle.

The lean principle indicates an operational system that places more emphasis on results and effectiveness than process and not a system that proposes standardized management logic (Pullerton and McWatters, 2001).

Womack and Jones (2005) altered the goal of lean solutions into lean consumption. Enterprises can continue creating values with their customers only by integrating lean service and lean consumption. In addition, the
theoretical study performed by Kivela and Crotts (2006) and suggested that although relevant research exists regarding traditional F and B service industries, the integration of lean service and lean consumption remains a novel topic of study in the field of F and B service. Current understandings indicate that the experience of consumers concerning F and B generally centers on their unforgettable memories of service events. Thus, methods by which to introduce the lean principle into the F and B service industry is a point of concern for companies today. This concern leads to the hope of developing and establishing an educational and experience system for F and B preparations using blended learning.

In an age of knowledge economy influenced by continually changing information technology (IT), network technologies have increased the pace of learning. Organizations encounter effects caused by drastic changes in this environment and individual learning and living are also connected to trends in the digitized world. It is important to include the modern IT applications in human resources education training and development. Because of continual renewals in computer software development and application technologies as well as breakthroughs in bandwidth bottlenecks, network or digital learning technologies have changed the educational ecosphere of schools and corporate training systems. This phenomenon is extremely influential in teaching and learning at the management level (Govindasamy, 2001).

When evaluating traditional educational methods adopted in schools and companies, this study considered quotas for entrance, temporal and spatial flexibility and cost and resources logistics. These factors did not satisfy the multiple requirements students and company employees have regarding learning large amounts of material, rapid learning, learning at any time, learning at any location, interactive learning, community learning and diversified knowledge. This study implements the spirit of lean service through IT and develops a teaching curriculum for F and B preparations and an experience system. These achievements will be expanded into a blended learning educational environment for the development of human resources for lean F and B preparations. Blended learning employs technology using physical, synchronized online, or unsynchronized online methods to transmit course content to learners. The most commonly encountered method of blending is adding online learning into the physical classroom (Oliver and Trigwell, 2005). This study develops an educational environment for F and B preparation that provides experience to students using a physical classroom, online learning and actual operations. Students and company employees can use these techniques to implement progress in lean service through the blended learning environment. Consequently, schools and companies must use the benefits provided by modern information technology and encourage students and employees to learn. They must endow these students and employees with sufficient information and response abilities and allow them to become core points of strength that develop with the times.

Lean service is an innovative applied technique that can be employed in F and B preparations. With rapidly changing developments in technology, innovations and changes that combine different methods, paths and media are becoming new trends in education. In addition, the familiarity of the present generation of students with information technology and their methods of speed reading and learning can enhance the ability of teaching technology and real work in creating harmonic benefits for learning and working (Chou, 2007). Consequently, developing and researching a simulated teaching and experience system for lean F and B preparations and establishing a blended learning environment can provide more convenience and flexibility for learning, generating an optimal balance between pedagogical goals and learning efficiency.

The age of service industries has arrived and numerous companies intend to introduce lean thinking into their services because of its wide and successful applications in the manufacturing industry. However, the meaning of lean must be understood before this application of lean thinking occurs. The central idea in lean is the removal of unnecessary waste during the production process. If resources are consumed without creating value, they become waste. Taiichi (1988) defined seven types of waste that create no value: Over-production, defects, inventory, transportation, waiting, motion and over-processing. Liker (2004) proposed an eighth type of waste: inappropriate design. If these types of wastes can be removed and the manufacturing process continually improved, a perfect lean production enterprise should be achieved. Womack and Jones (2005) were the first scholars to apply the principles of “zero waste, zero defects and precise value” to the consumption end of the equation; they emphasized that lean consumption should consider production, service and consumption as three areas in which to eliminate waste. The priority of this approach is satisfying customer demand which further reduces company costs and creates “win-win” situations for both customers and companies. Liu et al. (2011) further
proposed that only appropriate services, products and post-sales requirements could create customer values and integrate lean consumption and lean service.

In other words, the food and beverages industry is a service industry that sells the joy of eating to customers. In Taiwan, the F and B industry is mainly designed to facilitate restaurant evaluation and supervision. According to F and B evaluation reports from the Department of Health (Taipei City government), the F and B industry in Taiwan can be categorized into five general types: tourism hotels, restaurants, buffets and lunchboxes, cold drinks and roadside stands (Kao, 2002). Recently, phenomena such as social advances, economic prosperity and increases in dual-income families and single parent families have led to increasing numbers of people dining out. In addition, consumer demand for diversity and quality in food and beverages has provided numerous opportunities and areas for development in the F and B industry.

Characteristics of work in the F and B industry include long hours, standardization difficulties, labor-intensive service and changing environments. F and B products are characterized as customized, real-time (rapid), difficult to store, difficult to predict and difficult to standardize. Consequently, personnel who prepare F and B products play crucial roles in supporting management for F and B business services. The education of well-trained or highly specialized F and B preparation personnel has become an important school in the applied sciences. In this study, the study constructs an educational environment using the blended learning model and based on the spirit of lean service and requirements for F and B preparations by integrating the education environment and the technology acceptance model (TAM).

Davis (1986) designed TAM as shown in Fig. 1. The goal of TAM in this study is to provide a generalized explanation concerning the determining factors in user acceptance of the blended learning information system. Thus, TAM is used to investigate closed and forced blended learning information systems in organizations. The Technology Acceptance Model was a tool proposed used to evaluate or predict levels of user acceptance toward a new IT system. The theoretical basis of TAM is derived from the Theory of Reasoned Action (TRA). Fishbein and Ajzen (1975) proposed that, under the assumption of reasoned action, people undergo a process of conscious mental rationalizing before making potential choices in action. TRA is mainly a study of behavioural intentions in which variables are behavioral attitudes and subjective norms. An assumption is made that users are required to accept these systems because of their learning or working environments; thus, subjective norms are not considered and attitudes are the main factor in user acceptance of these systems.

Davis (1989) proposed that perceived usefulness and perceived ease of use show significant positive correlation to system usage. Lederer et al. (2000) indicated that perceived usefulness and perceived ease of use can predict the behavioural intention of Internet users. Results from a study conducted by Ndubisi (2006) showed that both TAM and the Theory of Planned Behaviour (TPB) can predict intention to use online learning, but TAM outperforms TPB. Usefulness, ease of use and attitude are significant prediction factors. A study conducted by Chen (2009) discovered that the information knowledge possessed by teachers had a significant positive influence on the perceived usefulness of, perceived ease of use for and intention to use wireless networks for teaching.

Marsh (2001) has indicated that although blended learning has gained increased attention in the past few years, the concept of blended learning has existed for more than a decade. All learning methods involving the integration of IT (including e-mail, TV broadcasts and the Internet) and traditional teaching are part of blended learning. Aspects of blended learning include the following:

- Models Combining Web-based Technologies: Live virtual classrooms, collaborative learning and video streaming
- Combining Pedagogical Approaches: (Such as constructivism, behaviourism and cognitive) and instructional technologies to achieve the most suitable learning results
- Combining Any Teaching Technology: (Such as video tapes, CD-ROMs and films) with face-to-face instructor-led training.
- Combining instructional technologies and actual job tasks to create a coordinated effect between learning and working

Singh (2003) adopted blended learning architecture from Khan, as shown in Fig. 2. This architecture provided

![Diagram of technical acceptance model (TAM) Davis (1986)]
a blueprint for planning, developing, managing and evaluating blended learning systems and suggested that blended learning integrated various event-based activities, such as face-to-face instruction, synchronized Web learning and self-guided learning.

Demtl and Motschning-Pitrik (2005) proposed a Blended Learning System Structure (BLESS) which provided a technique for the visual modeling of blended learning. In BLESS, blended learning is separated into smaller learning activity patterns as shown in Fig. 3. This approach allows effective application of learning technologies and can even serve as a guideline for blended learning class design. (Osguthorpe and Graham, 2003) maintained that the richness of instruction, channels of information, social interaction, self-management, cost-effectiveness and ease of return were the six focal points of blended learning design. This approach emphasizes that the instructor can determine the most suitable modes of teaching in their respective field which enhances instructor ability to generate a learning atmosphere and increase motivation to learn. Hcng (2003) conducted related studies concerning online courses, proving that integrating online and physical instruction is the only approach by which to both implement information technology and instruction blending and consider learning achievements, educational effectiveness and economic benefits.

Blended learning combines traditional face-to-face instruction and learning through Web information. In this

Fig. 2: Khan’s blended learning architecture diagram
Singh (2003)

Fig. 3: The blended learning systems structure (BLESS) model Demtl and Motschning-Pitrik (2005)
approach, courses are designed so that class time occurs in the traditional classroom and then continues in educational activities conducted through the Internet, e-mail, TV and other broadcasts. Thus, time spent in the traditional classroom is reduced, student learning achievements are improved and dropout rates decrease (Dzuban et al., 2004). Aspden and Helm (2004) attempted to connect physical students with online students in a blended learning environment to create an effective learning and teaching experience. Terashima et al. (2004) maintained that, in multimedia courses, the blended learning model could install an active spirit in students. In addition, Tsai (2009) applied blogs to blended learning. The result of this study indicated that using blogs for blended learning offered students real-time responses from instructors and other students which increased their degree of participation and their motivation to learn. The blog method was also effective for controlling learning content, documenting learning trajectory and reflecting student ideas and thoughts.

The findings of Wu et al. (2010) provided insight into factors that were possibly significant antecedents for planning and implementing a blended e-learning system to enhance student learning satisfaction. In their study, Chen and Zheng (2010) demonstrated that adult students accepted online learning models and achieved increased knowledge and consolidation of learning through interaction and sharing in virtual communities. They also discussed the meaning and application of online learning models for pedagogy. The present study referenced TAM and the theories and practices of blended learning and developed a blended learning educational environment for F and B preparations. The conceptual framework for this blended learning educational environment is shown in Fig. 4.

**STRUCTURAL MODEL**

In this study, the Design-based Research (DBR) structural model was adopted to develop a blended learning educational environment. DBR is a method that is both systematic and flexible. This method enhances the realization of education through repeated research, design, development and implementation (Wang and Hannafin, 2005). This study used the ADDIE process which is currently the most common application model for digital course developments (Shyu, 2003), to design online learning courses. The letters in ADDIE stand for the following: A: Analysis, D: Design, D: Development, I: Implementation and E: Evaluation. During the analysis stage in ADDIE, the characteristics of learners are understood, related information on course preparation is collected and pedagogical goals and the scale of courses are confirmed. This stage includes learner analysis, learning content analysis, learning goal analysis, information technology analysis and cost-benefit analysis. After analysis is completed, ADDIE proceeds to the design stage. This stage includes project timeline planning, course architecture design, interface design, course material design and the assignment of tasks to workers. Development represents the stage during which courses are prepared. The output from completed development must be evaluated and corrected before the next stage of ADDIE begins. During the implementation stage, instructors and learners implement and use courses. The evaluation portion of ADDIE includes formative evaluation and summative evaluation. Formative evaluation is a test given before course material has been applied. The test assists course developers in determining areas that must be improved. Summative evaluation is performed after course material has been applied. It mainly presents evaluation information to decision makers to determine if courses can be used in the future (Smith and Ragan, 2004; Chen and Yang, 2006). The ADDIE structural model employed in this study is shown in Fig. 5.
RESULTS

This study is the first to introduce the concept of lean service into the F and B service industry. Although they are not a panacea, the approaches used in this study should assist the construction of an educational model for new ideas in F and B preparation to develop smoother service processes and achieve optimal learning effects without increasing learning load. This is consistent with Womack and Jones (2005) had put forward arguments. In addition, incorporating blended learning into the design of the IT learning environment will improve and provide for the design of a more perfect educational environment.

Blended learning integrates various online networks and traditional learning resources to achieve the most effective learning results and economically beneficial strategies for introducing technology learning (Dzuban et al., 2004). The unique advantages of technological learning satisfy the multiple requirements of students and company employees regarding learning large amounts of material, rapid learning, learning at any time, learning at any location, interactive learning, community learning and diversified knowledge (Davis, 1986). However, progress toward a fully digitized learning environment is fraught with difficulties, including problems with software-hardware resource logistics and plans for complementary measures. Consequently, discovering the proper uses for blended learning to proceed with strategic plans for technological human resources development is an important research direction in current higher education.

The main structure of the blended learning educational environment for F and B preparation adopted in this study is shown in Fig. 6. The structural functions of this model are analyzed as follows.

Instructor system: The instructor system involves the construction of a server for the school to provide a platform for massive data exchange. This server allows instructors to produce content for teaching plans (including course outlines, norms, educational materials, digital audio-video displays and production technologies) using a variety of digital tools and upload this content to the instructor system. Students can then easily download this content and compare it with their actual work which improves mental processes and the effectiveness of learning in students.

Information and communication technology (ICT): With the Internet and service links provided by information and communication technology (ICT) operators in Taiwan
(who already provide fiber-optics transmission), massive
digital downloads of course material can become available
with great rapidity.

**Internet:** The power of the current Internet aids students
in finding relevant information. Repeated display on
computer systems can assist students in understanding
concepts they are unaware of and in turn, can provide
knowledge. Among Internet applications, teaching using
Web videos is an attractive option. The integration of this
Internet application with original teaching resources
should be encouraged. YouTube is a popular website.
Although it provides search channels, the wide array of
content on the Web site should be filtered to determine
those video clips that satisfy the requirements of a
specific course.

**E-mail:** Employing e-mail and group discussions is an
inseparable part of harnessing the Internet for
educational courses. Online forums can be important
venues for course discussions conducted between
teachers and students. Online forums record all issues
discussed by students and teachers (content-based or
otherwise).

**Interactive social learning:** Interactive social learning
methods, including experience and knowledge exchanges
performed during interactions using various text, image,
or audio-video blogs; forums; Google; Yahoo and
Facebook can also be employed. Participants or viewers
can form collective knowledge exchanges and interactions
when browsing, creating a knowledge system on the Web
and providing the knowledge in this system for limitless
adoption.

**Actual operating classroom:** Eee Pads can be inserted
into traditional F and B working tables, providing
technical tools for the learner or preparer. Using the
various functions of the Eee Pad, the learner or preparer
can use the touch screen to browse a course or can create
reports using the keyboard. Consequently, a wired and
wireless transmission environment is developed in the
actual operation classroom which allows the learner or
preparer to achieve learning goals using the technological
environment.

Whether teaching is conducted in a classroom or an
online setting, three dimensions of education must be
considered: Knowledge, teaching and emotion. In
traditional classroom settings, teachers often focus only
on knowledge dimension because of strict schedules.
When establishing online courses, teachers have
continued to adopt this tradition and have focused solely
on knowledge discussion when leading online courses.

This approach ignores emotional transactions occurring
between teachers and students and between students and
their peers. In this situation, teachers cannot flexibly
adjust teaching strategies and content according to the
learning conditions of students which causes dry and
unappealing online interactions. Thus, constructing a
blended learning educational environment is an important
step in the implementation of modern education through
technology.

**CONCLUSION**

Lean thinking is not only a tool used for
improvement, it is also a complete educational
management thinking system. Katayama and Bennet
(1996) indicated that lean production is a dynamic system
that requires comparatively little resource input but
increases value output. This study constructs a relevant
blended learning educational environment model for F and
B preparations, introducing the essence of lean thinking
into educational training for F and B and promoting a
series of training courses on lean F and B preparations.
Using information technology, this study tries to develop
the independent thinking and multiple capabilities of
trainees to achieve goal of creating value.

Before introducing lean service, this study must
strengthen promotion and education for the lean service
concept. Trainees should also be encouraged to develop
creative thinking as well as ideas that “breaks rules.” All
personnel in the F and B service industry should be
encouraged to participate in blended learning educational
courses and improve using these courses. During
educational training, uninterrupted application of training
courses increases knowledge of information technology
and improves working ability. With complete educational
training systems, trainees can obtain diversified learning
and apply their learned skills when working, improving
both work efficiency and quality.

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