How Are Live-Streaming Services and Social Media Platforms Changing On-Job MBA Students' Learning? A Case Study for Applying e-Case Live in Management Case-Based Learning in Taiwan

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ABSTRACT This study examines how social media and live-streaming services can be used to assist on-job MBA students with their learning of Management cases. A learning framework called e-Case Live, which integrates a popular live-steaming broadcast service with social media, is proposed. A total of 48 on-job MBA students participated in this study to learn about the practices of Management in a case-based course. In terms of the two case-learning scenarios, the traditional case-based learning method group (TG) consisted of 23 participants, while the e-Case Live learning method group (e-CaseG) consisted of 25 participants. Students' perceptions were explored in terms of synchronous discussion, asynchronous discussion, and social presence. The results of this study indicate that: (1) compared to traditional classroom instructional methods, most on-job MBA students were more satisfied with e-Case Live in terms of synchronous and asynchronous discussion, but no significant difference was found in terms of social presence; (2) integrating live-streaming services with social media platforms can offer a valuable instructional method for on-job students who practice authentic problem solving by applying what they learn; (3) the e-Case Live framework can effectively enhance student involvement and engagement in understanding the contexts embedded in Management cases; and (4) social media has increased the interaction between teachers and students both in and out of the classroom.

INDEX TERMS Adult learning, live-streaming, continuing education, management case-based learning, social media.

I. INTRODUCTION

Social media platforms have been shown to provide a means of supporting student-student and student-teacher interaction outside the classroom [1], [2]. One of the most popular services offered by social media platforms is live-streaming services, through which people increasingly share their personal broadcasts to interact with others for social and commercial purposes. Several studies have demonstrated the potential of social networking sites to support a networked process of knowledge building [3], [4]. However, research on live-streaming broadcast services within the context of adult

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education remains scarce. Furthermore, the role of learning is not limited to full-time students, but also incorporates other workers or retirees as long as they have the need. In these countries, adult demand for continuing education is growing, fueled by government policies and initiatives designed to create a lifelong learning environment. For adult learners continuing their education, schools offer a physical space in which to gather people in different business areas, offering opportunities to develop their social networks alongside students from different backgrounds. Furthermore, with the increasing leveraging of the convenience and flexibility afforded by the internet, on-job MBA students can now conduct their learning assignments both more effectively and more efficiently through a process of continuing education [5], [6].

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One of the key factors that influence the effectiveness of web-based learning is interaction [7]–[9]. Although some studies have pointed out that online learning in business education provides more interactions than traditional classroom learning, students still believe that the potential for interaction in online learning is limited [10]. However, with the rapid development of Internet technology, live-streaming services, such as live broadcast services, can provide the real sense of interaction and social experiences between participants in the virtual space [11]. In particular, large amounts of interaction and discussion are essential considerations for learners when doing case studies in MBA programs. Such interactions will often necessitate a combination of real cases with intense discussions, including both synchronous and asynchronous discussions [5], [12]–[14].

On-job MBA students hail from many different industries and positions within them, such as CEOs, company managers, factory directors, and so on. These individuals' jobs become increasingly hectic as their rank increases, insofar as they often need to attend meetings, travel for work, or work overtime. Thus, it is not easy to gather them in the same classroom to attend classes. In addition, they may also have to commute between home, office, and school. For these reasons, the convenience of location and scheduling flexibility represent their primary considerations [15]–[17]. Consequently, the factors relating to the social presence of on-job students during the learning process merit investigation.

The objective of this study, therefore, is to examine how the live-streaming services of social media platforms can be used to assist on-job MBA students in learning Management cases. Furthermore, this study also investigates these different groups of adult learners, and their perceptions of our proposed live-streaming service, to facilitate social interaction in a Management course. Hence, three research questions guide this study:

1) Are there significant differences in learning perceptions regarding synchronous discussion across different learning methods?
2) Are there significant differences in learning perceptions regarding asynchronous discussion across different learning methods?
3) Are there significant differences in social interaction perceptions regarding social presence across different learning methods?

II. LITERATURE REVIEW
A. MANAGEMENT CASE-BASED LEARNING
The MBA program is a Management case-based learning program that originated from Harvard University in 1890 [18]. This learning type has been considered an effective way to combine theory and practice in business education [19]. In terms of Management case-based learning, the learning efficiency of group members can be increased significantly by taking a group discussion approach to Management case studies, taking advantage of the strengths of both cooperative

and collaborative learning [8], [20]. Kim *et al.* [16] also found that virtual teaming was a major factor that positively influenced MBA students' online learning experience; they viewed virtual teaming experiences as offering them valuable preparation for the increasingly global business environment. On the other hand, Arbaugh [21] also suggests that advances in technology offer the possibility of using different types of virtual classrooms for Internet-based MBA courses in the future. The emergence of new technologies will result in the original curriculum structure being deconstructed and reconstructed.

B. SYNCHRONOUS AND ASYNCHRONOUS DISCUSSION IN SOCIAL NETWORKS
Over the past ten years, Information and Communication Technology (ICT) has developed rapidly to carry large amounts of digital content around the world. Learning is no longer limited to one fixed limited time and place, but can now be made flexible and convenient for everyone. With the age of Web 2.0, social networking services, such as Facebook, YouTube, and live-streaming broadcasts, have made social interaction and sharing easier and more frequent than ever before [22].

In the Web 2.0 era, users generate digital content and publish messages at will on Social Network Sites (SNSs), like Facebook (FB). Epitomizing the Web 2.0 phenomenon, SNSs stress both autonomy and interaction [23], [24]. However, while it is true that the Web 1.0 era also offered interactive website functions, such as chat rooms, forums, message boards, and Bulletin Board Systems (BBSs), which enabled both synchronous and asynchronous discussions with no distance or time limitations, such services were still plagued by pedagogical limitations [25]. Even though research has demonstrated the interactive efficiency of asynchronous discussions from different approaches or methods [7], [13], students in online MBA courses using Web 1.0 technologies have reported that that the interactive functionality offered was no better than that of a traditional classroom [10]. Arbaugh [26] has rightly pointed out that asynchronous discussion can make online MBA courses more effective, but surely a combination of both synchronous and asynchronous methods can greatly increase the potential for effective learning [12], [16], [25].

Following the increased popularity of SNSs, educational researchers began to focus on the relationship between students' use of SNSs and the learning effectiveness of such services [27], [28]. These studies found that students have a positive attitude toward SNSs in learning. In particular, Facebook (FB) is a very popular SNS, with most students using FB chiefly for social interaction [13] or discussing informal learning issues [29]. In educational terms, Facebook is a Web 2.0 internet social environment which affords many innovative learning methods and opportunities, including learner-centered autonomous learning, collaborative learning, and lifelong learning. Facebook also allows instructors and learners to utilize synchronous and asynchronous
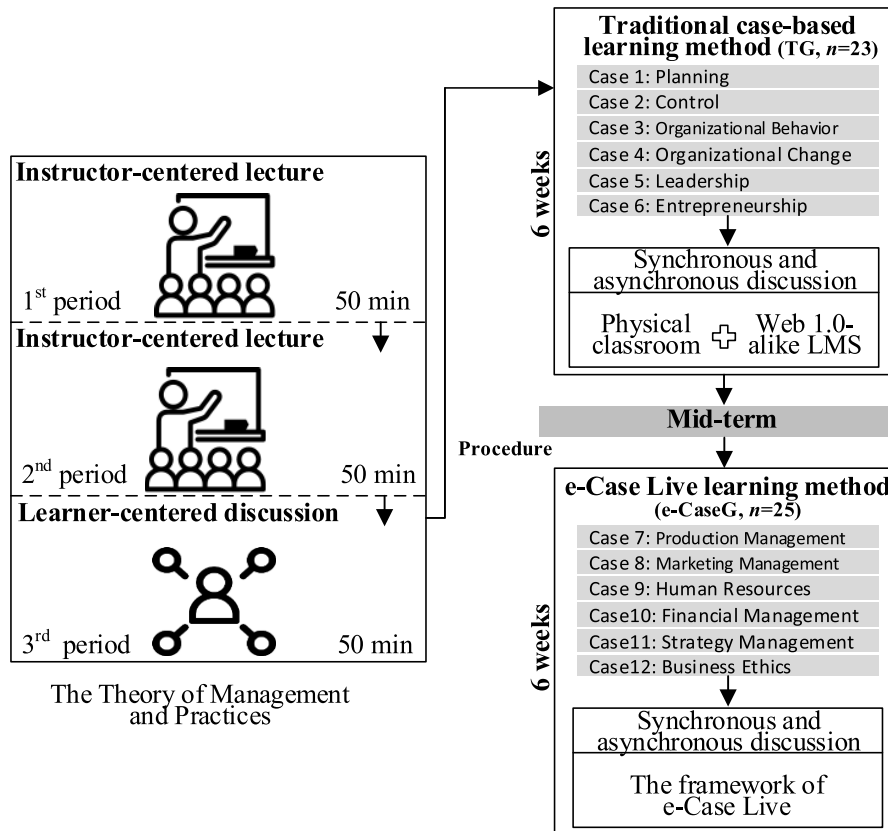
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FIGURE 1. The procedure of Management class.

discussion functions to facilitate resource sharing and the integration of learning materials [30]. Learners can also continue to interact socially with others even after a lesson has concluded, generating an environment for potential life-long learning in cyberspace. This feature thus represents a noteworthy research topic.

C. SOCIAL PRESENCE

Social presence in computer-mediated instruction has emerged as an important indicator for assessing the perceived existence of other people regarding more interactive, effective, and authentic online communication and learning [31], [32]. Social presence categories may be reflected in affective (expression of emotion), cohesive (collaboration and helping), and openly communicative (risk-free expression) content [33], [34]. Students in a small group will perceive a higher level of social presence in asynchronous online discussions [35]. Arbaugh [26] also suggests that instructors consider both teaching presence and social presence in the design and running of MBA curricula online. Rourke *et al.* [36] claimed that students with social presence are likely to instigate, sustain, and support content-related communication by making it more engaging. Researchers [37] have also pointed out that because social existence creates a supportive environment for critical thinking, it helps to generate interaction conditions that are richer, more enjoyable, and inherently beneficial for online learning.

As mentioned above, basic interactive technologies, such as asynchronous discussion forums, message boards, synchronous chat rooms, and BBS, were already present during the Web 1.0 era. However, the degree of interactivity regarding these Web 1.0 technologies still falls short of Web 2.0 technologies, which approach the idea of "social presence," originally defined as "a state where both parties can perceive whether the other actually exists during the process of human communication," [38] more closely.

As Web 2.0 has developed, a number of theories have been proposed to explain how these technologies generate both cognitive processes [37] and social presence, thus enhancing learning outcomes and learning perceptions [26]. Moreover, study also examined people's social media experiences and indicated that the sociality can make live streams on social media more engaging [11]. However, very little research has been conducted regarding whether the integration of live-streaming and social media network technologies can generate a higher level of social presence, and whether these can help on-job adult learners to enhance their learning outcomes compared to the traditional instructional methods offered by Management case-based learning. Hence, this study will further examine these issues.

III. RESEARCH SCENARIO

The procedure of Management class is shown in Figure 1. Blended instruction was adopted by the instructor in this

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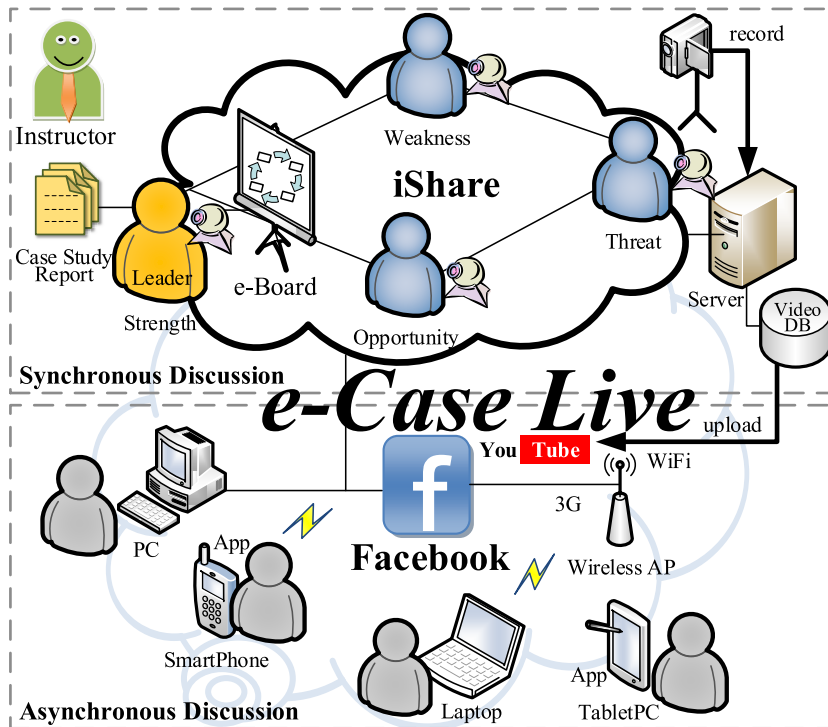
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FIGURE 2. The framework of e-Case Live.

"The Theory of Management and Practices" course. In terms of how this course was conducted, the instructor divided the class into 12 groups according to the 12 chapters of the textbook; each semester lasted 18 weeks, and classes took place weekly. The instructor spent the first and second periods of the class going over management theories, while the third period consisted of students reporting on case studies. In terms of student reports, the six groups that presented their reports prior to the mid-term adhered to the traditional case-based learning method, while the six teams that presented their reports after the mid-terms adhered to the e-Case Live learning method. Regardless of which learning method was used, the third period of each class was learner-centered, and instructors used the weekly case study as an axis for guiding discussions. Therefore, the different learning scenarios of the third period constitute the main focuses of this investigation. In addition, the content of the case study had to be arranged according to the teaching schedule, and was followed up by the instructor.

The report of the case study analysis was created collaboratively by all team members. The instructor required that all discussions regarding case studies used the techniques and solutions offered by the oft-applied SWOT (Strengths, Weaknesses, Opportunities and Threats) technique, which was the analytical method used to analyze each case. Each of the four members was responsible for one-fourth of the SWOT analysis, with the conclusions reached by the analysis outcomes to be discussed by all members. In this way, all members were required to participate in discussions within other members, with the leader then integrating and writing

up the final content of the report. In the following sections, we will describe the traditional and e-Case learning methods under different learning scenarios.

A. TRADITIONAL CASE-BASED LEARNING METHOD

In the traditional case-based learning scenario, the third period takes place in a physical classroom, where different teams conduct synchronous face-to-face discussions with the instructor and other students. After class, the students can use the Web 1.0-alike functions of the course website (e.g., discussion forum, online chatting, and so on) provided by the Learning Management System (LMS) to conduct asynchronous and synchronous discussions. Furthermore, the members of each team can use weekends to organize additional social learning activities, such as get-together meals, afternoon tea or coffee breaks, or country walks to discuss and generate the report for the management case study.

B. e-CASE LIVE LEARNING METHOD

The framework of e-Case Live is shown in Figure 2. In terms of the live webcast techniques of synchronous discussion, Skyoffice iShare, a synchronous teaching module based on multimedia collaboration system developed by SUN-NET Corporation (http://www.sun.net.tw), was integrated into e-Case Live. The iShare system provides multi-user audio and face-to-face video real-time communication, and discussion in an online virtual classroom. In the one-hour online class of Management cases, the team leader hosts the online presentation and conducts the synchronous discussion with a slide via the e-Board (Figure 3), which is similar
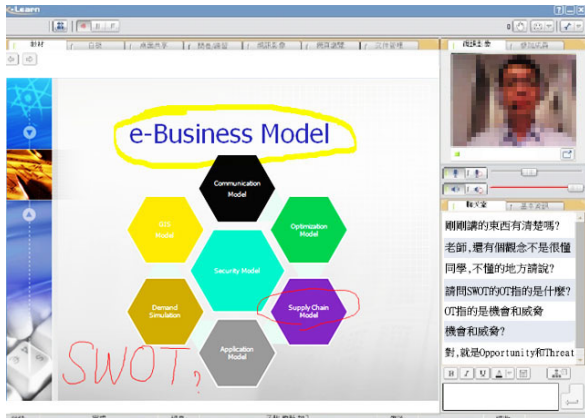
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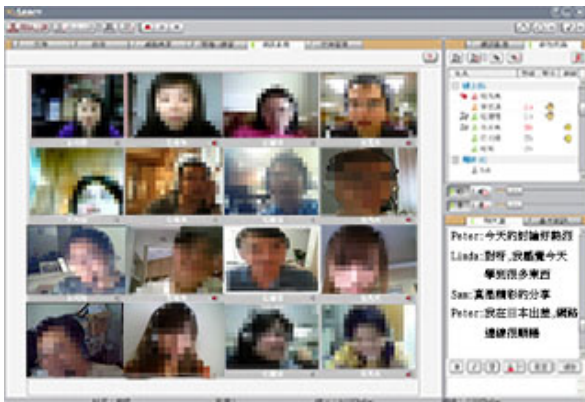
FIGURE 3. Online e-Board.

FIGURE 4. Online discussion.

to a blackboard of classroom in functionality, to introduce and analyze the Management case for which his team is responsible. During the synchronous discussion, these team members have to take turns to discuss the problems and solutions in the case with other online students, while also opening the online call-in function to allow remote students to join a videoconference with the team leader or members (Figure 4).

In terms of asynchronous discussion, e-Case Live incorporates SNSs with Facebook for students to discuss the case content. The instructor sets up a closed FB group for online case discussion, adding students to this group. In the closed group, the instructor and students can publish information related to Management cases at any time. Learners who don't take the course are not allowed to see the content, protecting the students' privacy. The leader of a certain week has to upload the learning materials or slides to the closed group for students to download and study in advance. On the other hand, the live webcast content in e-Case Live is uploaded to YouTube, embedded in another closed group for those who cannot participate in the synchronous discussion, to also provide them with the opportunity for asynchronous self-learning via video.

IV. METHODS AND APPROACHES
This study collected data through web-based questionnaires. Qualitative and quantitative analyses were conducted to

understand both the effectiveness of interactive learning and the perceptions of students.

A. DEVELOPMENT OF INSTRUMENTS
To develop suitable question items from our research scenario, three business school professors who had previously taught this Management course were invited as our expert panel. In terms of synchronous and asynchronous discussion question items, we referred to Kim *et al.* [16] and Rovai's [39] question items, which were used as a basis for revision. Our social presence question items were adapted from Gunawardena and Zittle [32] and Han *et al.* [40]. We designed a total of two surveys, one for the traditional case-based learning method and the other for the e-Case Live learning method. After several panel discussion meetings, the questionnaires were developed and expert validity was confirmed to ensure their accuracy and reliability. A five-point Likert scale ranging from "1: Strongly Disagree" to "5: Strongly Agree" was used to represent the extent of students' perceptions.

B. PARTICIPANTS
In total, 48 participants joined this study. All questionnaire respondents were on-job MBA students who had taken the Management course in an MBA program in northern Taiwan. Their ages ranged from 30 to 56, and they all had a wide range of working experiences. The students (31 males and 17 females) came from different industries: 35.9% from traditional industries (e.g., logistics, retail, construction, energy, machinery), 31% from high-tech industries (e.g., semiconductor, IT, electronics), and 33.1% from government organizations. In terms of the two case-learning scenarios, the traditional case-based learning method group (TG) consisted of 23 participants, while the e-Case Live learning method group (e-CaseG) consisted of 25 participants.

V. RESEARCH RESULTS AND ANALYSES
The Cronbach's α of composite reliability for the three dimensions is above 0.88, indicating that the reliability of the questionnaire is high. The factor loadings for all items are higher than 0.5, as determined by exploratory factor analysis (EFA). Hence, the results of Cronbach's α and EFA show that the questionnaire is reliable, valid, and well-designed. The means, standard deviations, t values, and significance values are shown in Table 1.

Table 1 lists the questionnaire results of both the e-CaseG survey and TG survey, highlighting the respective learning perceptions the eCase Live method and the traditional method after school LMS. The TG group version of this questionnaire (see Appendix) differs slightly. For example, item 1 on the TG survey states, "I feel that participating in discussions using the chat room is stimulating," whereas on the e-CaseG survey, item 1 states, "I feel that participating in discussions with iShare is stimulating."

Table 1 showed significant differences in dimensions of synchronous and asynchronous discussion between the two groups. The average scores for e-CaseG were higher than TG

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TABLE 1. The survey results for the three dimensions of perception.

Items	Ms		SDs		t	Sig.
	TG	e-CaseG	TG	e-CaseG		
Synchronous Discussion	3.77	4.18	.332	.323	-4.251	.000 **
1. I feel that participating in discussion with iShare is stimulating.	3.87	4.28	.694	.542	-2.293	.026*
2. I feel enthusiastic about speaking up with iShare.	3.48	4.24	.511	.523	-5.099	.000 **
3. I feel that the discussion atmosphere is engaging with iShare.	4.00	4.04	.522	.735	- .219	.828
4. I am impressed with the case interactions with iShare.	3.61	4.00	.656	.500	-2.309	.026 *
5. Overall, I am satisfied with the learning effectiveness in the synchronous discussion.	3.91	4.32	.596	.476	-2.623	.012 *
Asynchronous Discussion	3.82	4.31	.493	.300	-4.152	.000 **
1. I am able to use FB social functions to get to know other members.	3.96	4.48	.767	.510	-2.805	.007 **
2. I am able to better understand members' thinking from their FB discussions.	3.70	4.36	.822	.569	-3.278	.002 **
3. I am satisfied with my learning as extended by FB.	3.83	4.28	.778	.678	-2.160	.036 *
4. I am satisfied with the privacy protected by FB.	3.87	3.92	.626	.572	- .292	.772
5. Overall, I am satisfied with the learning effectiveness in asynchronous discussion.	3.74	4.52	.541	.510	-5.149	.000 **
Social Presence	4.01	4.25	.527	.371	-1.830	.074
1. I feel my contact with others is authentic.	4.04	4.16	.767	.554	- .607	.547
2. I feel a sense of social connection.	4.04	4.44	.638	.583	-2.250	.029 *
3. I feel comfortable expressing myself.	3.87	4.32	.694	.627	-2.361	.022 *
4. I feel that team members collaborated and worked well together.	3.91	3.96	.733	.611	- .242	.810
5. Overall, I am satisfied with the learning effectiveness from the social interaction in e-Case Live.	4.17	4.36	.491	.490	-1.313	.196

* $p < .05$; ** $p < .01$ **TG**: Traditional Group; **e-CaseG**: e-Case Live Group

both for synchronous discussion ($M_{TG} = 3.77$, $M_{e-CaseG} = 4.18$, $t = -4.251$, $p = .000$) and asynchronous discussion ($M_{TG} = 3.82$, $M_{e-CaseG} = 4.31$, $t = -4.152$, $p = .000$). Only one item in each of the synchronous and asynchronous dimensions failed to reach significant; all other items reached statistical significance. However, average scores for the social presence dimension failed to show significant differences ($M_{TG} = 4.01$, $M_{e-CaseG} = 4.25$, $t = -1.830$, $p = .074$). It is worth noting that the e-CaseG average scores for items 2 and 3 were still higher than TG. We discuss these results further in the next section.

A. ANALYSIS OF LEARNING PERCEPTIONS OF SYNCHRONOUS DISCUSSION

Most e-CaseG students discussed the management case studies on iShare, and, compared to the TG students, felt that it was more stimulating ($M_{TG} = 3.87$, $M_{e-CaseG} = 4.28$, $t = -2.293$, $p = .026$). Through live webcast techniques, the e-CaseG students were more willing to speak enthusiastically to other members than the TG students ($M_{TG} = 3.48$, $M_{e-CaseG} = 4.24$, $t = -5.099$, $p = .000$), and were also impressed by the case interaction ($M_{TG} = 3.61$, $M_{e-CaseG} = 4.00$, $t = -2.309$, $p = .026$). One student remarked that, "When I participate in case study discussions in the classroom of school after work, I sometimes feel stressed. But when I participate in discussions at home via iShare, I feel more relaxed ..." One student even said, "...I like this way to discuss the Management cases ... It's very helpful and useful when I get a deeper impression from the one-hour live broadcast discussion; it's just like in the real world..." In general, the on-job MBA students have busy careers and often have to either travel for business or work overtime. Consequently, they are sometimes late for class. In such instances, iShare fulfills the learning needs of on-job MBA students to cross the barriers of time and space.

Moreover, participants felt satisfied with the effectiveness of the synchronous learning on iShare. This view was expressed by another student: "I can express my real thoughts to other members on iShare, which is like a videoconferencing tool I have used to have meetings with customers ..." Due to these reasons, the synchronous discussion tool for the Management cases using the live webcast technology iShare satisfied most of the participants. It is also worth mentioning that both groups considered the discussions to be engaging, and that average satisfaction scores were higher than 4 ($M_{TG} = 4.00$, $M_{e-CaseG} = 4.04$, $t = -0.219$, $p = .828$), suggesting that satisfaction with the live webcast medium was not inferior to the in-class discussions.

B. ANALYSIS OF LEARNING PERCEPTIONS OF ASYNCHRONOUS DISCUSSION

Compared to the TG students, the e-CaseG students were able to use SNSs like FB to quickly establish familiarity with their classmates either inside or outside their teams ($M_{TG} = 3.96$, $M_{e-CaseG} = 4.48$, $t = -2.805$, $p = .007$). One student commented, "... I already have a Master's degree so I did not come here for a degree ... making a lot of friends and enriching my social network is the learning purpose ..." Most e-CaseG students also thought the updates on FB concerning their team members' ideas could help them to better understand others' thinking ($M_{TG} = 3.70$, $M_{e-CaseG} = 4.36$, $t = -3.278$, $p = .002$). Moreover, through the interactive functions offered by FB, e-CaseG students could not only communicate with their members, but also extend their learning beyond their initial discussions ($M_{TG} = 3.83$, $M_{e-CaseG} = 4.28$, $t = -2.160$, $p = .036$). As one student mentioned: "I can learn a lot of things here using FB with my Tablet PC anytime and anywhere ... Some members even generously share their work experiences with us ..." The asynchronous learning effects afforded by FB are both useful and plentiful:

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"I feel that FB has lengthened my overall learning time. Even when I am traveling out-of-town on a train to visit clients, I can use my smartphone to continue discussions with my partners." On the other hand, it should be mentioned that the privacy and personal information protection of FB did constitute an issue that caused concern for most participants. Still, both the TG and e-CaseG students displayed no significant differences in terms of their perceptions of privacy protection, with the average satisfaction scores for both groups lower than 4 ($M_{TG} = 3.87$, $M_{e-CaseG} = 3.92$, $t = -0.292$, $p = .772$). This indicates that most students worry about issues relating to personal information protection. However, even accounting for such problematic situations, the overall evaluation of participants was generally positive regarding using SNSs like FB as an asynchronous learning tool to study Management cases.

C. ANALYSIS OF PERCEPTIONS WITH SOCIAL PRESENCE

Compared to TG, most e-CaseG students felt comfortable using the e-Case Live learning framework to express their opinions on Management case studies ($M_{TG} = 3.87$, $M_{e-CaseG} = 4.32$, $t = -2.361$, $p = .022$). At the same time, this method also allowed them to experience a sense of social connectedness during their learning and interactive processes ($M_{TG} = 4.04$, $M_{e-CaseG} = 4.44$, $t = -2.250$, $p = .029$). In fact, a number of student comments were actually quite enthusiastic: "...live broadcast is an excellent medium for social interaction. I felt comfortable conversing through this service..."; and "As my peers come from various industries, using e-Case Live allows me to make friends with people from different fields ...it's very easy to socialize with other members when we finished our management case..." It is worth noting that even though both groups failed to show significant differences in terms of the collaboration item ($M_{TG} = 3.91$, $M_{e-CaseG} = 3.96$, $t = -0.242$, $p = .810$), the average satisfaction scores were still close to 4. They also felt satisfied with the collaborative process of analyzing and writing their case study reports with their team members on e-Case Live. In addition, participants were also satisfied with the collaborative learning activities that leveraged the sharing of their previous work experiences to analyze Management cases during e-Case Live. Overall, the participants were satisfied with their effort and dedication to the case study work.

VI. DISCUSSION

This study examined the impact of different learning methods on the Management case-based learning perceptions of on-job MBA students in terms of synchronous learning, asynchronous learning, and social presence.

A. DIFFERENCES IN LEARNING PERCEPTIONS OF SYNCHRONOUS DISCUSSION BETWEEN THE TWO GROUPS

Knowledge acquisition in Management case learning is a process that involves large amounts of real-time discussion and brainstorming [18], [19]. There are differences in the cultures and backgrounds of different industries, while there may even be differences in corporate governance systems of two companies from the same industry; it is these differences in organizational climates, operational performance, and leadership styles that Management case studies seek to examine [41]. In this study, the e-CaseG group adopted live webcast techniques, using webcams to synchronously transmit real-time video between live-streamers and end-users in a virtual classroom environment. Simultaneously, the TG group used text-based chat rooms built on the school's LMS for after-class discussions, in addition to the face-to-face discussions they conducted in class. A comparison of these interactive technologies showed that the use of live-streaming technology allowed on-job MBA students to take advantage of case discussion opportunities, regardless of their work situations [14], [26]. Furthermore, when participants used video streaming to conduct online real-time face-to-face communications, they could see the video and hear the audio of the other person. This both stimulated participants to engage in discussions and encouraged them to speak up and voice their opinions, helping to strengthen their case learning outcomes [20], [42]. These represent the e-CaseG students' learning perceptions of synchronous discussion, which, by contrast, the TG students lacked.

B. DIFFERENCES IN LEARNING PERCEPTIONS OF ASYNCHRONOUS DISCUSSION BETWEEN THE TWO GROUPS

In terms of the applicability of Management systems and principles, contingency school advocates have proposed a theory which states that "few principles of Management are universal" [43]. That is, one system may be successful when implemented by Company A but may also result in failure when implemented by Company B, even if the two companies are affiliated. In addition to using the brainstorming process to learn from Management case studies, another noteworthy focus is the use of asynchronous discussion to repeatedly reflect on differences between cases [42]. The e-CaseG group in this study used the SNS-like environment of Facebook to establish social relationships and conduct the asynchronous discussion of case topics; the TG group, on the other hand, used the discussion forum built into the school's LMS to discuss questions relating to the cases. As the SNS-like Facebook application has many members globally, it has much better software and hardware compatibility [1]. Users can install the app on their smartphones or tablet PCs, enabling them to use text, emojis, images, documents, and web links to conduct asynchronous arguments, debates, reflections, and clarifications at any time [13], [44]. They can even provide a SWOT analysis of each case. As a platform for social interaction, Facebook has extended the informal learning time of on-job MBA students, presenting a clear record of everyone's opinions during the discussion process, allowing the interaction and learning portfolio of each learner to be reviewed at any time [17], [29]. These findings are in line the

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with e-CaseG students' learning perceptions of asynchronous discussion, which were absent in the case of TG students.

It is worth pointing out that both groups of students still had concerns over privacy issues. Since FB mainly positions itself as a social networking site, the privacy issues that stem from social interactions during the learning process should be investigated more deeply in future research [45]. For example, when team members are using previous experiences from their company to come up with a solution for a case study, do they fear the possibility of leaked trade secrets or damaged company reputations? If so, they can avoid such sensitive issues, or simply provide only a rough outline of the situation, as none of the SNSs can guarantee users that all of their discussions will remain private.

C. DIFFERENCES IN SOCIAL INTERACTION PERCEPTIONS OF SOCIAL PRESENCE BETWEEN THE TWO GROUPS

The course taught in this study, "The Theory of Management and Practices," covers multiple chapters discussing topics relating to human aspects, such as organizational change, leadership, entrepreneurship, human resources, and so on. Management is a social science which studies the management activities of humans and the procedures through which managers and others complete activities effectively in collaboration with others [8], [20], [46]. Given that this is a field focused on human-related management, students gain an enhanced understanding of people and events through contact and interaction [6], [21]. In this study, the e-CaseG group mainly used the e-Case Live learning method, while the TG students used the traditional case-based learning method. In terms of research scenarios, physical social presence normally exists in traditional classrooms, but, even when students are face-to-face with their instructors, their physical positions are restricted by the limitations of classroom environments and students are unable to engage in discussion with one another during the instructor's lecture [3], [47]. For instance, students sitting in the last row are unable to conduct real-time discussions with students sitting in the first row. Problems like these can be resolved by the e-Case Live learning method, while the e-CaseG students were also shown to feel more comfortable when expressing themselves during the process of social interaction; in other words, they experienced a sense of social affective connectedness during these social interactions [44], [48], which in turn helped to create and strengthen their social relationships [14]. This is the main reason why there were no significant differences in social interaction perceptions regarding social presence between the e-Case Live and Traditional LMS student groups.

VII. CONCLUSION

Advances in web technology and the emergence of various social media communication tools have increased both the number and the diversity of interpersonal communication channels. Web 2.0 technological affordances have created a virtual interactive space similar to that of an actual classroom,

providing the convenience and flexibility needed to help resolve the problematic issues that result from imposing rigid place and time constraints for on-job adult learners (Duncan *et al.*, 2012; Kim *et al.*, 2005). Furthermore, during the process of synchronous and asynchronous discussion, Web 2.0 technological affordances generate a better social presence, resulting in enhanced learning perception and effectiveness (Arbaugh, 2018; Idris & Wang, 2009). When studying Management case studies, the e-Case Live learning method proposed by this study allows on-job MBA students to use live-streaming services to brainstorm and conduct synchronous discussions. Throughout the semester, students can use the SNS to both reflect on and debate case topics through asynchronous discussions. Although lacking the vivid feel of a real classroom, such a virtual learning environment and learning effectiveness was affirmed by e-CaseG students' high satisfaction scores. This study does not mean to suggest that the teaching of Management cases in classrooms should be completely replaced by Web 2.0 technologies and environments. However, this study recommends that educators in the future consider the issue of how to best take advantage of technological affordances to redesign Management case study pedagogy in way that best meets the needs of the growing population of on-job adult learners.

VIII. RESEARCH LIMITATIONS

Although this study provides useful insights for on-job adult learners to undertake Management cases, it nonetheless has five limitations:

1) The course used in this study was conducted as a form of blended instruction. As this study only explores the learning perception regarding the online class of Management cases from the course, the specific Management class theories taught in the classroom do not fall within the scope of this study.

2) In studying the function of FB, this study focused on its asynchronous discussion, not on its text-based synchronous discussion.

3) The different sets of surveys were administered to the two different groups (TG vs eCaseG) of participants. The main differences between these two groups were the lecture method adopted during the third period of the class and the levels of web technology used for after-class discussion. As only one class participated in this study, these limitations meant it was only possible to compare the differences between these two instruction methods. Consequently, we were unable to establish a control group for additional comparisons involving other procedures.

4) The blended instructions consisted of the two face-to-face instructor-centered sessions (1st and 2nd periods) and one learner-centered synchronous session (both traditional vs e-Case Live), followed by the after-class interaction (Web 1.0 technology vs SNS). In the absence of any relevant evidence, we were unable to determine whether the two instructor-centered sessions

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had any moderating effect on survey outcomes, and hope to examine this issue further in future studies.

5) Many of the participants in this study were adult learners with many years of working experience, and these on-job MBA students had to balance their work and conduct Management case-based learning under limited time constraints. For this reason, the study did not use pre-test, post-test, or semester grades to evaluate the learning outcomes of these students, instead using learning perceptions to evaluate their learning effectiveness.

Finally, generalizing the findings of this research to other academic subjects may be inappropriate, and future studies have to be cautious in making generalizations based on the results of this research.

APPENDIX

See Table 2.

TABLE 2. The questionnaire items for TG version.

Items
Synchronous Discussion
1. I feel that participating in discussions using the chat room is stimulating.
2. I feel enthusiastic about expressing my opinions in the chat room.
3. I feel that I am engaged in the discussion atmosphere in the chat room.
4. I am impressed with the interactions regarding the case in the chat room.
5. Overall, I am satisfied with the learning effectiveness in the synchronous discussion.
Asynchronous Discussion
1. I am able to use social functions in the discussion forum to get to know other members.
2. I am able to better understand members' thinking by using the discussion forum.
3. I am satisfied with my learning as extended by the discussion forum.
4. I am satisfied with the privacy protected by the discussion forum.
5. Overall, I am satisfied with learning effectiveness in asynchronous discussion.
Social Presence
1. I feel my contact with others is authentic.
2. I feel a sense of social connection.
3. I feel comfortable expressing myself.
4. I feel that team members collaborated and worked well together.
5. Overall, I am satisfied with social interaction learning effectiveness in the traditional learning environment.

REFERENCES

[1] L. Deng and N. J. Tavares, "From moodle to Facebook: Exploring students' motivation and experiences in online communities," *Comput. Educ.*, vol. 68, pp. 167–176, Oct. 2013.

[2] L. Z. Wise, J. Skues, and B. Williams, "Facebook in higher education promotes social but not academic engagement," in *Proc. Changing Demands, Changing Directions, ASCILITE*, G. Williams, P. Statham, N. Brown, and B. Cleland, Eds., 2011, pp. 1332–1342.

[3] J. Dron, and T. Anderson, *Teaching Crowds: Learning and Social Media*. Edmonton, AB, Canada: Athabasca Univ. Press, 2014.

[4] G. Siemens and M. Weller, "Higher education and the promises and perils of social network," *Revista de Universidady Sociedad del Conocimiento*, vol. 8, no. 1, pp. 164–170, 2011.

[5] K. Duncan, A. Kenworthy, and R. McNamara, "The effect of synchronous and asynchronous participation on Students' performance in online accounting courses," *Accounting Educ.*, vol. 21, no. 4, pp. 431–449, Aug. 2012.

[6] M. Kibelloh and Y. Bao, "Can online MBA programmes allow professional working mothers to balance work, family, and career progression? A case study in China," *Asia–Pacific Educ. Res.*, vol. 23, no. 2, pp. 249–259, 2014.

[7] S. Jyothi, C. McAvinia, and J. Keating, "A visualisation tool to aid exploration of students' interactions in asynchronous online communication," *Comput. Educ.*, vol. 58, no. 1, pp. 30–42, Jan. 2012.

[8] C. S. L. Ng, W. S. Cheung, and K. F. Hew, "Interaction in asynchronous discussion forums: Peer facilitation techniques," *J. Comput. Assist. Learn.*, vol. 28, no. 3, pp. 280–294, Jun. 2012.

[9] A. G. Picciano, "Beyond student perceptions: Issues of interaction, presence, and performance in an online course," *J. Asynchronous Learn. Netw.*, vol. 6, no. 1, pp. 21–40, 2002.

[10] S. Y. McGorry, "Online, but on target? Internet-based MBA courses," *Internet Higher Educ.*, vol. 5, no. 2, pp. 167–175, Jun. 2002.

[11] O. L. Haimson and J. C. Tang, "What makes live events engaging on Facebook live, Periscope, and Snapchat," in *Proc. CHI Conf. Hum. Factors Comput. Syst.*, May 2017, pp. 48–60.

[12] G. Johnson, "The relative learning benefits of synchronous and asynchronous text-based discussion," *Brit. J. Educ. Technol.*, vol. 39, no. 1, pp. 166–169, 2008.

[13] H.-S. Lin, Z.-R. Hong, and F. Lawrenz, "Promoting and scaffolding argumentation through reflective asynchronous discussions," *Comput. Educ.*, vol. 59, no. 2, pp. 378–384, Sep. 2012.

[14] A. Rockinson-Szapkiw, J. Wendt, M. Whighting, and D. Nisbet, "The predictive relationship among the community of inquiry framework, perceived learning and online, and graduate Students' course grades in online synchronous and asynchronous courses," *Int. Rev. Res. Open Distrib. Learn.*, vol. 17, no. 3, May 2016.

[15] M. S. Beqiri, N. M. Chase, and A. Bishka, "Online course delivery: An empirical investigation of factors affecting student satisfaction," *J. Educ. Bus.*, vol. 85, no. 2, pp. 95–100, Nov. 2009.

[16] K.-J. Kim, S. Liu, and C. J. Bonk, "Online MBA students' perceptions of online learning: Benefits, challenges, and suggestions," *Internet Higher Educ.*, vol. 8, no. 4, pp. 335–344, Oct. 2005.

[17] R. Sebastianelli, C. Swift, and N. Tamimi, "Factors affecting perceived learning, satisfaction, and quality in the online MBA: A structural equation modeling approach," *J. Educ. Bus.*, vol. 90, no. 6, pp. 296–305, Aug. 2015.

[18] L. Barnes, R. Christensen, and A. Hansen, *Teaching and the Case Method*. Boston, MA, USA: Harvard Business School Press, 1994.

[19] H. L. Harrington, "Fostering reasoned decisions: Case-based pedagogy and the professional development of teachers," *Teaching Teacher Educ.*, vol. 11, no. 3, pp. 203–214, May 1995.

[20] B. Kopp, M. Hasenbein, and H. Mandl, "Case-based learning in virtual groups—Collaborative problem solving activities and learning outcomes in a virtual professional training course," *Interact. Learn. Environments*, vol. 22, no. 3, pp. 351–372, May 2014.

[21] J. B. Arbaugh, "Republication of virtual classroom characteristics and student satisfaction with Internet-based MBA courses," *J. Manage. Educ.*, vol. 42, no. 4, pp. 533–556, Aug. 2018.

[22] D. J. Hughes, M. Rowe, M. Batey, and A. Lee, "A tale of two sites: Twitter vs. Facebook and the personality predictors of social media usage," *Comput. Hum. Behav.*, vol. 28, no. 2, pp. 561–569, Mar. 2012.

[23] N. Jones, H. Blackey, K. Fitzgibbon, and E. Chew, "Get out of MySpace!" *Comput. Educ.*, vol. 54, no. 3, pp. 776–782, Apr. 2010.

[24] A. Y. Yu, S. W. Tian, D. Vogel, and R. Chi-Wai Kwok, "Can learning be virtually boosted? An investigation of online social networking impacts," *Comput. Educ.*, vol. 55, no. 4, pp. 1494–1503, Dec. 2010.

[25] M. Oztok, D. Zingaro, C. Brett, and J. Hewitt, "Exploring asynchronous and synchronous tool use in online courses," *Comput. Educ.*, vol. 60, no. 1, pp. 87–94, Jan. 2013.

[26] J. B. Arbaugh, "System, scholar or students? Which most influences online MBA course effectiveness?" *J. Comput. Assist. Learn.*, vol. 30, no. 4, pp. 349–362, Aug. 2014.

[27] R. Junco, "The relationship between frequency of Facebook use, participation in Facebook activities, and student engagement," *Comput. Educ.*, vol. 58, no. 1, pp. 162–171, Jan. 2012.

[28] P. A. Kirschner and A. C. Karpinski, "Facebook and academic performance," *Comput. Hum. Behav.*, vol. 26, no. 6, pp. 1237–1245, Nov. 2010.

[29] C. Madge, J. Meek, J. Wellens, and T. Hooley, "Facebook, social integration and informal learning at university: 'It is more for socialising and talking to friends about work than for actually doing work,'" *Learn., Media Technol.*, vol. 34, no. 2, pp. 141–155, Jun. 2009.

[30] Y. Idris and Q. Wang, "Affordances of Facebook for learning," *Int. J. Continuing Eng. Educ. Life-Long Learn.*, vol. 19, nos. 2–3, pp. 247–255, 2009.

I.-F. Liu, H.-C. Hung: How Are Live-Streaming Services and Social Media Platforms Changing On-Job MBA Students' Learning?

IEEE Access

[31] L. L. de Bruyn, "Monitoring online communication: Can the development of convergence and social presence indicate an interactive learning environment?" *Distance Educ.*, vol. 25, no. 1, pp. 67–81, May 2004.

[32] C. N. Gunawardena and F. J. Zittle, "Social presence as a predictor of satisfaction within a computer-mediated conferencing environment," *Amer. J. Distance Educ.*, vol. 11, no. 3, pp. 8–26, Jan. 1997.

[33] J. Borup, R. E. West, and C. R. Graham, "Improving online social presence through asynchronous video," *Internet Higher Educ.*, vol. 15, no. 3, pp. 195–203, Jun. 2012.

[34] D. R. Garrison, T. Anderson, and W. Archer, "Critical inquiry in a text-based environment: Computer conferencing in higher education," *Internet Higher Educ.*, vol. 2, nos. 2–3, pp. 87–105, Mar. 1999.

[35] M. Akcaoglu and E. Lee, "Increasing social presence in online learning through small group discussions," *Int. Rev. Res. Open Distrib. Learn.*, vol. 17, no. 3, pp. 1–17, May 2016.

[36] L. Rourke, T. Anderson, D. R. Garrison, and W. Archer, "Assessing social presence in asynchronous text-based computer conferencing," *J. Distance Educ.*, vol. 14, no. 3, pp. 51–70, 2001.

[37] D. R. Garrison, "Online community of inquiry review: Social, cognitive, and teaching presence issues," *J. Asynchronous Learn. Netw.*, vol. 11, nol. 1, pp. 61–72, 2007.

[38] J. Short, E. Williams, and B. Christie, *The Social Psychology of Telecommunications*. London, U.K.: Wiley, 1976.

[39] A. P. Rovai, "Development of an instrument to measure classroom community," *Internet Higher Educ.*, vol. 5, no. 3, pp. 197–211, Sep. 2002.

[40] S. Han, J. Min, and H. Lee, "Antecedents of social presence and gratification of social connection needs in SNS: A study of Twitter users and their mobile and non-mobile usage," *Int. J. Inf. Manage.*, vol. 35, no. 4, pp. 459–471, Aug. 2015.

[41] C. Evans, "Re-thinking case-based assessments in business management education," *Int. J. Manage. Edu.*, vol. 14, no. 2, pp. 161–166, Jul. 2016.

[42] P. A. Ertmer and A. A. Koehler, "Facilitation strategies and problem space coverage: Comparing face-to-face and online case-based discussions," *Educ. Technol. Res. Develop.*, vol. 66, no. 3, pp. 639–670, Jun. 2018.

[43] W. V. Muse, "The universality of management," *Acad. Manage. J.*, vol. 10, no. 2, pp. 179–184, Jun. 1967.

[44] J. Lim and J. C. Richardson, "Exploring the effects of students' social networking experience on social presence and perceptions of using SNSs for educational purposes," *Internet Higher Educ.*, vol. 29, pp. 31–39, Apr. 2016.

[45] Y. M. Al-Dheleai and Z. Tasir, "Facebook and education: Students' privacy concerns," *Int. Educ. Stud.*, vol. 8, no. 13, pp. 22–26, Jun. 2015.

[46] S. P. Robbins, D. A. Decenzo, and M. Coulter, *Fundamentals of Management*. Tehran, Iran: Cultural Research Office, 2001.

[47] J. Bowers and P. Kumar, "Students' perceptions of teaching and social presence: A comparative analysis of Face-to-Face and online learning environments," *Int. J. Web-Based Learn. Teaching Technol.*, vol. 10, no. 1, pp. 27–44, Jan. 2015.

[48] Z. Tasir and Y. Al-Dheleai, "Web 2.0 for fostering students' social presence in online learning-based interaction," *J. Technol. Sci. Educ.*, vol. 9, no. 1, pp. 13–19, 2019.

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