Association for Information Systems
AIS Electronic Library (AISeL)

PACIS 2008 Proceedings

Pacific Asia Conference on Information Systems (PACIS)

July 2008

# Enhancing Student Learning with Podcasting, a Newly Emergent Social Technology

Rachael Ip
*City University of Hong Kong*, isip@cityu.edu.hk

Y.K. Lau
*City University of Hong Kong*, raylau@cityu.edu.hk

T Chan
*City University of Hong Kong*, csmtchan@cityu.edu.hk

Eva Wong
*City University of Hong Kong*, eva.wong@cityu.edu.hk

Sharon Wong
*City University of Hong Kong*, wmwong@cityu.edu.hk

***See next page for additional authors***

**Authors**
Rachael Ip, Y.K. Lau, T Chan, Eva Wong, Sharon Wong, and Johnny So

# ENHANCING STUDENT'S LEARNING WITH PODCASTING, A NEWLY EMERGENT SOCIAL TECHNOLOGY

Ip, K.F. Rachael, City University of Hong Kong, isip@cityu.edu.hk
Lau, Raymond Y.K., City University of Hong Kong, raylau@cityu.edu.hk
Chan, M. T., City University of Hong Kong, csmtchan@cityu.edu.hk
Wong, Y.W. Eva, City University of Hong Kong, eva.wong@cityu.edu.hk
Wong, W.M. Sharon., City University of Hong Kong, wmwong@cityu.edu.hk
So, C.F. Johnny, City University of Hong Kong, isjohnny@cityu.edu.hk

## Abstract

*The complement between pull and push learning modes is believed to be contributable to enriching students' learning experiences. Podcasting, a push technology, can be used to push teaching materials to the students' handheld devices, allowing them to study without any geographical and temporal constraints. The students can then revise the materials according to their own preferences. This explicit push technology together with students' implicit pull motivation can encourage the students to learn in a more efficient way. As the students have the autonomy to choose their preferred media to access learning materials, it is believed to be able to increase students' satisfaction in the learning process. We implemented this idea in one of the courses taught in a university in Hong Kong. The encouraging findings confirmed with our belief that podcasting can help students to learn better by increasing their learning satisfaction.*

*Keywords:* *Podcasting, task-technology-fit, learning satisfaction*

# 1 INTRODUCTION

Social technologies, such as discussion boards, blogs, wikis, and online games, have been widely used for learning and teaching purposes. Social technology is defined as any type of "computing application that serves as an intermediary or a focus for a social relationship" (Schuler 1994). Although it was once perceived as a type of technology only for fun, it has gradually evolved across the boundary between pure social uses and business uses. In education, social technologies are used both inside and outside the classrooms, aiming at encouraging students to reflect what they have learned and to construct new knowledge. The underlying belief of successful uses of such technologies in teaching and learning is that students will actively use these technologies for their learning purposes. However, the majority of the instructors would embed the uses of the technologies in the "assessable" learning activities, that means, the technologies are mandatory rather than voluntarily used.

In Hong Kong, the decline of English proficiency level of students causes problems in tertiary education. A small portion of students are not able to fully understand the materials delivered in class, and consequently they will lose their interest in the subjects and perform badly in the assessments. Traditionally, HK lecturers will upload materials to course websites and "assume" students will download the materials prior to the lectures. However, only a few of the students will have self-motivation to actively access the website and download the materials for preparation. Contrarily, instead of checking the material availability, most students will do the downloading just before the lectures commence. Rather than letting the materials idle for downloading, it is more effective to notify the students their existences once they are uploaded.

To encourage the students prepare classes actively, we propose to adopt one social technology, podcasting in our teaching. Podcast is an audio broadcast converted to an audio file format for playback on portable media players and computers. With such technology, students can be notified the existence of the materials through their electronic devices, such as desktops, mobile laptops, PDAs, and cell phones. Podcasting technology can thus help to actively push the materials to the students. The nature of podcasting is believed to be able to stimulate students' self-initiative for pre-class preparation and post-class revision (Parikh and Verma, 2002).

This paper described a pilot project to help students to learn actively through the uses of podcasting technology. We had chosen students taking one computer science course run in a university in Hong Kong as our subjects. In the following section we provide a background on the push and pull approaches in education, podcasting, and task-technology-fit model. In the next section, we give a detail description of our research design and methodology, then, followed by the findings and discussion. Finally, we discuss the implication of this study.

# 2 BACKGROUND

Social technologies, originally designed for social purposes, are commonly used in education (Ip & Wagner, 2007). To study how students benefit from social technologies in their study, it is necessary to understand why and how such technologies are being used in both learning and leisure environment. We believed that the uses of social technologies must be able to align with the associated learning tasks. Any uses of social technologies must be carefully integrated into the students' learning experiences in a thoughtful way. The role of the features and functions of such technologies should also be investigated of their matching with the learning objectives and educational values.

## 2.2 Podcasting

A ***podcast*** is a collection of digital media files that distributed over the Internet using RSS Syndication technologies for playback on portable media players and computers (Copley 2007; Essex 2006; Oxford University Press; wikipedia, May 19, 2008). Podcasting uses an XML-based technology called RSS (Really Simple Syndication) to push audio content from websites down to individual devices. After subscribing to a podcast feed, the podcast can be automatically downloaded to the subscriber's computer and synced to his or her mobile devices. Individuals can choose what they want to listen to, such as, they can automatically have new shows ready to listen to while they are having their exercises or commuting to school or work.

## 2.1 Pull and push learning modes

While other research (Evan 2008; Parikh and Verma, 2002) emphasized the advantages of push technology over pull technology in enriching students' learning experiences, we argue that these two approaches actually complement each other in fostering students' learning capabilities.

Instructors usually ***push*** teaching materials to students by supplying them either by traditional hardcopies or online softcopies, and then lecturing with these materials. The delivered materials, usually well organized, are designed for the students to gain the information in the most efficient way – in term of their effort and time spent to gain the information or knowledge. Although some may challenge the learning effect brought by this one-direction lecturing, we cannot deny that it is still one of the most efficient and effective way in disseminating knowledge. On the other hand, the ***pull*** mode of learning is initiated from the student side. The students actively find ways to gain knowledge so as to enhance their capabilities or gain satisfaction through the learning process. We believe that the pull mode of studying can have a stronger effect in enhancing one's self-learning capabilities and the gained knowledge will be more sustainable (Perry et al., 2006).

## 2.3 Task technology fit model

No learning task will be meaningful if the task does not match with the learning objectives. Along the same line, technology will only contribute to learning if it fits the learning tasks. Task-technology fit is defined as the "the degree to which a technology assists an individual in performing his or her portfolio of tasks" (Goodhue et al. 1995, p. 216) and has been used to provide "conceptual basis for a user evaluation instrument aimed at an organizational assessment of information technologies in the general task domain of managerial use" (Goodhue, 1998, p. 106). Research has been undertaken to measure the fit between technologies and tasks assigned to either groups or individuals through evaluating the performance (Dennis et al. 2001, Goodhue et al. 1995, Iivari 1992, Lim et al. 2000, Maruping et al. 2004, Zigurs et al. 1998). The research reveals that there is a positive correction between employees' performance and the fit between the technology and the assigned tasks. In the learning environment, task-technology fit (TTF) concept can be used to explain how individuals learn with an appropriate social technology, among the alternatives, to fit the necessary learning tasks.

### 2.4 The application of podcasting in learning environment

It is not uncommon for us, as university instructors, to observe the decline of English proficiency level of HK students. Owing to their incapability of understanding English, students easy get lost in classes, especially in large lectures when individual attention is not always possible. In business school, situation will be even worsened if students are lacking of knowledge about current business practices. Consequently, some students start to lose their interest in the subjects, perform badly in the examinations, and even cause classroom discipline problems. Introducing teaching materials to students prior to lectures is definitely one of the solutions to the problems. If students can get to know the teaching materials in advance, it is believed that their understandings of the lectures will be improved.

A flash card system, with functions enhanced by podcasting technology was developed. Flash cards are virtual cards containing the explanation of specific terms and concepts that are going to be (or had been) taught in the class. With podcasting technology, flash cards were pushed to students' electronic devices, such as PDAs (in the University, each student was loaned a PDA for learning purposes) and cell phones (almost every student in the University had a cell phone). Students were to be notified of any newly uploaded materials and be able to access the materials with their handheld devices through the provided hyperlinks. Students could then download and read the materials at anytime and anywhere. With podcasting technology, materials were pushed to the students' own devices, but, at the same time, the students have their autonomy of deciding whether to pull the materials down from the Internet for preparation and revision. Through the self-motivated learning initiative, we believe that the students should be able to gain satisfaction as such initiative was originated from their side, therefore, we posited the following hypotheses:

H1: Individual evaluations of task-technology fit on the use of podcast for learning will directly influence positively on his/her learning satisfaction.

H2: Individual evaluations of task-technology fit on the use of podcast for learning will indirectly influence his/her learning satisfaction through positive podcast value.,

H3: Individual evaluations of task-technology fit on the use of podcast for learning will indirectly influence his/her learning satisfaction through positive podcast utilization.

## 3. RESEARCH METHODOLOGY

### 3.1 Research design

This study was conducted in one of the courses at a university in Hong Kong throughout the fall semester in 2007. A preliminary online survey was conducted at the beginning of the semester to understand podcast usage among contemporary youngsters. Two hundred and fifty-eight responses were collected from subjects who either attended a computer science or an information systems related undergraduate course. Most of the respondents aged from 20 to 23 years old. From this first survey, it was revealed that iPod and MP3 were the most prevalent portable devices, and they were mostly used for listening music during traveling. The survey also indicated that 62 percent of the respondents were interested in accessing course materials with portable devices.

During the semester, lecture contents were summarized and recorded as audio files. The files were uploaded to the course website as podcast for students to download. At the end of the semester, all students who had accessed to the podcast materials were invited to participate an online survey, which included the measurements of task technology fit, podcast value, utilization, and learning satisfaction. The survey was done outside class time. Participants

were reminded to read the heading notes of the questionnaire, which explained the meaning of Podcast.

Two hundred and twenty-nine responses were collected in the second survey. More than 70 percent of the respondents were between 20-23 years old. Most of them (83.4%) had listened to the podcast course materials. Personal computer and laptop were the most common devices to listen the podcast course materials (71.6%), followed by MP3 and iPod (21%).

### 3.2 Measurement

Among the twelve dimensions of TTF instruments developed by (Goodue, 1998), eight dimensions were selected for this study, which were *Ease of Use of hardware and Software*, L*ocatability*, *Compatibility*, *Accessibility*, *Assistance*, *Confusion*, *System Reliability*, and *Meaning*. Four of the dimensions were dropped because of the inappropriateness to our study context. Further explanation on the reason of removal will be covered in discussion section. Learning satisfaction measurements were adopted from (Chen et al., 2006) to evaluate the effect of applying podcast technology for learning. Podcast utilization was measured by asking if the respondents listened to podcast course materials frequently and intensively. Podcast value was measured by asking if the respondents felt the podcast materials as valuable because of the learning flexibility features provided by podcast. All items were measured in 7-point Likert-scale with 1 as Extremely Disagree and 7 as Extremely Agree.

## 4. ANALYSIS AND FINDINGS

The research models were tested using Partial Least Square (PLS), a variance based structural equation modeling technique that accesses the relationship between items and constructs (the measurement model) and analyzes the strengths and directions of the relationships among constructs (the structural model) (Lohmoller, 1989). It is well fit for this study because of its strengths in handling formative constructs and its small sample size requirements (Fornell and Bookstein, 1982). Moreover, TTF was formed as a first level construct, which was composite of the eight TTF dimensions as second level constructs following the procedure described by Chin (2000).

### 4.1 Measurement Model

Three tests were used to assess convergent validity: composite reliability of constructs, average variance extracted (AVE) by constructs, and reliability of questions. Convergent validity is adequate when composite reliability of constructs above 0.8; constructs have an AVE of at least 0.5; and item loadings above 0.7 (Fornell and Larcker, 1981; Hair, 1998; Nunnally, 1978). In both models, all constructs appeared to have an adequate convergent validity, except Compatibility, Confuse and System Reliability. These three constructs were excluded in subsequent analysis due to inadequate reliability and validity. Table 1 provides a summary of statistical results.

| **Direct Model** | | | | |
|---|---|---|---|---|
| Construct | Composite Reliability | Average Variance Extracted | Item | Loading |
| MEAN<br>(Meaning) | 0.874 | 0.776 | MEAN1<br>MEAN2 | 0.8845<br>0.8778 |
| ASSIST<br>(Assistance) | 0.823 | 0.699 | ASSIST1<br>ASSIST2 | 0.8236<br>0.8489 |
| EOU<br>(Ease of Use) | 0.858 | 0.752 | EOU1<br>EOU2 | 0.8529<br>0.8810 |
| LOCAT<br>(Locatability) | 0.847 | 0.734 | LOCAT1<br>LOCAT2 | 0.8615<br>0.8518 |
| ACCESS<br>(Accessibility) | 0.861 | 0.756 | ACCESS1<br>ACCESS2 | 0.8779<br>0.8606 |
| LS<br>(Learning Satisfaction) | 0.942 | 0.698 | LS1<br>LS2<br>LS3<br>LS4<br>LS5<br>LS6<br>LS7 | 0.8647<br>0.8106<br>0.8526<br>0.8269<br>0.8643<br>0.7935<br>0.8349 |
| **Indirect Model** | | | | |
| PODUTIL<br>(Podcast Utilization) | 0.930 | 0.869 | PODUTIL1<br>PODUTIL2 | 0.9360<br>0.9280 |
| MEAN<br>(Meaning) | 0.874 | 0.776 | MEAN1<br>MEAN2 | 0.8847<br>0.8775 |
| ASSIST<br>(Assistance) | 0.823 | 0.699 | ASSIST1<br>ASSIST2 | 0.8234<br>0.8491 |
| EOU<br>(Ease of Use) | 0.858 | 0.752 | EOU1<br>EOU2 | 0.8528<br>0.8811 |
| LOCAT<br>(Locatability) | 0.847 | 0.734 | LOCAT1<br>LOCAT2 | 0.8606<br>0.8527 |
| ACCESS<br>(Accessibility) | 0.861 | 0.756 | ACCESS1<br>ACCESS2 | 0.8765<br>0.8621 |
| PODVAL<br>(Podcast Value) | 0.939 | 0.793 | PODVAL1<br>PODVAL2<br>PODVAL3<br>PODVAL4 | 0.8634<br>0.9258<br>0.8983<br>0.8739 |
| LS<br>(Learning Satisfaction) | 0.942 | 0.698 | LS1<br>LS2<br>LS3<br>LS4<br>LS5<br>LS6<br>LS7 | 0.8731<br>0.8188<br>0.8525<br>0.8188<br>0.8591<br>0.7913<br>0.8333 |

*Table 1. Reliability and Validity*

For satisfactory discriminant validity, the AVE from the construct should be greater than the variance shared between the construct and other constructs (Chin, 1008). Table 2 shows the correlations among different constructs. It demonstrates good discriminant validity on the model because all the square roots of the AVE for a particular construct is larger than the correlations between it and other constructs, and the correlations between all pairs of TTF dimensions were below the suggested cutoff of 0.90 level (Fornell and Bookstein, 1982).

## 4.2 Structural Model

With adequate measurement model, the hypotheses were tested by examining the structural model. The test of the structural model includes estimating the path coefficients (the strengths of the relationships between the dependent and independent variables), and $R^2$ value (the amount of variance explained by the independent variables). A significance level of 0.05 was adopted. All path coefficients were significant, providing strong support for both direct and indirect model (See Table 3).

The path weights were examined for assessment of relative importance of TTF dimensions. In both models, the six TTF dimensions have similar relative importance. Meaning is found to be the most important dimension in formation of TTF in direct model (path weight = .274, t = 20.15) and indirect model (path weight = .266, t = 18.08). In direct model (see Figure 3), TTF can explain forty four percent of the variance in Learning Satisfaction ($R^2$ = 44.5%). In indirect model (see Figure 4), TTF significantly induces positive Podcast Value (path coefficient = .687, t = 16.79) and Utilization (path coefficient = .520, t = 9.34). In addition, positive effect on Learning Satisfaction is found from both Podcast Value (path coefficient = .500, t = 8.26) and Utilization (path coefficient = .411, t = 7.25). Forty seven percent of Podcast Value ($R^2$ = 47.1%) can be explained by TTF, and twenty seven percent of Podcast Utilization ($R^2$ = 27%) can be explained by TTF. The indirect model explains fifty nine percent of the variance in Learning Satisfaction ($R^2$ = 59.7%).

## 4.3 Findings

Hypothesis 1 is supported that individual evaluations of TTF on the use of podcast for learning has significant positive effect on his/her learning satisfaction. Hence, Hypothesis 2 & 3 are supported that individual evaluations of TTF on the use of podcast for learning has significant indirect influence on his/her learning satisfaction through podcast value and utilization. Most importantly, the results indicate that an additional 15% of variance in learning satisfaction can be explained by adding podcast value and utilization as mediating factors.

**Direct Model**

| | MEAN | ASSIST | EOU | LOCAT | ACCESS | LS |
|---|---|---|---|---|---|---|
| MEAN | **0.881** | | | | | |
| ASSIST | 0.573 | **0.836** | | | | |
| EOU | 0.441 | 0.441 | **0.867** | | | |
| LOCAT | 0.535 | 0.455 | 0.720 | **0.857** | | |
| ACCESS | 0.549 | 0.541 | 0.696 | 0.718 | **0.869** | |
| LS | 0.672 | 0.677 | 0.425 | 0.436 | 0.465 | **0.835** |

**Indirect Model**

| | PODUTIL | MEAN | ASSIST | EOU | LOCAT | ACCESS | PODVAL | LS |
|---|---|---|---|---|---|---|---|---|
| PODUTIL | **0.932** | | | | | | | |
| MEAN | 0.530 | **0.881** | | | | | | |
| ASSIST | 0.570 | 0.573 | **0.836** | | | | | |
| EOU | 0.300 | 0.441 | 0.441 | **0.867** | | | | |
| LOCAT | 0.346 | 0.535 | 0.455 | 0.720 | **0.857** | | | |
| ACCESS | 0.351 | 0.548 | 0.541 | 0.696 | 0.718 | **0.869** | | |
| PODVAL | 0.432 | 0.578 | 0.548 | 0.507 | 0.523 | 0.609 | **0.891** | |
| LS | 0.627 | 0.671 | 0.676 | 0.424 | 0.435 | 0.464 | 0.678 | **0.835** |

Notes: The diagonal elements are the square roots of the average variance extracted, the off-diagonal elements are the inter-construct correlations.

*Table 2. Construct Correlations*

| **Direct Model** | | | |
|---|---|---|---|
| | Path Coefficient | t-statistic | Result |
| TTF – LS | 0.667 | 12.7286** | H1 Supported |
| **Indirect Model** | | | |
| TTF – PODVAL | 0.687 | 16.7866** | H2 Supported |
| PODVAL – LS | 0.500 | 8.2641** | |
| TTF – U | 0.520 | 9.3377** | H3 Supported |
| U – LS | 0.411 | 7.2531** | |
| Notes: ** $p < 0.01$ | | | |

*Table 3. Results Summary*

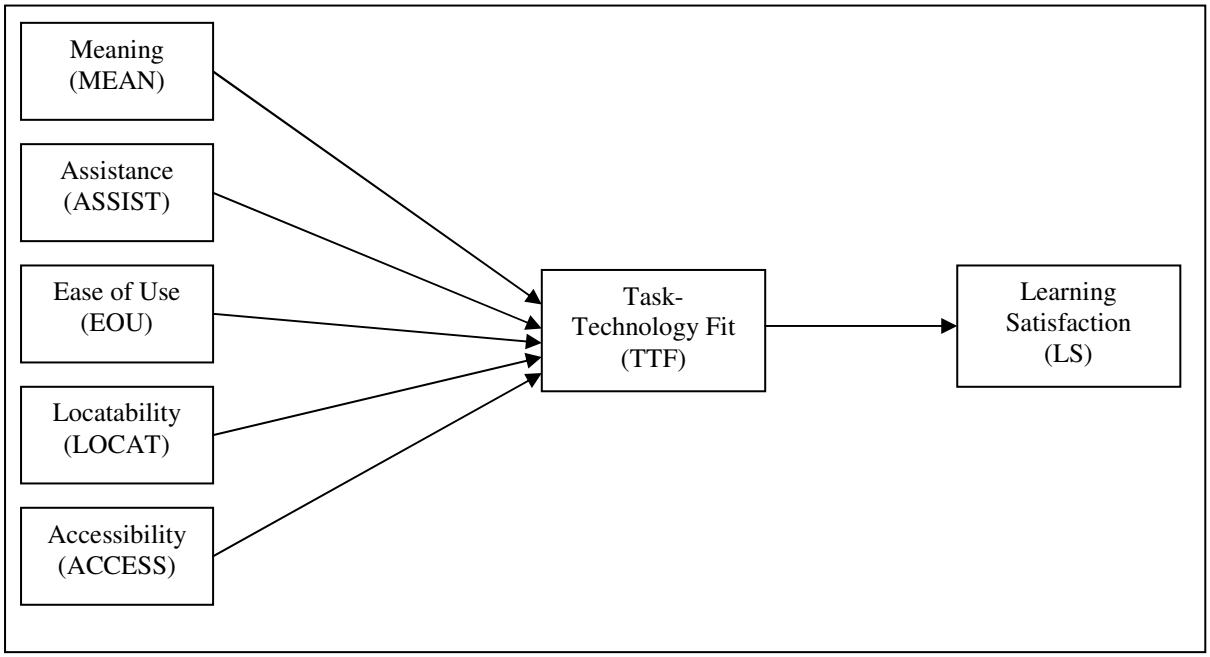


*Figure 1: Direct Model*

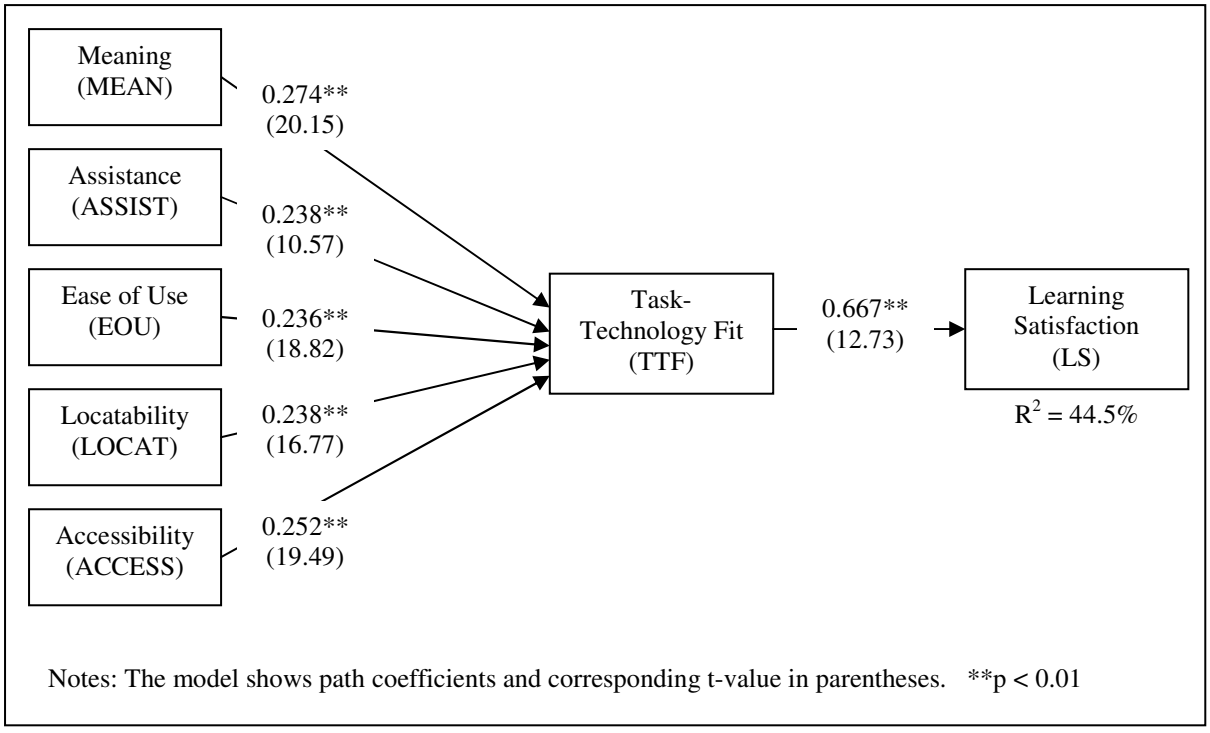


*Figure 2. Direct model result*

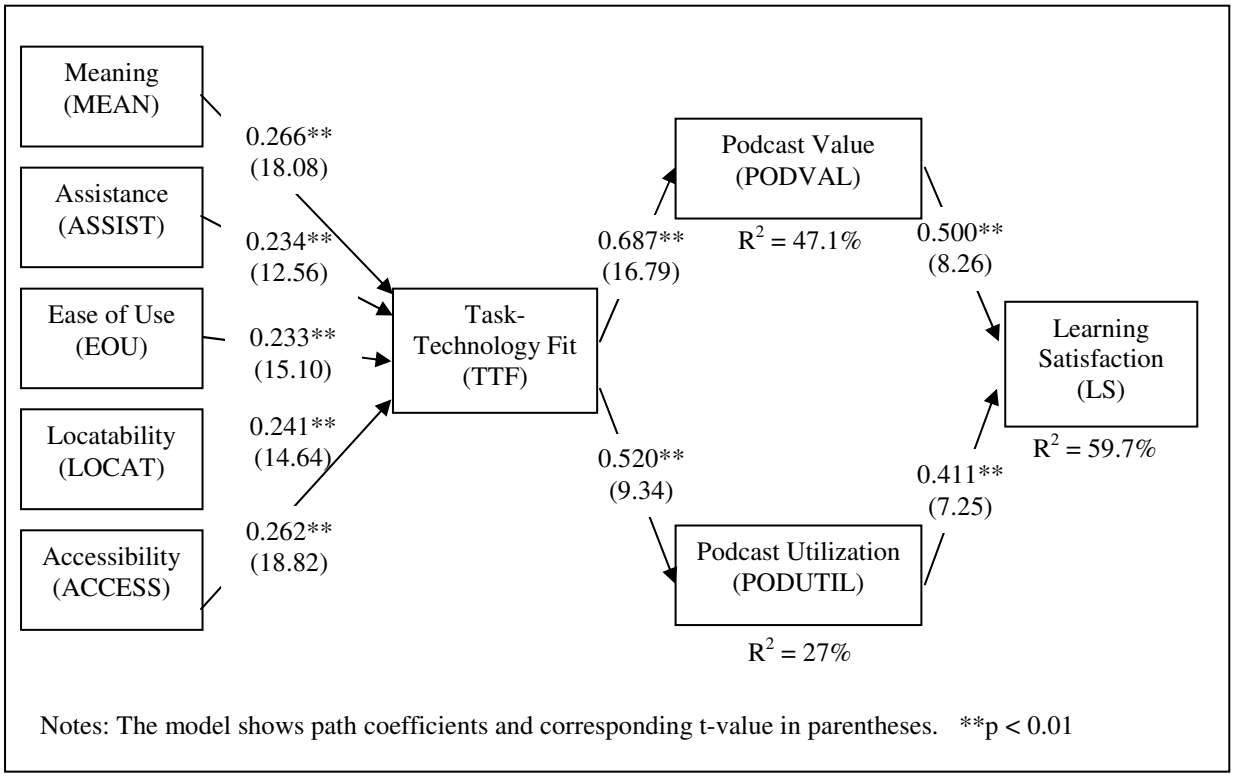


*Figure 3. Indirect model result*

# 5. DISCUSSION AND OPPORTUNITEIS FOR FUTURE RESEARCH

The result indicates that task-technology fit on the use of podcast for learning is a significant predictor of learning satisfaction. In this study, significant positive effect was found on the five TTF factors, Meaning, Assistance, Ease of Use, Locatability, and Accessibility. These five TTF factors can explain why podcast material is useful to induce student's learning satisfaction. Students felt that they could easily identify the content of podcast materials. They could also get assistance when they had difficulty in accessing or understanding the podcast materials. The use of podcast materials was an easy task for them. Besides, they also found that it was easily to locate what podcast materials were delivered by the course. They could get podcast materials quickly and easily whenever they needed. Consequently, students found that the podcast material could fit their learning needs and thus became satisfied.

The findings in Model 2 explain how podcast materials facilitate students' learning satisfaction. We found that TTF is a significant antecedent of perception on podcast value and podcast utilization. This supports our argument that students' evaluation of the fit on podcast usage for learning will influence their perception on podcast value and podcast usage. By adding podcast value and podcast utilization to the model, we found that the model has a greater explanatory power on learning satisfaction. This implies that the fit evaluation on podcast usage for learning will lead to positive podcast value and utilization, which ultimately will foster learning satisfaction.

Since this is an initial study of podcast usage for learning, the podcast material is designed to contain lecture summary in audio format. While (Goodhue, 1998) has developed twelve dimensions of TTF, four dimensions, i.e., Right Level of Detail, Accuracy, Currency and Presentation, were excluded in this study because their effectiveness may be influenced by

our research design. It is possible that the effects of these four factors may subject to podcast content, media format, frequency and time of delivery, etc. For example, bi-weekly podcast material, which is an audio lecture summary, may have different effect on student's evaluation of fit when comparing to daily podcast material, which is the latest video news related to course contents. Future study can exercise different types of podcast materials to further explore the TTF effect on podcast learning.

In this empirical study, most of the participants listened podcast materials with their personal computer or notebook. Portable devices, such as MP3 player, iPod, and PDA phone were not commonly used for podcast material. This finding could be related to culture and norm behavior. In our preliminary study, participants were asked to give the reasons of why they were or were not interested in accessing lecture or tutorial materials with portable devices, such as iPod, MP3 player or PDA phone, etc. According to the "NO" answers, these portable devices are mainly for entertainment purpose, and the participants used them to enjoy music and podcasts when traveling. Instead, they prefer to study with a personal computer or notebook at a quiet environment. However, the usage of portable devices for learning may vary from country to country because of different learning culture. To examine this phenomenon, this study can be carried out in other countries as a comparison study. Culture factors may also be considered as an influence factor on podcast learning.

# 6. CONCLUSION

The contribution of this study has two folds. In this paper, we have shown the evidences of how podcasting technology contributes to learning – students found greater satisfaction in learning with this technology. Social technology, which is originally designed for entertainments, but with no doubt, is able to be used in learning environment. However, not all learning tasks can be enhanced with podcasting technology. Its value can only be optimized when the technology fits the learning tasks. This finding is beneficial to teachers. Teachers should be able to match the learning tasks with appropriate technologies. Arbitrarily assign technology to students to complete any learning tasks, without considering the fit in between, may damage students' learning satisfaction. This research also contributes to the task-technology-fit model. It adds podcast value as a moderator between the TTF and the outcome (in this study – the learning satisfaction). It shows the technology value is also important in optimizing the use of a technology.

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