# UNDERSTANDING INNOVATION DIFFUSION ATTRIBUTES TOWARDS INTERNET TV ADOPTION IN ENHANCING STUDENTS LEARNING EXPERIENCE

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**Abstract**

*The entertainment technology nowadays such as Internet TV has become an excellent medium in creating awareness on news and current issues to public especially to the students. The expensive cost of technology might contribute to barriers of integrated to higher learning. Internet TV in Malaysia is relatively new and most studies are mainly focused on business and technology impact. This paper studied about innovations attributes towards Internet TV adoption to enhance students learning experience. A modified framework of Innovation of Diffusion theory was used to explore the exogenous variables that influenced students to adopt. 352 respondents were selected among the undergraduate students which were later analyzed through covariance-based structural equation modelling. The findings supported the notion that innovation attributes, except for trialability, give impact to students' intention to use Internet TV for educational purposes. The results also improve our knowledge and understanding in a mission to inform that Internet TV as part of educational approach in teaching and learning. In conclusion, Innovation and Diffusion theory is a good theoretical medium to understand students' intention to adopt Internet TV news. It is both beneficial and important for the researchers, educators, media practitioners and public.*

## 1. Introduction

Held (2007) mentioned that "Internet TV refers to the broadcast of news, weather, and TV shows from television stations that add an Internet interface to their over-the-air broadcasts". It is best known of its entertainment platform that can be assessed anytime and anywhere. The conventional media offers news and current issues to public especially the students. However, students may also stream Internet TV for the latest information which is more interactive. By using the smartphones, they can easily discuss the news on specific topic with classmates, friends or followers on social media. Their positive arguments might contribute to notion' impact towards certain issues. Moreover, media technologies such as online medium may help student to upgrade themselves to be more creative and being updated 24/7 on issues that happened in our surroundings (Dzaa Imma, Mohd Amirul & Siti Farrah Faadiah, 2013).

The availability of Internet TV on streaming news have change the patterns of media use among users. The "on-the-go" news' users can access to traditional media by streaming the news and current issues at their convenient. "Media technology demonstrate the purpose that referring to totally ideas of convenience, freedom and ubiquity" (Florano, 2008). Abdul Rauf, Dzaa Imma, Nurliyana Kamilah,

Rosilawati and Siti Nasarah (2016) claimed that the users of online news are almost related to the number of online users. Lee, Cheung and Chen (2005) identified that Internet access on educational channel become a positive impact and have been confirmed and accepted. Higher educational institutions are using the Internet in the classroom as part of their learning platform. "The Internet allow for more flexible and broader accessibility and improved students' performance. Thus, Iskrenovic (2015) said that Internet has the potential of making student-centered learning". Students may find online news on *Bernama TV, Astro Awani, Bulletin Utama (TV3), Berita RTM and Al-Hijrah* either live or archive. Therefore, it is important to conduct a study that focuses on students' cognitive assessment through innovation diffusion attributes towards streaming Internet TV news for learning purpose.

## 2. Objective

The objective of this study is to identify the relationship between students' intention to adopt Internet TV and streaming news with innovative variables based on Innovation of Diffusion theory as an outline. The innovative variables were identified as relative advantage, compatibility, ease of use, trialability, observation and intention to adopt. This paper also studied the usage pattern of Internet TV use among undergraduate students which include time, frequency, device used and the Internet access.

## 3. Research Hypotheses

Surry and Haab (2005) found some obstructions on the integration of new technology towards higher education. Hara (2000) determined that the failure came from students' frustration on Internet based learning which started from the complications to access these online channels. Next, such obstructions to access influences users' perception on whether the online medium can give impact to systemic improvement of students' learning experience. Therefore, we advance our hypotheses that:

H1: Relative Advantage (RA) has a positive and significant effect on intention to adopt.
H2: Compatibility (COM) has a positive and significant effect on intention to adopt.
H3: Ease of use (EU) has a positive and significant effect on intention to adopt.
H4: Trialability (TRI) has a positive and significant effect on intention to adopt.
H5: Observability (OB) has a positive and significant effect on intention to adopt.

## 4. Literature Review

Rogers (1995) clarified that "rate of adoption is the relative speed with which an innovation is adopted by members of a social system. The perceived attributes of an innovation are one important explanation of the rate of adoption of an innovation". Rogers (1995) affirmed five important perceived attributes of innovation which are relative advantage, complexity, compatibility, trialability and observability. Most of Rogers' studies are based on adoption on new technologies by individuals. As shown in figure 1, hypotheses were influence directly by innovation of diffusion attributes.
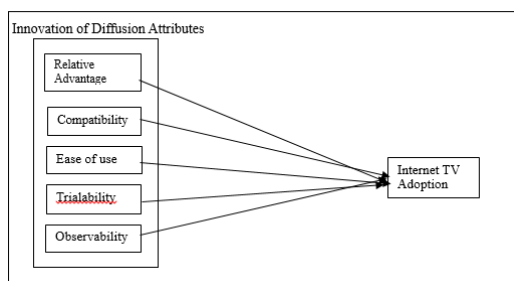


Figure 1: Conceptual framework based on Diffusion of Innovation Theory

Many research that focused on innovation of diffusion resulted that relative advantage become the best factor for adoption. Relative advantage is "the degree to which the innovation is perceived as better than the idea it supersedes. It refers to the extent to which the innovation is more productive, efficient, costs less, or improves in some other manner upon existing practices. Relative advantage is a key indicator of adoption".  Li (2004) found that relative advantage is the strongest predictor of the interactive cable service adoption in Taiwan. Du (1998) also revealed that relative advantage is significant to Internet adoption in China.

Complexity is "the degree to which an innovation is perceived as being difficult to understand and use. This attribute correlates negatively with the rate of adoption" (Rogers, 2003). In this study, complexity has been interpreted into perceived ease of use due to maintaining the same effect direction such as "to investigate whether perceived ease of use has a positive and significant effect on Internet TV adoption towards streaming news". This is more relevant than using the contrast effect direction.  Perceived ease of use defined as the "extent to which a person believes that using the technology will be free of effort (easy to use, skilful, and flexible)" (Davis, Bagozzi & Warshaw, 1989) and has been proven as a factor that affect the adoption.  Les Robinson (2009) claimed that new ideas that are simpler to understand are adopted more rapidly.

The Internet TV's nature is basically similar to conventional broadcasting because Internet TV delivers TV shows and video on demand that fulfil users' intention in order to energize their life with entertainment, information, news and many more.  Compatibility is "the degree to which an innovation is perceived as being consistent with the values, past experiences, and needs of potential adopters (Rogers, 1999)".  Moore and Benbasat (1996) found that "compatibility has a significant effect on the adopter's decision process" in their study on personal workstation adoption.  Li (2004) also identified that "compatibility is a crucial predictor in technology adoption".

Meanwhile, trialability is defined as "the degree to which an innovation may be experienced on a limited basis. New technology innovations that can be tried by potential users are usually adopted more rapidly than those that are not offered on a trial basis" (Rogers, 1995). Users can understand how the system works and may reduce uncertainties if they are allowed to test a product or service. For example, news online such as Awani news, Bernama news, RTM news and Buletin Utama news allowed users to stream for free.  Li (2004) claimed that trialability of an innovation is significant to rate adoption.

In addition, Rogers (1995) explained that "the easier it is for individuals to see the results of an innovation, the more likely they are to adopt. Visible results lower uncertainty and also stimulate peer discussion of a new idea, as friends and neighbours of an adopter often request information about it". Parisot (1997) discovered that "role modelling (or peer observation) is the key motivational factor in the adoption and diffusion of technology". Observability is positively correlated with the rate of adoption.

## 5. Sample and Statistical Procedure

The population of this research consist of undergraduate students at faculty of Communication and Media from University of Technology MARA, Melaka.  There are 1,350 full time students. A size of 384 respondents as a sample should be an appropriate minimum of this population (Krejcie and Morgan, 1970). Meanwhile, Hair, Black, Babin, Anderson and Tatham (2006) suggested that sample in a range of 150-400 is stable when using Structural Equation Model (SEM). In total, 400 questionnaires were administrated and 352 representing were returned. The survey used purposive sampling technique.

The analysis was conducted using SPSS and Amos version 23. In an effort to establish an initial instrument's reliability, a pilot study, comprising of 30 respondents, was carried out.  The descriptive statistics are shown in table 1. Overall, male students stated 114 and female 238. Majority of age range

was 20 to 21 (50.3%), followed by age from 18-19 (45.7%). Most of the students used Internet TV for 1 to 2 days (49.7%) and majority spent less than one hour (93.5%). Most students used smartphone to access to Internet TV (60.8%) and also accessed to mobile data (59.1%) for news streaming.

## 6. Instruments

The instruments used were adopted from the hypothesis of the study and past literature review about streaming news and online learning. The questions included demography items, Rogers (2003) studies with some adjustments and adoption from previous researchers. Relative advantage by Rogers (2003) and Chan-Olmsted & Chang (2006); ease of use by Davis, Bagozzi & Warshaw (1989); Venkatesh, Morris, Davis & Davis (2003); compatibility by Chan-Olmsted & Chang (2006), and Rogers (2003); trialability and observability by Moore & Bambasat (1996) and Rogers (1989). Meanwhile, intention to adopt was adopted by Venkatesh, Morris, Davis, & Davis (2003). The constructs used four-point Likert scales, from 1 (strongly disagree) to 4 (strongly agree).

Table 1: Descriptive statistics (*n=352*)

| Item | | Frequency (%) | Mean, SD |
|---|---|---|---|
| Gender | Male | 114 (32.4) | 1.6761, .46861 |
| | Female | 238 (67.6) | |
| Age | <18 | 3 (0.9) | 2.5568, .57206 |
| | 18-19 | 161 (45.7) | |
| | 20-21 | 177 (50.3) | |
| | >22 | 11 (3.1) | |
| Usage Frequency (Days in a week) | 1 to 2 days | 175 (49.7) | 1.7301, .88572 |
| | 3 to 4 days | 120 (34.1) | |
| | 5 to 6 days | 34 (9.7) | |
| | 7 days | 23 (6.5) | |
| Time (mins) | less than 1 hour | 329 (93.5) | 1.0937, .37707 |
| | 1 hour to 2 hour | 13 (3.7) | |
| | more than 2 hour | 10 (2.8) | |
| Device use | Smartphone | 214 (60.8) | 1.6534, .90222 |
| | Ipad/tablet | 57 (16.2) | |
| | Laptop/notebook | 70 (19.9) | |
| | Computer | 11 (3.1) | |
| Internet Access | Own Broadband | 98 (27.8) | 1.8523, .62319 |
| | Mobile Data | 208 (59.1) | |
| | Wifi accessed from the university | 46 (13.1) | |

## 7. Analysis of Measurement Model

First of all, we analyzed the measurement model in order to measure the validity procedure which called confirmatory factor analysis (CFA). The CFA method has the ability to access the unidimensionality, validity and reliability of a latent construct. The structural model was later examined for its fit, and strengths of the structural paths, hence supports for the hypotheses. (Refer table 2)

The unidimensionality must be conducted earlier before assessing validity and reliability. The factor loading items should be .6 or higher and must be positive. The validity includes convergent validity, construct validity and discriminant validity. It is essential to conduct Average Variance Extracted (AVE) for each construct to measure the validity. Mat Roni, Djajadikerta and Ahmad (2015) mentioned that to have a good discriminant validity, the square-root of AVE for each construct must be higher that the

construct's correlations with other constructs (refer table 3). If the correlation between the constructs exceed .85, it indicates redundant exogenous constructs. Zainuddin Awang (2015) mentioned that in order to achieve composite reliability (CR), the value of CR must be ≥ .6.

Table 2 shows the standardized item loading, average variance extracted (AVE), composite reliability (CR) and Cronbach alpha (CA) values. Majority of the factor loadings were larger than 0.6. The AVEs for all constructs exceed .5 and CRs exceed .7. As listed in table 4, below are items that recommended and the actual values of some fit indices. Overall, the items values were better than the recommended values. In addition, when the values meet the recommended level for fit indexes, the construct validity is achieved. "Three categories of model fit are normally used to assess a model fit in SEM. There are absolute fit, incremental fit and parsimonious fit."

Table 2: Standardized item loadings, AVE, CR and Alpha values

| Factor | Item | Item loadings ≥.60 | CA ≥.70 | AVE ≥.5 | CR ≥.6 |
|---|---|---|---|---|---|
| RA | Ra1 | .677 | .812 | .596 | .814 |
| | Ra2 | .816 | | | |
| | Ra3 | .814 | | | |
| COM | Com1 | .950 | .907 | .780 | .913 |
| | Com2 | .947 | | | |
| | Com3 | .735 | | | |
| EU | Eu1 | .656 | .840 | .667 | .855 |
| | Eu2 | .923 | | | |
| | Eu3 | .847 | | | |
| TRI | Tri1 | .765 | .853 | .669 | .858 |
| | Tri2 | .904 | | | |
| | Tri3 | .778 | | | |
| OB | Ob1 | .857 | .876 | .711 | .880 |
| | Ob2 | .892 | | | |
| | Ob3 | .776 | | | |
| ADOPT | Adopt1 | .943 | .954 | .912 | .954 |
| | Adopt2 | .967 | | | |

Table 3: Measurement Model: Discriminant Validity and Correlations

| | RA | COM | EU | TRI | OB | ADOPT |
|---|---|---|---|---|---|---|
| RA | **.77** | | | | | |
| COM | -.02 | **.88** | | | | |
| EU | -.05 | .20 | **.82** | | | |
| TRI | .22 | .01 | .08 | **.82** | | |
| OB | -.02 | .18 | .28 | .04 | **.84** | |
| ADOPT | -.15 | .30 | .04 | -.05 | .23 | **.98** |

Note: Diagonal shadow is the square root of AVE.
RA (Relative Advantage), COM (Compatibility), EU (Ease of Use), TRI (Trialability), OB (Observability), ADOPT (Adopt)

Hair, Black, Babin, Anderson and Tatham (2006) indicated that under the absolute fit, the $\chi 2$ test showed p-value=.000, applicable for large sample size (more than 200). Joreskog and Sorbom (1996) claimed that the ($\chi 2$/d.f) was below 3.0 showed acceptable fit. The standardized root mean square residual (SRMR) was lower (.02) than the acceptable upper bound of .08. The root mean square error of approximation

(RMSEA) showed a good fit value (.06) because it below the recommended value of .08 (Bentler & Bonnet, 1980). The adjusted GFI (AGFI) showed a good fit value (.91) because it is greater than .90 (Tanaka & Huba, 1985). The normed fit index (NFI) (.943) exceeds the lowest recommended value of .90 (Bollen, 1990). Tucker–Lewis index (TLI) showed greater value (.96) than the suggested value of .90 (Bentler & Bonnet, 1980) and the comparative fit index (CFI) was greater (.97) that the recommended lower bounds of .90 (Bentler & Bonnet, 1985). Meanwhile, the parsimonious goodness of fit index (PGFI) was greater (.64) than the suggested level of .5 which indicated a good result. The parsimonious normed fit index (PNFI) and the parsimonious comparative fit index (PCFI) were both higher (.73, .75) than .5 which signified a positive fit model (Mulaik et. al., 1989). The fit indexes in this study were acceptable, therefore the analysis of the hypotheses can be proceed.

Table 4. Fit indexes

| Fit index | Values | Fit indexes for the structural model. |
|---|---|---|
| *Absolute fit measures* | | |
| $\chi^2$ | 251.37 | The lower the better |
| d.f. | 105 | |
| *p*-Value | .000 | >.05 |
| $\chi^2$/d.f. | 2.392 | <3 |
| GFI | .936 | >.90 |
| SRMR | .015 | <.08 |
| RMSEA | .058 | <.08 |
| *Incremental fit measures* | | |
| AGFI | .907 | >.90 |
| NFI | .943 | >.90 |
| TLI | .956 | >.90 |
| CFI | .966 | >.90 |
| *Parsimonious fit measures* | | |
| PGFI | .643 | >.50 |
| PNFI | .728 | >.50 |
| PCFI | .746 | >.50 |

## 8. Analysis of Structural Model

The hypothesis effects were measured using the coefficients. The results as shown in table 5 indicated that relative advantage has negative but significant effect on adoption ($\beta$ = -.113, $p$<.05). Thus H1 was supported but negative. Compatibility indicated a positive and significant effect on adoption ($\beta$=.221, $p$<.01). The ease of use also indicated a positive and significant effect on adoption ($\beta$=.307, $p$<.01). Thus, H2 and H3 were supported. Meanwhile, trialability showed negative and insignificant effect on adoption to Internet TV. Therefore, H4 was rejected. Lastly, observability showed positive and significant effect on adoption ($\beta$=.10, $p$<.05). Therefore, H5 was supported. Figure 2 represent the SEM model for Internet TV used on news and current issues among students.

Table 5:  Hypotheses and Results

| Path | β | S.E | C.R | *P. value* | Hypothesis |
|---|---|---|---|---|---|
| H1 | -.113 | .041 | -2.214 | .027 | Supported |
| H2: | .221 | .047 | 4.547 | *** | Supported |
| H3: | .307 | .067 | 5.965 | *** | Supported |
| H4: | -.056 | .046 | -1.137 | .255 | Not supported |

| H5: | | .10 | .069 | 1.972 | .049 | Supported |

Note: *β*= estimates; SE= standard error of the regression weight; CV=critical ratio value for regression weight.
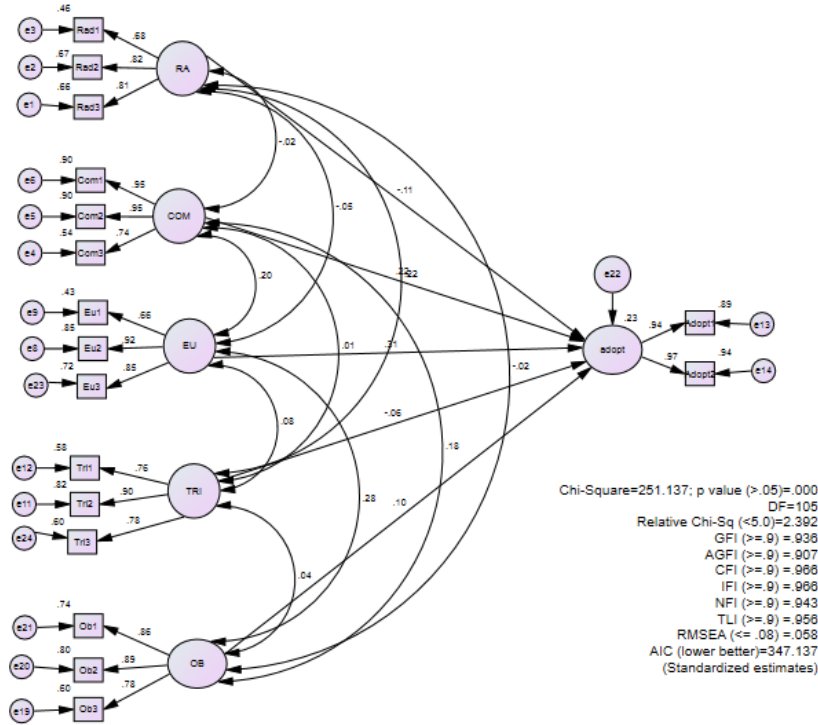***p=.000



Figure 2: The path coefficients between constructs - Internet TV used on news

## 9. Discussion and Conclusion

Many researchers have acknowledged that diffusion of innovation theory as one of the useful model in understanding people behavior in adopting new technology (Rogers, 2003; Venkatesh et al., 2003). As shown in table 5, all hypothesis are supported except for H4. The result for relative advantage was significant with the previous study by Li (2004) which found that relative advantage is the strongest predictor of the interactive cable service adoption in Taiwan. Internet TV offered the latest news and sufficient contents in order to fulfill students' needs. Moreover, Internet TV is more convenient to use compared to traditional TV. Students can use at any time and at anywhere without need to be at specific places (Dzaa Imma, Abdul Rauf, Rosilawati, Nurliyana Kamilah & Nur Alyani Mohd Shukri, 2016). Compatibility has a significant effect on Internet TV adoption and thus, significant to Moore and Benbasat (1996) study in adopter's decision process. Meanwhile, ease of use showed positive and significant effect towards Internet TV adoption. The result is consistent with Lee, Park and Ahn (2001) study on e-commerce adoption. However, trialability stated insignificant effect. Previous study by Kolodinsky and Hogarth (2001) identified that "trialability provides customers the ability to evaluate innovation benefits in their study about Internet banking adoption". Thus, the current study is inconsistent with previous research. Lastly, the result for observability showed consisted with previous study done by Kolodinsky and Hogarth (2001) in their study on Internet banking adoption.

This study is one of the method to investigate students' acknowledgment and respond towards Internet TV

news and current issues in learning purpose. In addition, this study may contribute to media technology aimed to learning environment. In conclusion, the results are important to educators and students in enhancing the innovative format of teaching through Internet TV which offers local and international news. Furthermore, Internet TV is synonyms to "on-the-go service", therefore the usage is much more convenience than the traditional media. Even though online newspaper is available on smarts phone or mobile devices but news with visuals and sound are much more interactive and effective.

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