Lesson 4: Theories

What is a Theory?

1. Theories are ***explanations of a natural or social behavior, event, or phenomenon.*** Theories ***should explain why things happen, rather than just describe or predict***.
2. Note that it is possible to predict events or behaviors using a set of predictors, without necessarily explaining why such events are taking place.
3. For example, market analysts predict fluctuations in the stock market based on market announcements, earnings reports of major companies, and new data from the Stock Exchange and other agencies, based on previously observed correlations
   - ❖ Prediction requires only correlations.
   - ❖ In contrast, explanations require causations , or understanding of cause-effect relationships.
4. More formally, ***a scientific theory is a system of constructs*** (concepts/variables) and propositions (relationships between those constructs/variables).
5. While understanding theories, it is also important to understand what theory is not. Theory is not data, facts, typologies, taxonomies, or empirical findings. A collection of facts is not a theory, just as a pile of stones is not a house. Likewise, a collection of constructs (e.g., a typology of constructs) is not a theory, because theories must go well beyond constructs to include propositions, explanations, and boundary conditions.
6. Data, facts, and findings operate at the empirical or observational level, while theories operate at a conceptual level and are based on logic rather than observations.

Benefits of Using Theories in Research

1. Theories ***provide the underlying logic of the occurrence of natural or social phenomenon*** by explaining what are the key drivers and key outcomes of the target phenomenon and why, and what underlying processes are responsible driving that phenomenon.
2. They ***aid in sense-making*** by helping us discover dependent factors influencing the relationship between two constructs in different studies.
3. Theories provide ***guidance for future research*** by helping identify constructs and relationships that are worthy of further research.
4. Theories can ***contribute to cumulative knowledge building*** by bridging gaps between other theories and by causing existing theories to be reevaluated in a new light.

Limitations of Theories

1. Theories may ***not always provide adequate explanations*** of the phenomenon of interest based on a limited set of constructs and relationships.
2. Theories are designed to be simple explanations, while ***reality may be significantly more complex***.
3. Theories may impose blinders or ***limit researchers' "range of vision,"*** causing them to miss out on important concepts that are not defined by the theory.

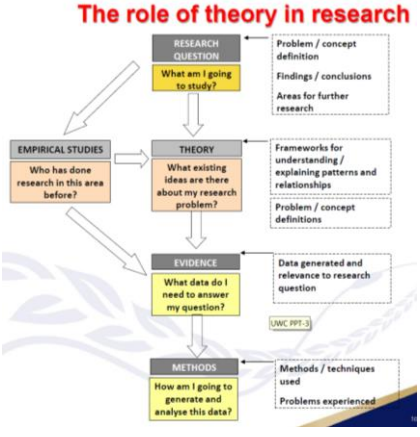
The dynamic relationship between Theories and Research

Theories and Research are interrelated in the following ways:

1. Theories frames what we look at, how we think and look at it.
2. It provides basic concepts and directs us to the important questions.
3. It suggests ways for us to make sense of research data.
4. Theory enables us to connect a single study to the immense base of knowledge to which other researchers contribute.
5. It helps a researcher see the forest instead of just a single tree.
6. Theory increases a researcher's awareness of interconnections and of the broader significance of data.

(Neuman, WL 1997. Social Research methods. Qualitative and quantitative approaches. Boston, London Toronto: Allyn & Bacon).

The role of theory in research



Theories Used in IS Research

- https://is.theorizeit.org/wiki/Main_Page

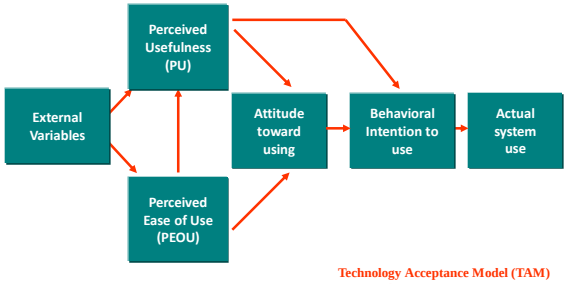
Examples of IS Theories

1. Technology Acceptance Model (TAM).
2. Task Technology Fit (TTF).
3. Unified Technology Acceptance and Use of Technology (UTAUT).

1. TECHNOLOGY ACCEPTANCE MODEL (TAM)

- TAM is one of the most frequently used models for research into new information **technology acceptance**.
- TAM suggests that when users are presented with **a new technology**, a number of factors determine their decision about how and when they will use it.
- Introduced by **Fred Davis in 1986** – an adaptation of TRA and specifically tailored for modeling user acceptance of information systems
- TAM attempts to explain *how users come to accept and use a new technology* based on positive attitudes towards two measures:
  1. Perceived usefulness.
  2. Perceived ease of use.

Theoretical Framework (TAM)



Technology Acceptance Model (TAM) by F D Davis (1986)

TAM VARIABLES/CONSTRUCTS

1. **Perceived Usefulness:** The degree to which an individual believes that using the system will help him or her to attain gains in job performance.
2. **Perceived ease of use:** The degree of ease associated with the use of the system.
3. **Attitude:** Individual's positive or negative feeling about performing the target behavior (e.g., using a system).
4. **Behavioral intention:** The degree to which a person has formulated conscious plans to perform or not perform some specified future behavior.

The ***Independent Construct(s)/ Variables***:
- Perceived usefulness.
- Perceived ease of use.

The ***Dependent Construct(s)/ Variables:***
- Behavioral intention.
- Actual system use.

- TAM can be used when considering rolling out a new piece of technology to the whole organisation, after an initial trial.
- The company can conduct surveys of staff to find out the perceived usefulness and perceived ease of use.
- Rating answers on the scale below, you can build a score for each value, and then use this to evaluate your staff's overall attitude towards the technology.

- For example, the questions below could be used to ascertain the value of Google+ to your marketing team.

Perceived Usefulness (PU)	Perceived Ease Of Use (PEOU)
1. My **job** would be **difficult** to perform **without** Google+.	1. I often become **confused** when I use Google+.
2. Using Google+ gives me greater **control over my work**.	2. I make **errors** frequently when using Google+.
3. Using Google+ improves my **job performance**.	3. Interacting with Google+ is often **frustrating**.
4. Google+ **addresses my job-related needs**.	4. I need to consult the user **manual** often when using Google+.
5. Using Google+ **saves me time**.	5. Interacting with Google+ requires a lot of my **mental effort**.
6. Google+ enables me to accomplish tasks **more quickly**.	6. I find it easy to **recover from errors** encountered while using Google+.
7. Google+ supports **critical aspects of my job**.	7. Google+ is **rigid and inflexible** to interact with.
8. Using Google+ allows me to **accomplish more work** than would otherwise be possible.	8. I find it easy to get Google+ **to do what I want it to do**.
9. Using Google+ **reduces the time** I spend on unproductive activities.	9. Google+ often behaves in **unexpected** ways.

Example of TAM in IT research

Technology Acceptance of Internet-based Information Services: An Integrated Model of TAM and U&G Theory

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ABSTRACT

The goal of this research is to develop and test a theoretical model of the effects of intrinsic and extrinsic motivations on user acceptance of Internet-based information services. We integrate the technology acceptance model (TAM) and uses and gratifications (U&G) theory to create an integrated model that can predict both usage and satisfaction of Internet-based information services. Two pilot studies were conducted to test the concepts and develop the measures and then three surveys were administrated to develop the integrated model. The results from the Partial Least Squares (PLS) analysis support our proposed model which posits that the use of Internet-based service is determined by the intention to use and the entertainment motivation. Plus it also suggests that the level of use influences the degree of satisfaction. The integrated model should improve our understanding of user acceptance behavior, providing new theoretical insights into the successful design and implementation of Internet-based information services.

Keywords

Information Services, Internet, Technology Acceptance Model, Uses and Gratifications Theory, Online Newspapers, Technology Adoption, Satisfaction, Partial Least Squares

INTRODUCTION

Recent Internet surveys documented the wide use of Internet-based information services in a customer context (The Graphic, Visual, and Usability Center, 1998; The UCLA Internet Report, 2003). As a number of these services are being designed with the needs of customers in mind, why and how the users will adopt and continue to use these services become more important. Researchers found that the adoption and continued use of World Wide Web (WWW) involve not only extrinsic motivations, as suggested by the technology acceptance model (TAM) (Davis, 1989), but also intrinsic motivations such as feeling of fun

Example of TAM in IT research

RESEARCH QUESTIONS

Figure 2 illustrates the conceptual framework of the integrated model. There are two bases for integrating TAM and U&G theory. First, both theories have a common construct which is behavioral usage. Second, both theories concern with the likelihood of an information service being used by customers.

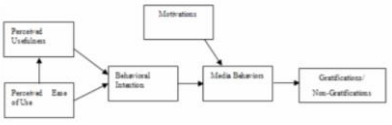


Figure 2. The Integrated Model of Technology Acceptance

To test the explaining power of our proposed model, we ask the following research question:

How well does an integrated TAM and U&G model explain the use of Internet-based information service?

Note that "motivations" in Figure 2 represent both intrinsic and extrinsic motivations. At this point, these constructs are not distinguished for conceptual clarity. After the motivations items are analyzed by conducting principal component analysis, we are able to distinguish the dimensionality of motivations.

RESEARCH METHOD

Surveys were conducted for data collection. The empirical setting was online news information services, namely, online newspapers. In this study, an online newspaper Website refers to a WWW page whose primary offering is news content. Prior to the main surveys, we conducted two pilot studies for scales development. All studies were administered at a major U.S. university.

TAM Analysis

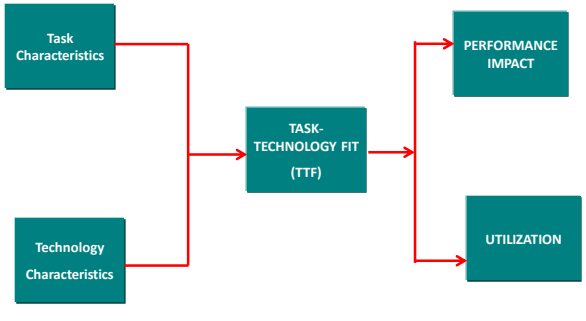
AVE/Correlation		Latent Constructs					
Latent Constructs	ICR	(1)	(2)	(3)	(4)	(5)	(6)
(1) Perceived Usefulness(PU)	0.963	**0.814**					
(2) Behavioral Intention (BI)	0.936	0.655	**0.750**				
(3) Behavioral Usage (BU)	0.839	0.306	0.384	**0.636**			
(4) Entertainment	0.953	0.420	0.418	0.591	**0.871**		
(5) Satisfaction (S)	0.882	0.441	0.459	0.435	0.515	**0.716**	
(6) Perceived Ease of Use (PEU)	0.952	0.519	0.558	0.245	0.391	0.348	**0.769**

Notes: 1. ICR: Internal Composite Reliability. 2. Diagonal elements are the square root of the shared variance between the constructs and their measures; off-diagonal elements are correlations between constructs.

2. TASK TECHNOLOGY FIT (TTF)

- Developed by **Goodhue and Thompson, 1995**.
- **Task-technology fit** is ***"the degree to which a technology assists an individual in his or her portfolio of tasks"*** (Goodhue and Thompson, 1995: 216).
- *"The heart of the task-technology fit model is the assumption that [ICT tools] give value by being instrumental in some task or collection of tasks and that users will reflect this in their evaluation…"* (Goodhue, 1998: 107).
- TTF) theory holds that **IT is more likely to have a positive impact** on individual performance and be used **if the capabilities of the IT match the tasks that the user must perform**.

TTF Framework



TTF VARIABLES/CONSTRUCTS

1. **Task Characteristics:** the things the user needs to do.
2. **Technology Characteristics:** the capabilities/features of the technology.
3. **Performance Impact**: the degree to which the technology improves the user's ability, i.e. performance will improve when an organization's design "fits" its task requirements and user capabilities.
4. **Utilization:** The degree to which a person has formulated conscious plans to perform or not perform some specified future behavior.

The ***Independent Construct(s)/ Variables***:

- Task characteristics.
- Technology characteristics.

The ***Dependent Construct(s)/ Variables:***

- Individual performance Impact.
- System Utilization.

Example of TTF in IT research

Task-Technology Fit in Data Warehousing Journal of International Technology and Information Management

Task-Technology Fit in Data Warehousing Environments: Analyzing the Factors that Affect Utilization

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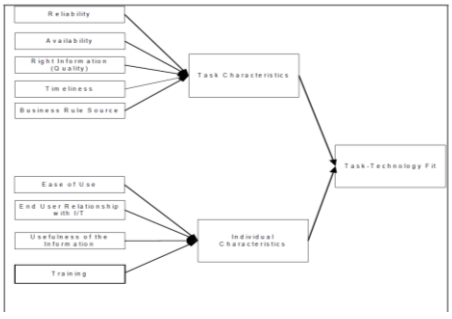
ABSTRACT

Enterprise data warehouses are an expensive investment in both time and resources. The promise of data warehouses is improved decision-making through user empowerment and enablement of sophisticated decision support tools. Have organizations been able to achieve this goal? Task-technology fit defines a model that suggests that for a technology to be utilized, it must meet the needs of a user and provide features that support the fit of the requirements of the task; performance impacts will result. When an organization commits the time and resources necessary to develop an enterprise data warehouse, their expectation will be a high task-technology fit. This study extends prior task-technology fit research to provide an evaluation of task-technology fit in data warehouse applications. The focus of the study is to examine the factors that contribute to the task-technology fit specifically within data

Example of TTF in IT research

Figure 1: Data Warehousing Task-Technology Fit Model.



TTF Questionnaire

APPENDIX A –
DATA WAREHOUSE USERS SURVEY

(Circle one per each line.)

		Strongly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Strongly Agree
1	The data warehouse available to me is missing critical data that would be useful to me in my job.	1	2	3	4	5
2	The company maintains data at an appropriate level of detail for my purposes.	1	2	3	4	5
3	There are accuracy problems in the data I use or need.	1	2	3	4	5
4	It is easy to learn how to use the query tools that give me access to data.	1	2	3	4	5
5	The data model does not support my ad hoc reporting needs.	1	2	3	4	5
6	The data that is available to me allows me to make a significant contribution to the success of the business.	1	2	3	4	5
7	When business requirements change, it is easy to change the selection and format of data made available by your data warehouse.	1	2	3	4	5
8	It is easy to get assistance when I am having trouble finding or using the data.	1	2	3	4	5
9	It is easy to get access to data that I need.	1	2	3	4	5
10	On the reports I deal with, the exact meaning of data	1	2	3	4	5

TTF Analysis

Table 1: Factor Analysis of the Data Warehouse Variables.

Construct	Question Number	Coefficient
Quality (Q1)	Q3	0.5822
	Q11	0.6674
	Q26	0.6749
	Q33	0.6218
Usefulness (Q2)	Q6	0.6418
	Q23	0.5042
	Q29	0.5185
Reliability (Q13)	Q27	0.5215
	Q15	0.6060
Business Rule Source (Q7)	Q14	0.6196
	Q20	0.6771
	Q32	0.5875
	Q10	0.5817
End User Relationship with IT (Q9)	Q25	0.8100
	Q17	0.5186
	Q40	0.5860
Timeliness (Q18)	Q16	0.5003
	Q8	0.5691
Ease of Use (Q4)	Q21	0.5427
	Q28	0.6182
System Availability (Q5)	Q34	0.6704
	Q24	0.5808
	Q22	0.5047
	Q12	0.5112
Training (Q30)	Q35	0.5677
	Q37	0.5327
	Q39	0.6018

A Cronbach's Alpha test of construct validity was performed on each of the constructs that comprise the individual characteristics. It is generally held that a coefficient Alpha of 0.7 or greater indicates that the

TTF Analysis

TABLE 10. Correlations of the latent variables.

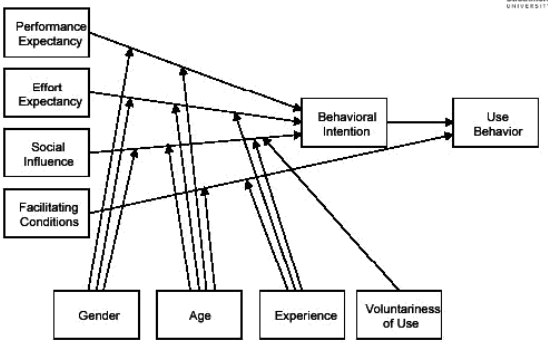
Constructs	*Task*	*Technology*	*Individual*	*TTF*	*Use*	*Performance*
Task	*0.812**					
Technology	*0.053*	*-***				
Individual	*0.210*	*0.054*	*-***			
TTF	*0.274*	*0.308*	*0.233*	*0.805**		
Use	*0.456*	*0.068*	*0.202*	*0.256*	*0.810**	
Performance	*0.397*	*0.072*	*0.217*	*0.312*	*0.393*	*0.911**

*square root of the AVE on the diagonal for reflective constructs
** Formative constructs

3. UTAUT Model

- (UTAUT) is a technology acceptance model formulated by **Venkatesh** and others in "User acceptance of information technology: Toward a unified view"
- UTAUT **tries to explain the degree of acceptance** of the use of information technology.

UTAUT Framework



UTAUT VARIABLES/CONSTRUCTS

The ***Independent Construct(s)/ Variables***:

1. Performance expectancy.
2. Effort expectancy,
3. Social influence,
4. Facilitating conditions,

Moderators: *Gender, Age, Experience, Voluntariness of use*

The ***Dependent Construct(s)/ Variables:***

1. Behavioral intention.
2. Usage behavior.

UTAUT Variables/Constructs

1. **Performance expectancy:** "The degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003). Performance expectancy is hypothesized to moderate the influence on behavioral intention by gender and age.
2. **Effort expectancy:** "The degree of ease associated with the use of the system" (Venkatesh et al., 2003). Effort expectancy hypothesized to moderate the influence on behavioral intention by gender and age, and experience.
3. **Social influence:** "The degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003). Social influence, hypothesized to moderate the influence on behavioral intention by gender and age, and experience, and volunteers of system.
4. **Facilitating conditions:** "The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., p. 2003). Hypothesized to moderate the influence on behavioral intention by age, and experience.

Determinants


What will it do for me?


How hard will it be to learn/use?


Do other people want me to use it?


Do current conditions support my use of it?

Behavioural Intention and Use Behaviour

- These are influenced by:
  - Gender,
  - Age,
  - Experience, and
  - Voluntariness of use.

Moderators


What gender am I?


How old am I?


What has my experience with tech been?


Is it a choice or is it a mandate?

Applications of UTAUT

International Journal of Education and Development using Information and Communication Technology (IJEDICT), 2013, Vol. 9, Issue 3, pp. 71-85

The utility of the UTAUT model in explaining mobile learning adoption in higher education in Guyana

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ABSTRACT

In this paper, we compare the utility of modified versions of the unified theory of acceptance and use of technology (UTAUT) model in explaining mobile learning adoption in higher education in a developing country and evaluate the size and direction of the impacts of the UTAUT factors on behavioural intention to adopt mobile learning in higher education. The data were obtained through a web survey of university students and the models are estimated in a structural equations modelling framework. Many of the UTAUT relationships are confirmed, but some are contradicted. The results suggest that culture and country level differences moderate the UTAUT effects, hence, a straightforward application of the model regardless of the context can lead to non-detection of important relationships and to suboptimal mobile learning promotion strategies. Including attitude in the model is also a prudent modification since it increases its explanatory power.

Keywords: *mobile learning, UTAUT, higher education, technology adoption, Guyana*

INTRODUCTION

Mobile learning (MLearning) which emerged with the evolution of mobile devices, has extended the reach of e-learning and distance education systems by allowing educators and students to teach and learn anywhere, anytime and on the move (Negas & Ramos 2011; Wang et al. 2009). Mobile devices include, but are not limited to, smart phones, mp3 players, tablet PCs and PDA's. The ubiquity of these devices along with their popularity among students make them suitable for use in educational contexts (El-Hussein & Cronje 2010; Negas & Ramos 2011; Jeng, et al. 2010).

Applications of UTAUT

HYPOTHESES

This study is conducted at the University of Guyana. In spite of the inconsistencies in the effects observed in the literature, we expect to find confirmation of the basic form of the UTAUT model. We advance the following hypotheses, which are consistent with the projections based on the UTAUT model.

Hypothesis 1: Performance expectancy is positively related to behavioural intention.
Hypothesis 2: Effort expectancy is positively related to behavioural intention.
Hypothesis 3: Social factors are positively related to behavioural intention.

One of the UTAUT hypotheses is that attitude towards the use of the technologies has no effect on behavioural intention once the effects of performance expectancy and effort expectancy are controlled. Consequently, attitude is not explicitly included in the UTAUT model. However, the studies that include attitude (Jairak et al. 2009; Nassuora 2012) find that it impacts positively on behavioural intention. These two studies are conducted in non-Western countries. We therefore believe that in such contexts, an explicit measure of attitude provides unique information beyond that provided jointly by performance expectancy and effort expectancy. We advance as the fourth hypothesis:

Hypothesis 4: Attitude towards the use of the technologies for learning is positively related to behavioural intention.

The inclusion of attitude enables investigation of its relationships with the UTAUT factors. Except for the agreement on a positive effect of social factors on attitude, the literature show inconsistencies in relation to the effects of the UTAUT factors on attitude, but whenever an effect on attitude is found, it is positive. In spite of the inconsistencies observed in the literature, we expect that the following hypotheses about effects on attitude to hold:

Hypothesis 5: Performance expectancy is positively related to attitude.
Hypothesis 6: Effort expectancy is positively related to attitude.
Hypothesis 7: Social factors are positively related to attitude.
Hypothesis 8: Facilitating conditions are positively related to attitude.

The UTAUT model also indicates that facilitating conditions has no effects on behavioural intention, but we believe that whenever there are constraints on resources, facilitating conditions will become an important predictor of behavioural intention. We therefore include as a final hypothesis:

Applications of UTAUT

Table 1: *The UTAUT Items*

Construct	Item Code	Item
Performance Expectancy	PE1	Mobile Technoiogies are useful in education in general.
	PE2	Using mobile technologies enable students to accomplish tasks more quickly.
	PE3	Mobile technologies would improve students' performance.
	PE4	Mobile technologies would increase students' productivity.
Effort Expectancy	EE1	Mobile technologies are easy to use.
	EE2	Finding or using features in mobile technologies is easy.
	EE3	Learning to operate mobile technologies is easy.
Social Factors	SF1	People who influence my behaviour think that I should use mobile technologies.
	SF2	People who are important to me think that I should use mobile technologies for learning.
	SF3	University teachers are supportive of the use of mobile technologies.
Facilitating Conditions	FC1	In general, my University campus has support for mobile learning.
	FC2	In general, the country in which my university campus is located has support (infra-structure, policies etc.) for mobile learning.
	FC3	I have the resources necessary to use m-Learning.
	FC4	I have the knowledge necessary to use m-Learning.
	FC5	Support from an individual or service is available when problems are encountered with m-Learning technologies.
Attitude	ATT1	Using m-Learning technologies is a good idea.
	ATT2	I would like to use m-Learning technologies.
	ATT3	I believe that working with m-Learning technologies would be fun.
Behavioural Intention	BI1	I intend to use m-Learning technologies in the next semester.
	BI2	I predict I will use m-Learning technologies in my courses in the next semester.
	BI3	I have a plan to use m-Learning technologies in the near future.

Scale labels: 1 – Strongly disagree , 2 – Disagree, 3 – Neither Agree nor Disagree, 4 –Agree, 5 – Strongly Agree