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*A new way to think*

# User Satisfaction: An Evaluation of a Carbon Credit Information System

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# I'll be talking about...

- The Carbon Calculator
- Prior research and information system success model
- Data collection and sample
- Exploratory factor analysis (EFA)
- Structural equation modelling (SEM)
- Analysis findings
- Future research

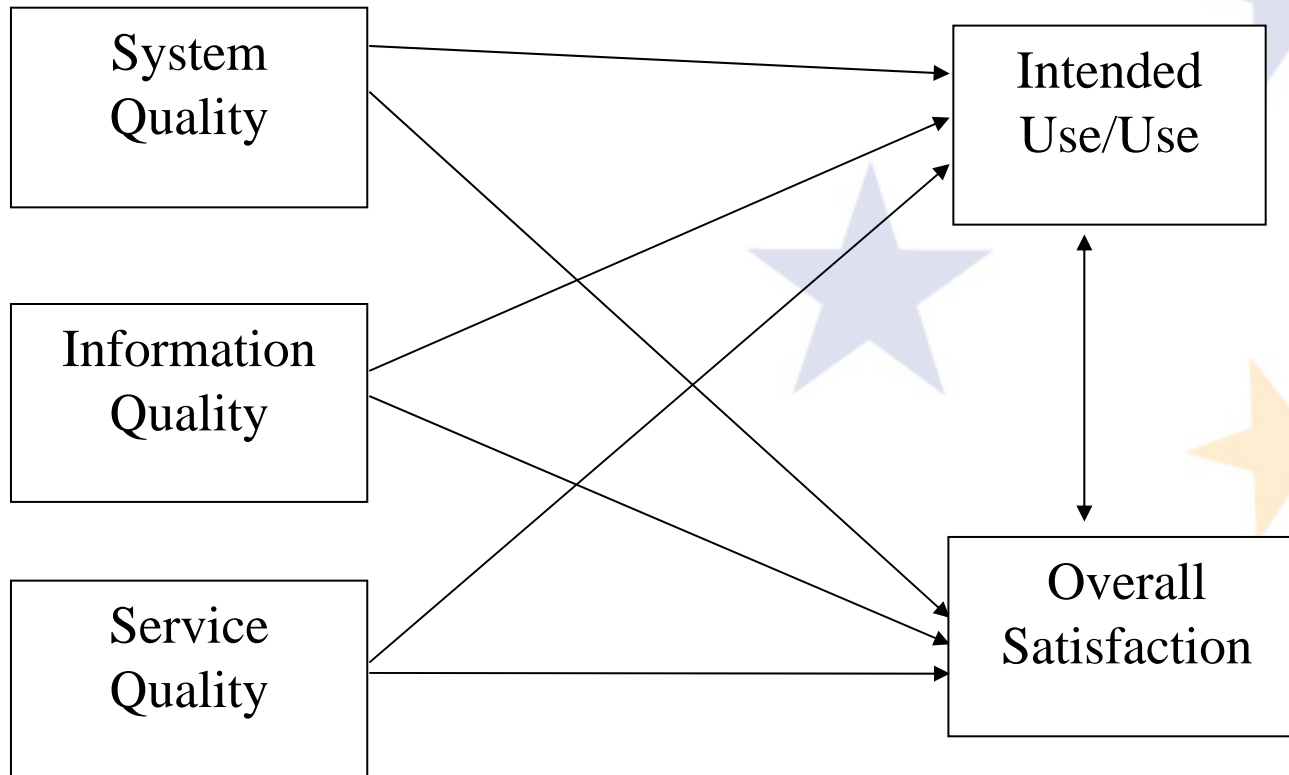
# The Carbon Calculator

- Carbon trading world wide (Kyoto Protocol), Australia non-signatory but, about to sign (Labor) therefore worldwide carbon-credit trading soon. Previously, Labor NSW Greenhouse Gas Abatement Scheme (NGAC)
- System was developed jointly with industry in Lismore, Northern NSW
  - Allows user to estimate the potential value of carbon credits on landholdings (based on existing NSW legislation)
  - Also demonstrates timber plantations (managed appropriately) can also earn carbon credits as an additional income stream
- <http://www.australianforestcorporation.com.au/CO2calc>
- Is the information system successful?

# Prior research IS success

- DeLone and McLean (1992, 2003) information system success model chosen as measure of user satisfaction
- Technology Acceptance Model (TAM) and derivatives not chosen as:
  - Technology familiar to users
  - Web-based (standard browser)
  - Web-submission forms
  - Even carbon credits are topical issues
- Previous research to basis UIS survey on
  - Used previously to demonstrate D & M model

# Information system success model



Based on DeLone and McLean (1992, 2003) Information Success Model  
D & M's Net Benefits category not shown as – beyond scope of study

Survey designed to seek factors to Overall Satisfaction

# Data Collection

- System users had to register (name & email)
- Each user sent an email with attached Excel spreadsheet. Excel chosen as:
  - Enable users to complete in their own time (as opposed to on-line survey), yet electronically (point & click)
  - Prevented data transcription errors (macro designed)
  - Minimise data entry by researchers
- Questions (for information system success) based on previous research (e.g. Torkzadeh and Doll, 1999)
- Questions had to be modified as system is publicly accessible (web mounted) and is not a proprietary organisationally-focussed IS

# Sample Description

- 260 surveys collected and used as basis of statistics
- Survey designed with :
  - 11 demographic questions (plus influences on results – experience in forestry, computing)
  - 21 information system success questions – these questions used as the basis of this paper (two dealing with overall satisfaction).
  - 1 privacy question (as system could be classified as e-commerce system \*\*interesting)
  - 6 attitude to Carbon Sequestration questions
  - 3 qualitative questions
- Only information system success questions used

# Data Analysis

- SPSS 14 and Amos 7.0 used to test the sample. This done in four stages.
  - General descriptive (check outliers, invalid cases & distributions)
    - No problems due to excel
  - Examination of correlations – looking for structures
  - Exploratory Factor Analyses (EFA) – Identify structures within variables do they match the DeLone & McLean model? – Not quite (close though) - Therefore renaming of overall model factors occurs
    - Service Quality scales moved to System Quality (for various reasons).
    - System Quality and Information Quality retained from D & M model
    - Service Quality and Intension to Use/Use removed from model.
    - Ease-of-Use and System Usefulness added to model (for clarity)
  - Structural Equation Modelling – Develop a model.
    - 7 of 22 scales removed (for various reasons) to strengthen model

# Exploratory Factor Analysis (Pt 1)...

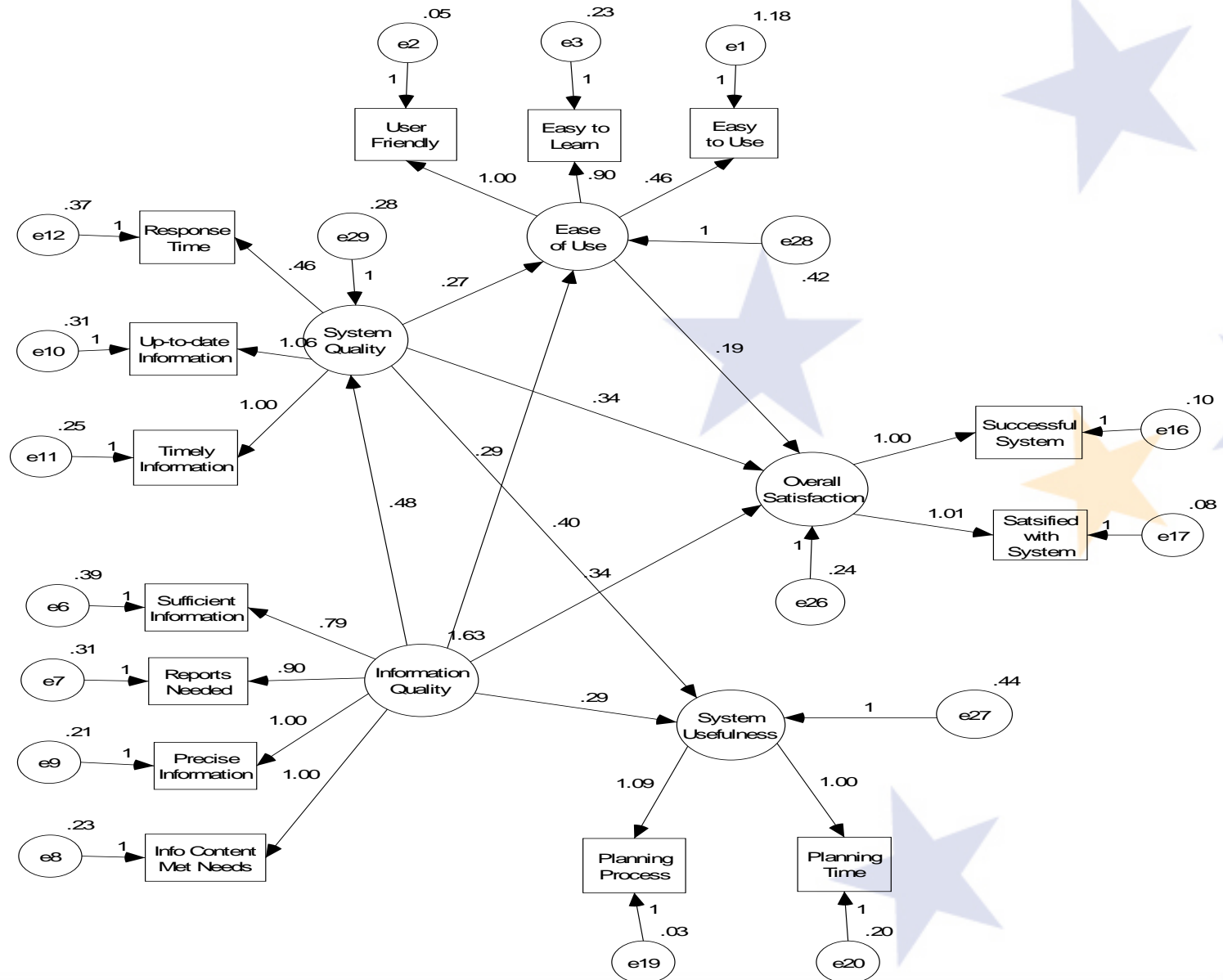
<b><u>INFORMATION QUALITY</u></b>				
8. The information content meets my needs	.941	-.021	.074	-.066
9. The system provided the precise information I needed	.911	.031	.054	-.050
7. The system provided me with reports that seemed to be just what I needed	.721	.169	.120	-.056
6. The system provided me with sufficient information	.665	.071	.087	.127
5. The system is accurate	.642	.033	-.013	.247
14. The output from the system was accurate	.520	-.120	.051	.487
16. Overall, how successful was the system	.475	.269	.157	.079
17. Overall, how satisfied with the system were you	.431	.274	.146	.135
<b><u>EASE-OF-USE</u></b>				
2. The system is user friendly	.005	.938	-.017	.026
3. The system is easy to learn	-.071	.832	.075	.015
1. The system is easy to use	.131	.772	-.036	.049
4. Information I got from the system is clear	.318	.385	.088	.111

# ...Exploratory Factor Analysis (Pt 2)

<b><u>SYSTEM USEFULNESS</u></b>				
20. Using the system saves planning time	-.018	-.097	.960	.050
19. Using the system improves the planning process	.054	-.062	.929	.0337
18. How well do you feel the system assisted your land management process	.260	.214	.462	-.001
21. I will use the system in the future	.000	.098	.423	-.022
22. I would recommend the system to others	.179	.119	.379	.142
<b><u>SYSTEM QUALITY</u></b>				
11. The system provided me with timely information	.087	.206	-.027	.669
10. The system provides up-to-date information	.344	.049	-.040	.571
12. The response time of the system was good	-.091	.017	.099	.542
13. The systems output is presented in a useful format	.113	.105	.240	.461

**Blue items:** removed from Structural Equation Model (SEM) for various reasons, resulting in significantly improved model fit.

# Structural Equation Model



# Goodness-of-fit and Model Indices

Measurement Indices	Recommended Value	Value Range	Model Indices
Root Mean Square Error of Approximation (RMSEA)	< 0.05 (ideal) < 0.08 (acceptable)		.052
Goodness-of-Fit Index (GFI)	≥ 0.95 (Good) ≥ 0.90 (Adequate)	0 to 1	.944
Adjusted Goodness-of-Fit Index (AGFI)	≥ 0.95 (Good) ≥ 0.90 (Adequate)	Upper limit 1	.915
Normed Fit Index (NFI)	Close to 1 (unity)	≤ 1 (unity)	.967
(Same as TLI – see below)	Close to 1 (unity)	≤ 1 (unity)	.980
Minimum Sample Discrepancy Function (CMIN/DF)	< 2.0 (Good) < 3.0 (Adequate)		1.837

# Model Highlights

- Explains 72.2% of variance in Overall Satisfaction
- Ease-of-Use and Systems Usefulness are not related
- System Usefulness and Overall Satisfaction are not related
  - *suggests that user satisfaction of web-based IS not dependant on whether it is useful to user – or that may be the case only in environmental IS context*
- Information Quality is a predictor of System Quality
- In the case of this IS a number of changes from the foundation research (DeLone & McLean) have been observed.

# Further Research

- Complete survey process
  - Now complete total 324 surveys received.
- Analysis with larger data set
- Use of demographic items as mediating factors
  - Net connection
  - State
  - Experience
- Hierarchical regression analysis