Information Systems Success Revisited William H. DeLone, Ephraim R. McLean (2002) Proceedings of the 35th Hawaii International Conference on System Sciences - 2002

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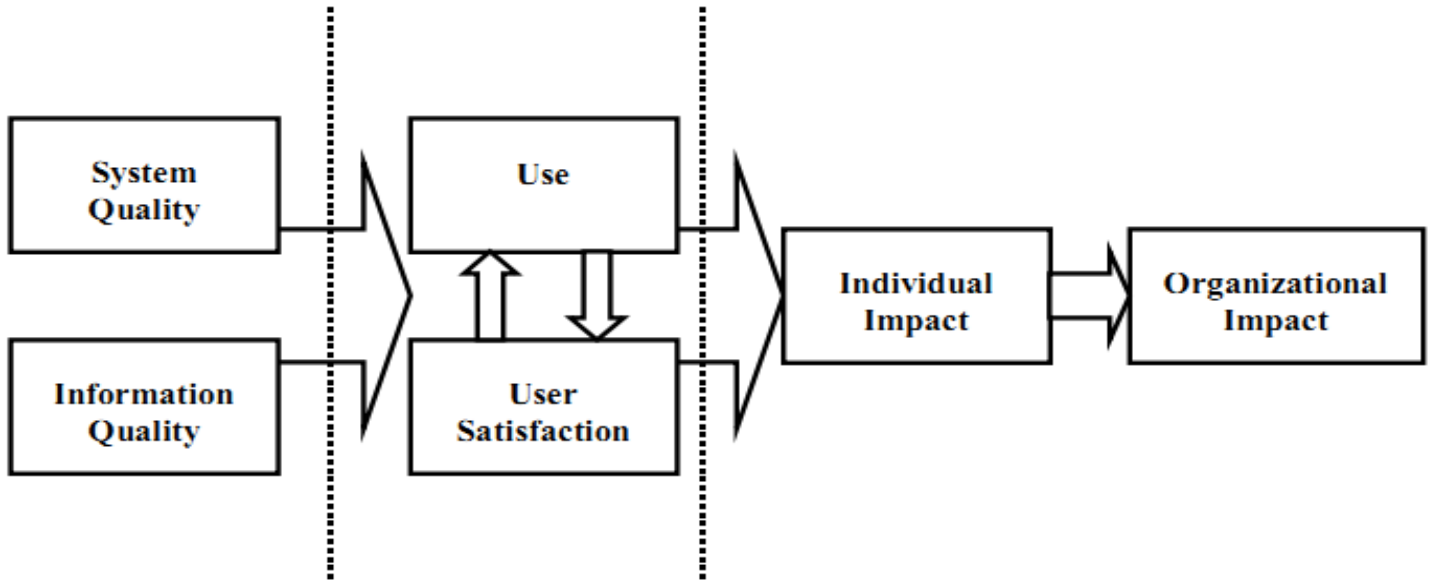
Introduction

- The D&M IS Success Model published in 1992
- Since then, over 150 articles in refereed journals and conference proceedings have referred to, and made use of, this IS Success Model.
- Five of the nine articles in Garrity & Sanders' 1998 book, Information System Success Measurement, focus explicitly on issues related to the D&M IS Success Model.
- The IS success section of the ISWorld Web site is currently organized according to the D&M success taxonomy.

D&M IS Success Model

FIGURE 1. D&M IS Success



(Source: DeLone & McLean, 1992, p. 87)

Purpose ?

- The purpose of this paper therefore is to :
  - Revisit,
  - Reexamine
  - Reformulate

  the D&M IS Success Model and IS measurement practice in light of this rich body of recently published research.

Subsequent Research and Citations of the D&M IS Success Model

- D&M IS Success Model have been tested and challenged over the past eight year, resulting in a deeper under-standing of IS success.
- 144 refereed journal articles and 15 papers from the International Conference on Information Systems (ICIS) that have referenced the D&M Model during the period 1993 to mid 1999.
- Many of these cited articles tended to justify their empirical measurement of IS success by citing the D&M Model.
- Although some rely on the article more heavily then the others using it like a drunkard uses a lamppost

Table 1

Journal Articles Citing the DeLone & McLean IS Success Model
(Excludes a number of conference proceedings that also cite the model)

Journals	Number of Articles Citing the Model
Information & Management	24
Journal of Management Information Systems	11
MIS Quarterly	15
European Journal of Information Systems	10
Information Systems Research	7
Decision Sciences	6
Omega – International Journal of Management Science	6
Management Science	4
IEEE journals	4
Communications of the ACM	2
IBM Systems Journal	1
Other journals	54
Total	**144**

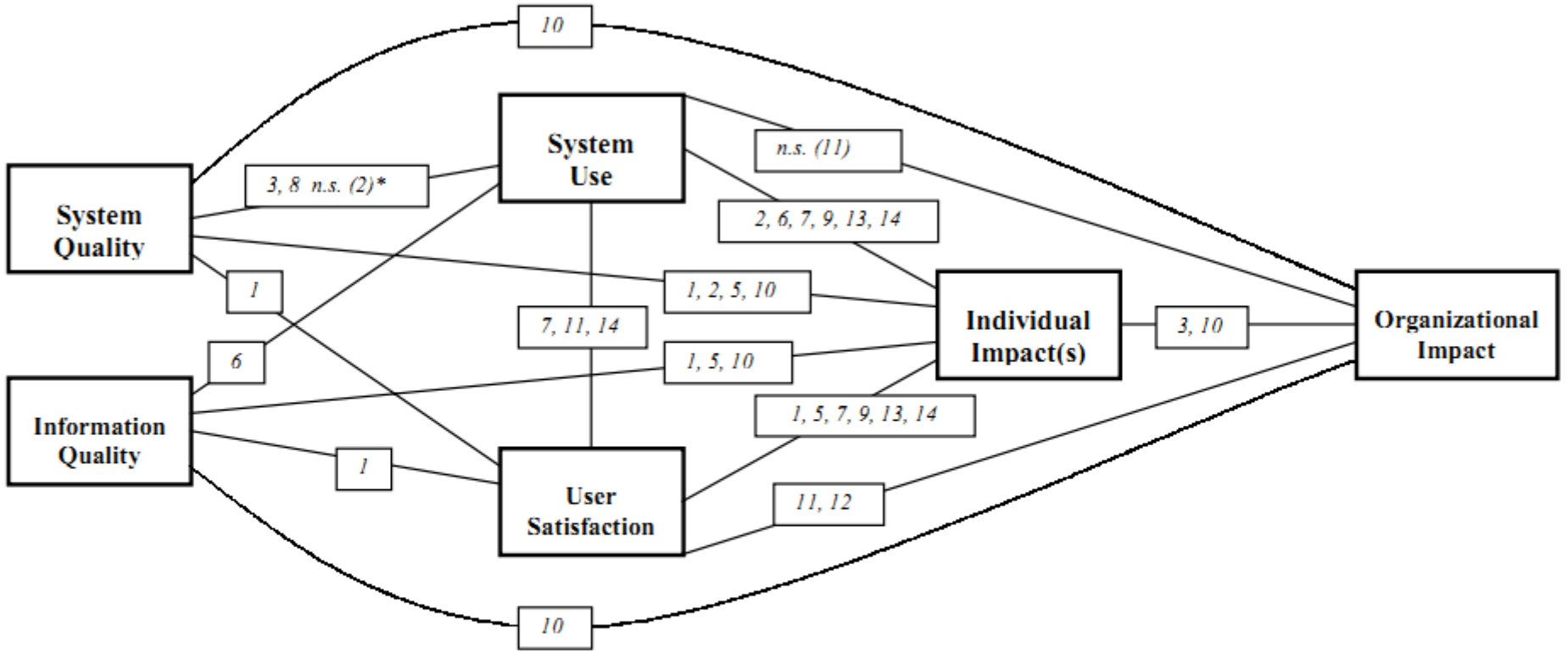
Empirical Tests of the D&M Model

- Unlike a process model, which merely states that B follows A, a causal model postulates that A causes B; i.e., increasing A will cause B to increase (or decrease). In the 1992 article, it was proposed such interrelationships among the dimensions in the model; but it was not tested empirically.

- After 1992, some of the studies explicitly tested the associations among the measures identified in the D&M IS Success Model

- Taken as a whole, these empirical studies give strong support for the proposed associations among the success dimensions and help to confirm the causal structure in the model.

FIGURE 2. Tests of Associations Among IS

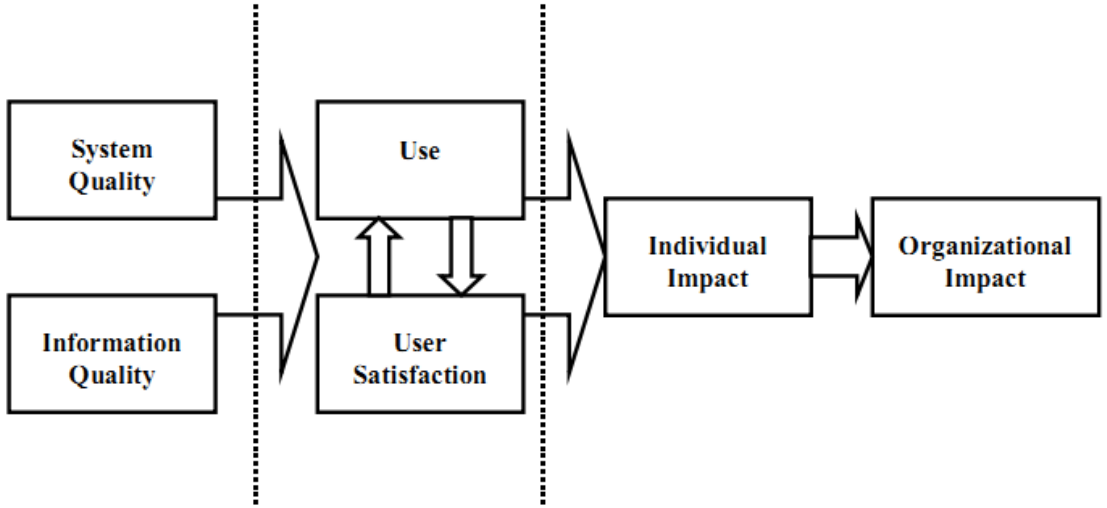


1. Seddon & Kiew (*1994*)
2. Goodhue & Thompson (*1995*) *mandatory use
3. Taylor & Todd (*1995*)
4. Jurison (*1996*)
5. Etezadi-Amoli & Farhoomand (*1996*)
6. Teng & Calhoun (*1996*)
7. Igbaria & Tan (*1997*)
8. Igbaria, Zinatelli, Cragg & Cavaye (*1997*)
9. Guimaraes & Igbaria (*1997*)
10. Teo & Wong (*1998*)
11. Gelderman (*1998*)
12. Yoon, Guimaraes & Clevenson (*1998*)
13. Yuthas & Young (*1998*)
14. Torkzadeh &Doll (*1999*)

Model Enhancements

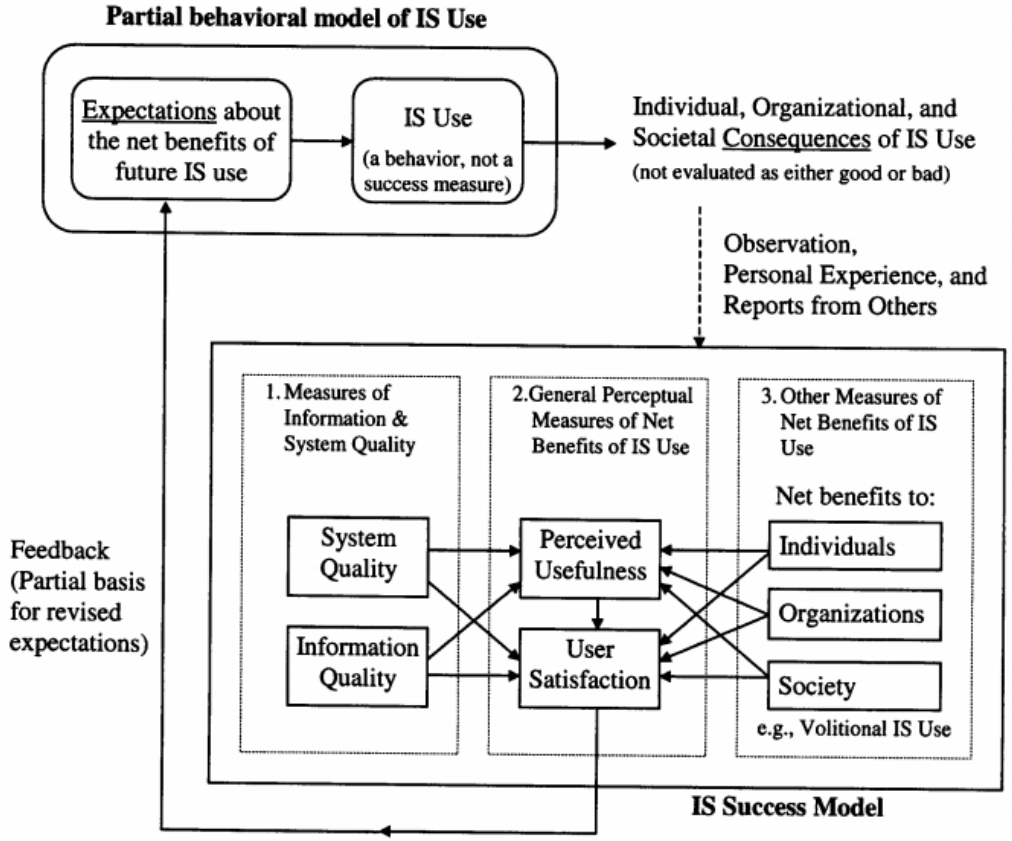
- The D&M IS success taxonomy and its six success categories are based on a process model of information systems (Shannon & Weaver 1949).
- It is also argued that the six dimensions are interrelated, resulting in a success model which indicates that causality flows in the same direction as the information process flows.
- However, Seddon (1997) argues that D&M have "attempted to combine both process and causal explanations of IS success in their model. After working with this model for some years, it has become apparent that the inclusion of both variance and process interpretations in their model leads to so many potentially confusing meanings" (Seddon 1997, p.240).

FIGURE 1. D&M IS Success



(Source: DeLone & McLean, 1992, p. 87)

Figure 5 Respecified Version of DeLone and McLean's (1992) Model of IS Success (Constructs Defined in Table 1)



Model Enhancements (cont'd)

- Authors agree with Seddon's premise that the combination of process and variance interpretations of IS success in one model can be confusing.

- However they also believe that:
  - Seddon's reformulation of the D&M Model into two partial variance models complicates the success model, defeating the intent of the original model.

  - Perceived usefulness and user satisfaction are so conceptually intertwined that they defy separate measurement.

Model Enhancements (cont'd)

- Seddon (1997) argues for the removal of SYSTEM USE as a success variable in the causal success model, claiming that use is a behavior, appropriate for inclusion in a process model but not in a causal model.
- He argues that use must precede impacts and benefits, but it does not cause them.
- Authors disagree. They believe that system usage is an appropriate measure of success in many cases.

Model Enhancements (cont'd)

- They also believe that:
  - The problem to date has been a too simplistic definition of this complex variable.
  - Researchers must also consider the extent, nature, quality, and appropriateness of the system use. Is the full functionality of a system being used for the intended purposes? Is it being used to the fullest extent?
  - Simply measuring the amount of time a system is used does not properly capture the relationship between usage and the realization of expected results.

"Use", especially informed and effective use, will continue to be an important indication of IS success. Because :

Model Extensions – Impacts

- Pitt et al. observed that "commonly used measures of IS effectiveness focus on the products rather than the services of the IS function. Thus, there is a danger that IS researchers will mismeasure IS effectiveness if they do not include in their assessment package a measure of IS service quality"

- Researchers who have argued that service quality be added to the success model have applied and tested the SERVQUAL measurement instrument from marketing

- However, recent empirical research (Van Dyke, Prybutok, & Kappelman, 1999) has challenged this SERVQUAL metric, identifying "problems with the reliability, discriminant validity, convergent validity, and predictive validity of the measure.

Model Extensions – Impacts(cont'd)

- Although authors agree with it, they nevertheless believe that SERVICE QUALITY, properly measured, deserves to be INFORMATION QUALITY as components of IS success.

- While a claim could be made that SERVICE QUALITY is merely a subset of the model's SYSTEM QUALITY, the changes in the role of IS over the last decade argue for a separate variable -- the SERVICE QUALITY dimension.

Model Extensions – Impacts(cont'd)

- As the impacts of information systems have evolved beyond the immediate user, researchers such as:
  - Workgroup impacts (Myers et al. 1998, Ishman 1998)
  - Interorganizational and industry impacts (Clemons & Row 1993; Clemons, Reddi & Row 1993)
  - Consumer impacts (Hitt & Brynjolfsson 1994; Brynjolfsson 1996)
  - Societal impacts (Seddon 1997).

But rather than complicate the model with more success measures, they prefer to move in the opposite a single impact or benefit category called NET BENEFITS.

Model Extensions – Impacts(cont'd)

- In addition to the many published critiques and extensions to the D&M Model, a number of suggested improvements to the model.
- These suggestions have taken two forms:
  - One, like the discussion above on impacts, has urged greater granularity, breaking down a dimension like ORGANIZATIONAL IMPACT into workgroup impact, departmental impact, divisional impact, and so forth.
    - Authors resisted such further refinements for the sake of parsimony.
  - The second set of suggestions flow from a confusion between what is an independent variable and what is part of the dependent variable, IS success.
    - Ex : "User involvement" and "top management support" are suggested additions to the D&M Model; yet these are clearly variables that may cause success rather than being a part of success.

Model Extensions – Impacts(cont'd)

- Several researchers have commented on the difficulty of applying the D&M IS Success Model in order to define and operationalize IS success in specific research contexts.

- This was not unexpected:
  - "This success model clearly needs further development and validation before it could serve as a basis for the selection of appropriate IS measures" (DeLone & McLean 1992, p. 88).

Model Extensions – Impacts(cont'd)

- Jiang & Klein (1999) found that users prefer different success measures depending on the type of system being evaluated.
- Whyte et al. found that "there are important differences deriving from organizational, user, and systems variations which can modify the view as to which attributes (success measures) are important" (Whyte et al. 1997, p. 65).
- Seddon et al. (1998) make an important contribution by proposing a two-dimensional matrix for classifying IS effectiveness measures based on the type of system studied and on the stakeholder in whose interest the information system is being evaluated.

Model Extensions – Impacts(cont'd)

- Authors completely agree with these remarks
  - "no single variable is intrinsically better than another, so the choice of success variables is often a function of the objective of the study, the organizational context [emphasis added], . . . etc. (DeLone & McLean 1992, p. 80).

Other Success Frameworks

- Grover, Jeong & Segars (1996) created six effectiveness categories based on dimensions. The six effectiveness classes are:
  - Infusion measures
  - Market measures
  - Economic measures
  - Usage measures
  - Perceptual measures
  - Productivity measures.

  Authors believe that, while interesting and informative, these frameworks do not introduce any new constructs not present in the original model.

Analysis and Recommendations

- Seddon states that "the boxes and arrows in variance- and process-model diagrams represent quite different concepts and cannot be combined meaningfully in one model. . . . Unfortunately, combining variance and process models is exactly what [DeLone and McLean] attempted to do."
- Authors believe that:
  - a process model has just three components: the creation of a system, the use of the system, and the consequences of this system use. Each of these steps is a necessary, but not sufficient, condition for the resultant outcome(s).
    - For instance, without system use, there can be no consequences or benefits.

Thus, to understand fully the dimensions of IS success, a variance model is also needed.

Analysis and Recommendations

- Seddon (1997) has found, the application of D&M model to empirical research requires a contextual variance specification of the model.
- Authors found appropriate to add a third dimension, SERVICE QUALITY, to the two original system characteristics, SYSTEMS QUALITY and INFORMATION QUALITY.
- And, they combined INDIVIDUAL and ORGANIZATIONAL IMPACTS into a single variable, NET BENEFITS

The Reformulated D&M IS Success Model

- As discussed earlier, quality has three major dimensions:
  - INFORMATION QUALITY
  - SYSTEMS QUALITY
  - SERVICE QUALITY.

Each should be measured – or controlled for -- separately, because singularly or jointly, they will affect subsequent USE and USER SATISFACTION.

The Reformulated D&M IS Success Model(cont'd)

- Given the difficulties in interpreting the multidimensional aspects of USE – mandatory versus voluntary, informed versus uninformed, effective versus ineffective, etc. – they suggest ;
  - INTENTION TO USE As an alternative measure.

INTENTION TO USE is an attitude, while USE is a behavior. Substituting the former for the latter may resolve some of the process versus causal concerns that Seddon (1997) has raised.

The Reformulated D&M IS Success Model(cont'd)

- As in the original Model, USE and USER SATISFACTION are closely interrelated.
- USE must precede USER SATISFACTION in a process sense
- A positive experience with USE will lead to greater USER SATISFACTION in a causal sense.
- Similarly, increased USER SATISFACTION will lead to increased INTENTION TO USE and thus USE.

The Reformulated D&M IS Success Model(cont'd)

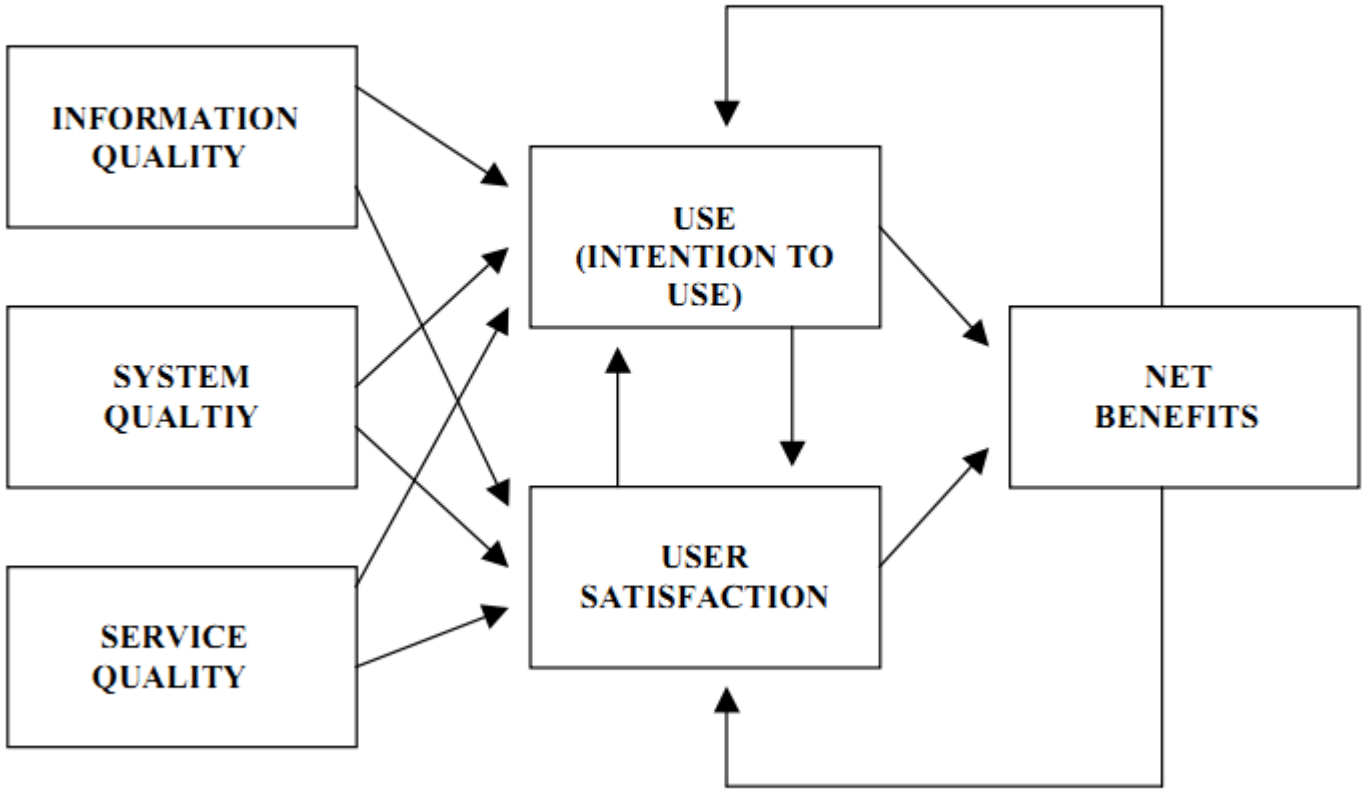
- As a result of this USE and USER SATISFACTION, certain NET BENEFITS will occur.

- If the information system or service is to be continued,
  - NET BENEFITS from the perspective of the owner or sponsor of the system are positive,

Thus influencing and reinforcing subsequent USE and USER SATISFACTION.

The Reformulated D&M IS Success Model

FIGURE 3. The Reformulated IS Success



Conclusions

- Despite the recent research studies which both support and challenge the original D&M IS Success Model, authors believe that the original conclusions still form a sound basis for IS success measurement.
- The changes in the Reformulated IS Success Model are largely changes in degree, not in kind.
- The addition of SERVICE QUALITY and the collapsing of INDIVIDUAL IMPACTS and ORGANIZATIONAL IMPACT into NET BENEFITS still preserves the parsimonious nature of the Model.