'Conceptualizing Information System Success': Towards a 3D-Model'

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Introduction

Decision Support Systems (DSS), and Information Systems (IS) more generally, have a twenty year history of attempting to provide aid to decision makers. There have been some notable successes but also many failures. In the following we will concentrate on DSS as subgroup of information systems.

Most of the DSS successes are in small-scale personal decision support, while success at supporting senior management in strategic roles is much more limited. There are many descriptions of successes (and a few of failures), but there is a paucity of research that attempts to provide a comprehensive, inclusive investigation of DSS success.

This paper develops and builds on the *3D-Model of IS Success* to illuminate the issues underlying IS and especially DSS success and failure.

Model Development

The 3D-Model for IS improves understanding of the concept of IS success by separating the concept into *three fundamental dimensions or levels*:

- 'Technical **D**evelopment Level',
- '**D**eployment to the User', and
- '**D**elivery of Business Benefits.'

The name ′3D-Model' stems form the three critical levels of the model, '**D**evelopment', '**D**eployment', and '**D**elivery'.

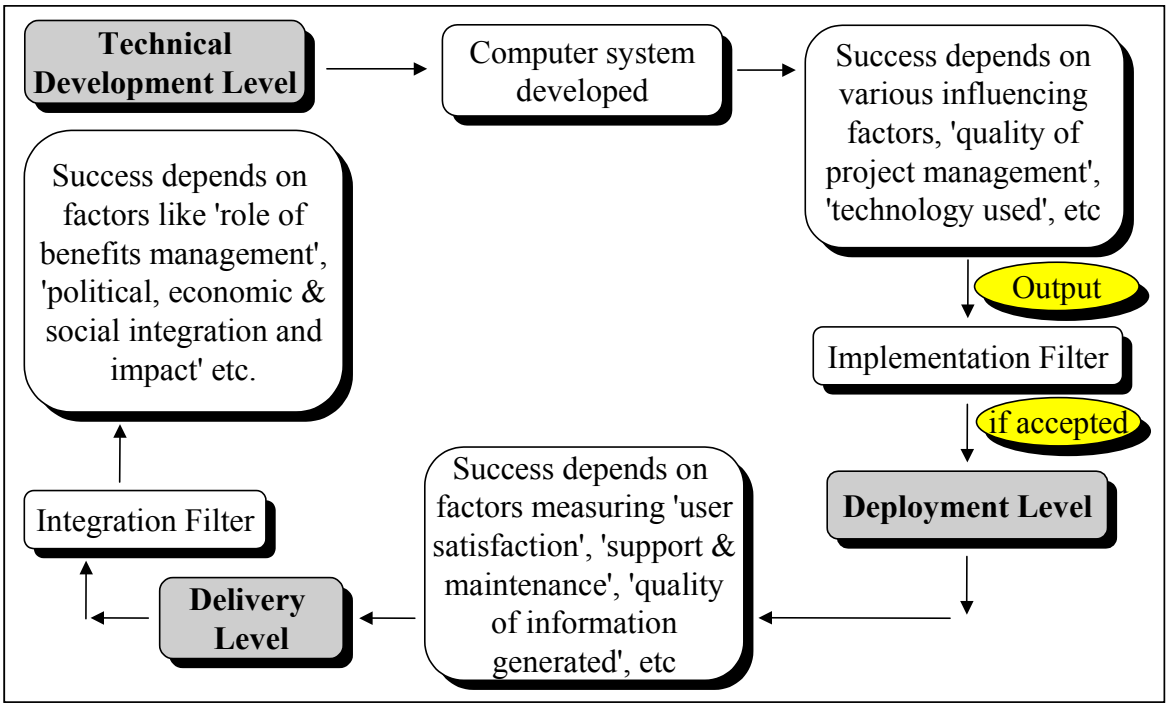

Figure 1: 3D-Model for Assessing IS Success

Filters act between these levels of IS effectiveness and contain influences which inhibit or encourage the adoption of the system at the next level. However, the filters act independently of the quality of the system at lower levels.

Influencing factors are identified which collectively determine the quality of the IS within their respective levels. Some factors work at more than one level. Not all factors have to be positive in order to achieve a positive result overall. There are inter-relationships between factors within and across levels. Influencing factors can be endogenous or exogenous. Endogenous factors are those within the remit and control of the actors at the respective levels. Exogenous factors are those outside such control.

At the *'Development Level'*, IS success is influenced by a variety of endogenous influencing factors related to the complexity of the system, the quality of project management, the quality of the technology used, the development methodology used, the

degree of user involvement, the professional skills and experience of the development staff, and quality of the data. The output from this level is a technical system, whose quality is variable.

The resulting technical system enters the *'Implementation Filt*er'. Exogenous factors, not under the control of the development staff, also influence the process of implementation, such as other existing IS. The implementation filter results in the acceptance or the rejection of the technical system. Thus, a technically excellent system, but one in which users have not been involved, might be rejected and fail to result in a used IS at the deployment level. There may be similar results, if the system is imposed rather than offered, or because other information sources are perceived as more valuable by users. In such a case, the IS could be considered 'successful' at the development level, but not at the deployment level. Conversely, a low quality technical system may still be 'successfully deployed' due to the support of a business champion, business imperative or by management dictate.

A successful, or otherwise, implemented IS enters the *'Deployment Level'*. Here, factors influence how much and how well the system is used. In particular, the user is a central influencing factor at this level. The technical system serves the user, whether an individual or a group, which hopefully improves the performance of their decision making and their role in the organization, and thus delivers benefits to the business. Success of this deployment is influenced by such factors as 'user satisfaction', 'support and maintenance', and the 'quality of the information generated', i.e. its relevance, timeliness, and accuracy. The skill of users and the resources deployed for implementation can also influence acceptance. Depending on the task, the information generated by the system may be more or less appropriate, which will affect its success.

An IS / DSS that is successfully used might still fail to deliver the business objectives. Elements in the *'Integration Filter'* determine whether the use of the IS - or more specifically the DSS - actually works within the organization. It may be prevented by the organization structure or a culture that does not recognize its potential contribution. The

status of the individual or group, who possesses the information, may not be sufficiently high for their enhanced potential contribution to be recognized, and thus the IS / DSS may not achieve its business objectives. This filter includes many of the 'contingency' factors.

As long as there is a degree of integration of the used system with the organization's decision making structure, the IS or DSS can begin to deliver business objectives, thus impacting at the *'Delivery Level'*. Forces that can help here are the active support of a senior manager who is the project champion, as well as sensitive change management and re-organization where necessary. The role of benefits management can also help in achieving success by improving the fit between the IS and the organization. The level of resources available and the way output from the system is used also affect success. The alignment of individual and business objectives is a key issue at this stage in measuring success. At the delivery level, the issues and forces are not particularly IS/DSS-oriented; they are forces which are at work in any change process which aims to enhance business performance.

It could be considered that having permeated so far, the IS could be considered a success. At this level it could be so; however even achieving its business objectives might not result in increased business performance in the marketplace, due to factors entirely exogenous to the business, those in the *'Environment Filter'*. These influencing factors include competitor movements as well as political, social and economic factors. This final level is included in the model since it has implications for measurement of success; for example, should market share not actually increase as a result of using the IS, it may not be appropriate to label it a failure at any but the top level.

To summarize: Using a comprehensive set of altogether 134 identified success contributors, this work has developed the *'3D-Model'* for IS and DSS. The model communicates that neither IS success in general nor DSS success more specifically are

simple. It helps to conceptualize a broader view. Thereby, it provides a firmer foundation for research, by

- identifying appropriate and fundamental measures of IS and DSS success,
- assisting in the formulation of quantitative research on success, and
- enhancing the usefulness of subsequent analysis and discussion.

Finally, the model can also be used for planning or evaluating IS / DSS success.

Empirical Evidence

Empirical evidence of applying the 3D-Model has demonstrated in a number of contexts that the model has validity.

- In assessing *Intranet projects*, the model was felt to help structure the problem and to highlight the link between success and participation and involvement at all levels.
- In a *financial systems context*, the model filters were identified as measures of the outputs from earlier stages. This application reinforced the notion that senior management and technical stakeholders have a very blinkered view of success. Developers focus on the 'Development Level' and senior management on the 'Delivery Level'.
- In an *SAP evaluation*, the model was found warranting in the area of user-friendliness.
- Use in a *civil service department* stressed the opportunity to use the balanced business scorecard as a complementary tool.
- In a *supermarket scenario*, the model offered an opportunity to rapidly assess the variables requiring analysis and to focus management attention on the 'softer' issues of success.
- Dynamics and constant learning are themes from *automotive applications*.
- Another *automotive use* suggests that the 3D-Model may need to be inverted, in that delivery must be considered before development and

deployment in planning any system. The embedded issue of data accuracy is paramount too.

- Other uses of the 3D-Model have stressed the need for sufficient iterations between levels in any business system development.

Conclusion and Outlook

In conclusion, the developed 3D-Model extends the work of Delone and McLean in several ways. One of its main features, the distinction of three investigation levels with filters in between has proven to be very helpful when applying the model and the approach in a number of practical settings. More research and empirical work needs to be done to further investigate the applicability and the validity of the model in various industry sectors as well as system architectures and applications.

Reference

Delone, W.H. and McLean, E.R. (1992) Information Systems Success: The Quest for the Dependent Variable, *Information Systems Research,* Volume 3, No. 1, March 1992, pp 60-95.