DSS Development within the Services Industry: A User Based Design Science Approach
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Abstract
While there is no universally accepted definition of a Decision Support System (DSS), this study will focus on the characteristics of a DSS with particular emphasis on the DSS Development and Implementation process within service industries. An analysis of traditional, DSS Development Life Cycle, and User Development within Service Industries are synthesized based on an analysis of 30 sources spanning the past 40 years. User involvement throughout the development and implementation phases is further discussed as an information systems subspecialty, in relation to the user’s satisfaction level. A Value Based DSS Methodology for developing and implementing decision support systems is introduced as a means of suggesting a user based design science approach. Four case studies within differing service industries are presented, with two illustrated as success case studies and two illustrated as unsuccessful case studies.
DSS Development and Implementation

DSS development and implementation (Swanson & Ramiller, 1993) represent two phases within a majority of service industry’s (i.e. financial institutions, airlines, etc.) system development methodologies. While a majority of the organizations follow a traditional or IT centric method of DSS development and implementation, a user-centric method for designing, development, and ultimately implementation success is discussed as an alternative method (Parker & Sinclair, 2001). Application of the user-centric model within service industries make it possible to further justify, through value analysis (Keen, 1981), the development of a DSS.

The seminal concepts of Decision Support Systems (DSS) were first developed by Michael S. Morton in the ‘70s under the term management decision systems (Power, 2007). Since its inception, a myriad of definitions defining a DSS have proliferated the Information Technology (IT) industry. As discussed in Mann and Watson’s (1984) study of user involvement in the DSS Development process, Sprague posits the focus of development should be viewed as a process that is, 1) aimed at managers who make unstructured and underspecified problems, 2) combines analytical and transactional methods of online processing, 3) emphasizes flexibility and adaptability with user input based on changes in the user’s environment, and 4) considers the decision making approach of the user.

Sprague’s (1982) framework has since been adjusted by the very managers he discusses through more of a user-oriented (Reimann & Waren, 1985; Mann & Watson, 1984) methodology of DSS development and implementation. Reimann and Waren (1985) specifically discuss the need for the composition of a selection team and the choice of evaluation criteria needing to reflect a hybrid model of IT and end-user criteria. The end-user, through identified criteria, selection process, and training help to frame an end-user orientation of DSS software development and implementation.

Throughout this study, identification of multiple DSS methodologies will be presented in consideration for future projects. A discussion regarding the
changing values, by end users, of how DSS development and implementation projects are selected is analyzed in further detail. A breakdown of the DSS development and DSS implementation phases are discussed, along with synthesized findings from the literature as they relate to service industries. Four case studies are presented, from the services industry, on success and failures of DSS development and implementation projects. Furthermore, as posited in Sprague’s (1982) study, a DSS is as an “interactive computer based system, which help decision makers utilize data and models to solve unstructured problems” (p. 1).

Services Industry

Otherwise known as the tertiary sector of the industry, the services industry represents a myriad of organizations spanning from technology to medical, government to consulting, amongst others. While difficult to define purely in terms of the types of services offered, a service can include medical, intellectual, artistic, physical, and experiential activities to name a few. Throughout this study, the term service industry will be defined as the sector of the economy which provides personal and business services (Collins, 2006).

“Data from the U.S. Bureau of Labor Statistics indicates that more than 97 percent of the jobs added to U.S. payrolls from 1990 to 2002 were provided by the service-producing sector” (Simmering, 2006, p. 1). As a result of the phenomenal growth of the services sector, the need to store the vast amount of data generated from servicing customers within data warehouses has become more apparent. Furthermore, access to the data, via a DSS, has provided service-based organizations with new methods of learning how to better serve their customer, through knowledge gained in analyzing the data, to include customer patterns, behaviors, and preferences. Examples of how service based organizations utilize DSS’ include “marketing managers to support brand decision making, bank officers for financial planning, and physicians for therapy” (Mann & Watson, 1984, p. 27).

Users of a DSS within a service based organization can be considered as power users (Power User, 2003), whereby certain individuals who gravitate
toward technology. These power users, either self-identified, or selected by IT, use the DSS tool to further train their non-power user counterparts. In either case, the end-user will benefit from the use of a DSS in making their unstructured and semi-structured decisions regarding providing services. Furthermore, use of the DSS in aiding the decision maker will only serve as good as the value the user receives from practical utilization, plus the validity of the data presented through the DSS.

Value Analysis

“The physical structure of a DSS breaks down into three major components: a database, a model base, and a user-machine interface” (Hogue & Greco, 1990, p. 22). Given all three of these units of analysis (Pinsonneault & Kraemer, 1993), a database, a model base, and user-machine interface can be shared in their creation through an IT and Business partner relationship, justification for the costs, time, and unforeseen expenses with regard to these three elements are typically driven through the IT community. A recent survey (Wixom & Watson, 2003) studied 111 organizations, of which 72% considered their Data Warehousing and database efforts (the infrastructure projects by which the DSS application is driven) to be up and coming systems.

With the expectation of faster time to market and on-demand analysis metrics continually surfacing, the justification of what value a DSS provides to a service-based organization must equally be seen through the lenses of the users. Lusk, Belhadjali, Halperin, and Matzner (2005) discuss an implementation paradox exists between users and IT, whereby upon completion of a DSS, the implementation can be considered a success by the users, in terms of user sign-off, however actual usage of the DSS lacks in relation to expectations set by IT. Thus, the implementation paradox exists. These authors further suggest an increase in user involvement throughout the development process can increase proper DSS utilization, as opposed to pure expectations, which ultimately helps determine value.

The pure longevity aspect alone regarding DSS projects, which typically tie into a data warehousing effort, present cost/benefit justification issues. While
the general user may see value in utilizing a DSS for analytical decision making, and IT views the concepts of a DSS as they relate to data integration efforts, the valuation equation in service based organizations initially follow in line with Wixom and Watson’s (2003) concept of a DSS as up and coming. The question, in relation to longevity, then becomes at what point is the DSS development and implementation effort deemed worthy of calling it a success.

Furthermore, as the question of valuation of a DSS surfaces, this study finds the link between IT and user communities strengthening in a symbiotic method of serving as checks and balances toward a higher utilization rate. The services industry, which places a strong priority in commitment to the customer, must be selective in choosing which goal(s) within service is to be supported by a DSS. Thus, with identification of the goal(s) and possible problems to solve, a recommendation toward the methodology of DSS development and implementation can begin.

Literature Review

DSS Development

Activities within the DSS Development phase can be seen as evolutionary (Arnott, 2006). The analysis, by an IT professional, during this phase requires an understanding of the decision task, and conceptualization of how to support the decision process in collaboration with a service industry user. In return, the business users must have well-defined problems to warrant the use of a DSS (Forgionne, 1988). In support of an evolutionary development model, the IT professional and user of a DSS must expand upon the necessary user decision making tasks and DSS tool capabilities as a means of improving upon service based usage. While there is no one generic model for development and/or implementation success regarding a DSS, three models toward development, to include 1) Traditional, 2) Life Cycle, and 3) User Development can be considered. A survey of each development methodology suggests advantages and disadvantages of each, with the User Development methodology representing the most recent work in relation to DSS development.
Traditional Development. DSS development efforts have been created to support three stages of decision making to include intelligence, design, and choice (Turban & Aronson, 1998). One method of supporting such decisions can follow the buy vs. build model of development methodology. Software development organizations that develop DSS software (i.e. MicroStrategy and Business Objects) utilize objects called agents, which aid in the cognitive decision making processes of a user (Sproule, 2003). The method by which these organizations develop software typically follows the traditional systems development methodology as a waterfall, or phased approach to include planning, analysis, design, development, testing, implementation, and maintenance (Malaga, 2005).

In a buy situation, where the benefits are expected to be advantageous over development costs, the software can be purchased based on multiple criteria to include overall business fit and infrastructure integration fit. IT and users alike then work in more of a learning, support, and training capacity together tweaking the software to fit the problem. On the other hand, the build approach toward DSS development presents a modular traditional methodology of identifying the user process to be supported along with existing inhibitors to the process. The outcome of analyzing the process and inhibitors then serve as requirements for users to feed the design and development phases of the DSS (Hine, 1993). While the buy vs. build and traditional development methodology concepts are rooted deeply within IT communities world-wide, a different approach toward DSS Development can be considered.

DSS Development Life Cycle. In a departure from Malaga’s (2005) traditional SDLC approach to systems development, Meador, Guyote, and Keen (1984) discuss traditional project management and development tactics as ill-suited to DSS projects. The author’s further view the development of a DSS as requiring a different focus and commitment level by IT professionals and users alike. The DSS Development Lifecycle is posited as “a 13-stage tactical plan for DSS development, called the DSS development life cycle” (Meador, Guyote, & Keen, 1984, p. 117) and alternative from the SDLC. These authors further argue
that effective management of DSS development requires, 1) an explicit plan for the full development life cycle, 2) careful assignment of responsibility for DSS development, 3) appropriate user involvement and direction, and 4) on-going user needs assessment and problem diagnosis.

The life cycle approach is termed as such due to the evolutionary and adaptive needs of users. The 13-stage plan resembles that of the traditional SDLC model, however emphasizes more specific objectives, to include 1) Planning, 2) Application Research, 3) Analysis, 4) Design, 5) System Construction, 6) System testing, 7) Evaluation, 8) Demonstration, 9) Orientation, 10) Training, 11) Deployment, 12) Maintenance, 13) Adaptation. In terms of involving the user, the life cycle approach clearly demonstrates less of an abbreviated approach with higher possibilities for user interaction and cognitive understanding.

These authors’s present this methodology as more of a ‘tactical’ plan in light of adapting toward the environments needs. The life cycle approach presents an approach toward development that emphasizes less on concepts of developing by cost efficient means, and more toward an emphasis on value. The strongest evidence in support of the life cycle approach lies in the study’s results of identifying Planning, Evaluation, and Orientation as critical DSS development steps that differ from traditional SDLC methods. These findings further support the beginnings of a shift toward user centric methods of DSS development.

User Development within Service Industries. “Many authors have stressed that the DSS development requires a high level of user involvement” (Mann, Watson, & Hugh, 1984, p. 27). These authors’ further stress users' cognitive styles are not considered throughout the development of each DSS. Arnott (2006) further suggests a design science approach to consider users cognitive and psychological bias in support of their decisions. These author’s models are described as descriptive in nature, as opposed to normative prescriptive methods of DSS Development.

Mann, Watson, and Hugh (1984) suggest a DSS development model that considers four dimensions, to include 1) level of management activities, 2) level
task structuredness, 3) amount of necessary task repetitiveness, and 4) level of task interdependence. Sprague’s (1982) taxonomy represent as inputs into the proposed four dimensional model. The level of user involvement, information aspects, and the link between these two, along with available technology, further represent the user’s cognitive style in this contingency DSS development methodology, separate from the traditional and life cycle models. These authors’ further adjust three service organizations (Dispatching, LTV, and General Dynamics) case studies to fit the model as a means of describing their model in action. Meanwhile, Arnott’s (2006) study further expands upon the user centered approach by elaborating on a design science toward user development through a case study of a strategic DSS project where a managing director is supported in a decision about the closure of a division within a company.

The user centric models, while continually evolutionary in nature, present additional research toward DSS development as a method to aid in the cognitive and psychological bias of end-users, and not merely to support the end-user. This study adds value in the evaluation of IT professional’s relationship with user’s decision tasks, as the development and implementation phases’ progress. Although, strong support for either model is absent in the review of literature given the newness of the models, and lack of existing case studies to prove and compare against the traditional and life cycle methodologies of development.

_Synthesized Development Comparisons._ In the same manner that there is no unified definition of a DSS, there has been no agreed upon development methodology on how to develop a DSS. Service industries (i.e. financial institutions, airlines, etc.) continue to utilize a myriad of DSS development techniques (to include some of which that were not presented in this study, i.e. RAD/JAD approaches) and the three DSS development methodologies, illustrated in Table 1. The traditional and Life Cycle approaches toward DSS present a different kind of cost, whereby the need for more expensive power workstations warrant the need for power users. Thus, a culture barrier exists in possibly discouraging use of the DSS (Gazmuri & Maturana, 2001). Although, a strong case toward comprehending the psychological and cognitive decision
tasks, in support of user-centric DSS development models, is becoming a growing area of research as a value-added method within service industries.

Table 1

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Author(s)</th>
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<tr>
<td><strong>Traditional Methodology</strong></td>
<td>Turban &amp; Aronson (1998)</td>
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<td></td>
<td>Malaga (2005)</td>
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<td>Hine (1993)</td>
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<td><strong>Life Cycle</strong></td>
<td>Meador, Guyote, &amp; Keen (1984)</td>
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<tr>
<td><strong>User Development</strong></td>
<td>Mann, Watson, &amp; Hugh, 1984</td>
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<td>Arnott (2006)</td>
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DSS Implementation

The DSS Implementation phase, often lumped together with the DSS Development phase (Swanson & Ramiller, 1993) represents yet another critical phase toward user acceptance. As discussed by Wixom and Watson (2001), full-scale implementation of one of the DSS components (the database) can lead to the rejection by users due to lack of support, training, and overall involvement throughout the DSS Development process. Therefore, implementation success is largely measured not by the merits of the IT community (who typically justifies the need for the DSS), but rather by the users of the DSS.

**User Involvement within Service Industries.** In the experiences of the author of this study, user involvement as it relates to DSS implementation in the services industry is defined as the level of commitment, input, design decisions, and final decision authority prior to production implementation. Parker and Sinclair (2001) discuss the notion while many DSS development efforts have been completed, many of these efforts cannot be considered successful (i.e. have a significant uptake by intended users, and used by them). These authors’s study further supports the importance of user-centered design approach by tying each issue considered to be relevant to the failure of DSS in production (service
based) can be addressed by the appropriate inclusion of users in the design and development process.

DSS implementation, through the lenses of these IT professional's experience in working on multiple DSS projects within the financial industry, must consider the user's feedback throughout the rollout process. User related factors believed to support a DSS implementation rollout process include a cross-factor approach toward understanding user-centered variable (i.e. cognitive abilities) and implementation variables (i.e. user involvement). Alavi and Joachimathaler (1992) suggest, irrespective of the DSS design development methodology employed, the level of user involvement and feedback within these phases will increase the likelihood of DSS utilization, which is the ultimate measure for both users and IT alike.

*User Satisfaction.* Measuring user's satisfaction of a DSS can typically signify their level of comfort, or discomfort as discussed by Basu and Blanning (1994) with the user-interface component of the DSS. While a valid measure, a more significant unit of analysis in measuring is that of system usage (Barki & Huff, 1990). The correlation of user-interface comfort levels combined with system usage statistics can aid the IT professional in further comprehending the conceptual, psychological, and cognitive user traits to evolve the DSS toward the user's needs. Determination of DSS implementation success, measured by DSS satisfaction and perceived DSS benefits (Guimaraes, Igbaria, & Lu, 1992) can further be based upon three direct factors, as posited by Barki & Huff (1990), 1) system flexibility, 2) user willingness to change, and 3) user participation in implementation. Table 2 synthesizes the authors and their suggested implementation factors toward DSS implementation success.
Table 2

*DSS Implementation Factors*

<table>
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<tr>
<th>Factors</th>
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<tr>
<td>User Involvement</td>
<td>Parker &amp; Sinclair (2001)</td>
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<td></td>
<td>Alavi &amp; Joachimathaler’s (1992)</td>
</tr>
<tr>
<td>User Satisfaction</td>
<td>Basu &amp; Blanning (1994)</td>
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<td>Barki &amp; Huff (1990)</td>
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<td></td>
<td>Guimaraes, Igbaria, &amp; Lu (1992)</td>
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<td>Wixom &amp; Watson (2001)</td>
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Development and Implementation Synthesized

Coupled together, DSS Development and Implementation suggest a need for the system methodology to be flexible in relation to the users’ willingness to change. Implementation is suggested as a never-ending phase, unlike traditional methods of development and implementation methodologies. Thus, the level of evolutionary state of implementation, in relation to user needs, suggests a possible need to work backwards in identifying a proper DSS development methodology. Parker and Sinclair (2001) provide the strongest evidence toward synthesizing a need for a user-centered approach, within the services industry, in an evolutionary method toward design, development, and implementation of a DSS.

As more prescriptive measures of adopting DSS methodologies are chosen (i.e. traditional and life cycle approaches), the likelihood of identifying quantifiable cost/benefit analysis will increase. Although, more recent DSS research suggests a more descriptive user-centric method of development and implementation, which begins to lean away from cost/benefit analysis, and more toward value creation in the eyes of the user. Thus, the importance for user communities and IT communities within service based organizations, who rely heavily on providing value to the customer, must question to what extent value of a DSS will support their management decisions, utilization rates, and customer service goals.
Research Method

A qualitative research method (Creswell, 2007) in the form of multiple case studies was utilized as a means of studying a broader range of organizations. The purpose of the study in the context of utilizing multiple cases studies is to further extend the available research on DSS development and implementation frameworks within the services industry. Yin (1994) further suggests case study analysis applicability via a synthesis of multiple-case studies using replication strategy spread across multiple industries.

The multiple case studies informing the current research include a total of four selected cases based on three organizational DSS Development and Implementation methods. As a means of protecting the anonymity of each organization, a system for renaming each organization has been coded in the form of an alphabetized schema. Case Study A stems from the airline industry, Case Study B stems from the marketing services industry, and Case Studies C and D stem from the same organization within the financial services industry. Together, the strength of these case studies lie in the service industry's representation of, a) sampling applicable DSS use, b) the relationship of the DSS methodology utilized in each case as they relate to this study's discussion on DSS development and implementation, and c) the ontological experiences of these researchers with practical acumen in descriptive versus prescriptive DSS methodologies.

Data were selected via primary and secondary sources, to include academic research, a structured interview, company reports, and books. The secondary data were collected and sorted via thematic analysis as described by Strauss and Corbin (1990). The intention of this research is to analyze each case study and their respective constructs in relation to how the combined frameworks, models, and methodologies on DSS Development and Implementation progress or digress from a user centric DSS. The driving purpose of this research is to extend the concept of the assessed value of a DSS in relation to the chosen development and implementation methodology. While the analysis of the data is subjective, inductive reasoning and ontological
experiences are called upon to help build patterns between development, implementation, and the value of a DSS.

A User Based Design Science Approach

Evidence for more user-centric DSS development models is becoming a growing area of research as a value-added method within service industries. Alavi and Joachimathaler’s (1992) meta-analysis study of 144 findings from 33 studies indicates that multiple user-situational variables (development involvement, training, and experience) are more important to the implementation success, by as much as 30 percent, than psychological factors to DSS implementation. System usage can be defined as mandatory (i.e. more transactional in nature) or voluntary, which is the case that most DSS systems fall under. Therefore, system usage and system failure have been defined throughout IT research not by how poorly IT methodologies have fared, but more so based on the underutilization of the DSS.

Upon analyzing the DSS Development Comparisons (Table 1) and the DSS Implementation Factors (Table 2), these authors posit a model that enforces collaboration between a user (e.g. external customer, internal customer, etc), and their IT counterparts who work to develop and implement the DSS. It is not the intent of a user based design science model to neither prescribe nor describe how to use the model. Rather, the model has been driven from the available research and developed through the findings of the research conducted therein. The foci of the proposed model is to develop and implement a DSS in the service based industry through a design science approach which encompasses a) user-centric model, b) descriptive methods, and c) the need for user satisfaction through more descriptive means.

Design Science Approach. The end product of a DSS is to utilize the system for the purposes of supporting the cognitive decision process while succumbing to the changing needs of the decision maker, independent of the DSS taxonomy to include, a) communication driven DSS, b) model driven DSS, c) document driven DSS, d) data driven DSS, e) knowledge driven DSS, f) enterprise-wide DSS, g) desktop DSS, h) passive DSS, i) active DSS, j)
cooperative DSS, or k) consumer DSS (Haettenschwiler, 1999; Power, 1997; & Zahir, 2005). From a customer and/or decision maker’s point of view, they are not obligated to cognitively think or feel one way, or be loyal to any particular DSS. Rather, a DSS based on a design science approach empowers the decision maker by pre-analyzing the information through shared knowledge and experiences to trigger a thought pattern with the purpose of making an informed decision.

Table 3 suggests a value-based methodology whereby the success of a DSS implementation is suggested to be measured by, a) the number of users it serves, and b) the frequency the DSS is used, and c) by the tangible and/or intangible value that results based on the decisions made as a result of the extracted data. The measures are intended to help answer to what degree the Decision Support System development and implementation project is successful and how much value the system added to the organization, and/or the user community. This Value Based Methodology aligns with the traditional approach of the Software Development Life Cycle methodology and the Waterfall Model of Development. Beginning with the basic requirement gathering process through the final delivery of the system, users will provide IT teams, with the help of business analysts, a proactively prescriptive direction about their requirements. This approach differs from traditional methodologies where IT teams drive the initiative, business users, and suggested software. The information technology department’s role now serves to align through the technical aspects of the project, review delivery feasibility of the requirements, and propose changes/improvements accordingly.

The suggested process of following and implementing the Value Based Methodology is via an iterative approach by taking modular steps breaking down delivery into phases. Each iterative phase is initiated by the business user who drives the initiation process through implementation. It is the paradigm of these researchers that a business analyst may need to be involved between the end user and the information technology department. Thus, the toggling of user prescriptive requests can either be communicated to a business analyst, or
straight to their IT counterpart. Ultimately, the Value Based Methodology combines prescriptive with descriptive methodologies and can be incorporated with varying project management and/or software development methodologies.

Table 3

*DSS Development Methodologies*

<table>
<thead>
<tr>
<th>Generic Methodology</th>
<th>Value Based Methodology</th>
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<tr>
<td>IT Research Description</td>
<td>User Implementation Prescription</td>
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<tr>
<td>IT Plan Description</td>
<td>User Research Prescription → IT Research Description</td>
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<td>IT Design Description</td>
<td>User Plan Prescription → IT Plan Description</td>
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<tr>
<td>IT Develop Description</td>
<td>User Design Prescription → IT Design Description</td>
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<td>IT Test Description</td>
<td>User Develop Prescription → IT Develop Description</td>
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<tr>
<td>IT Implementation Description</td>
<td>User Test Prescription → IT Test Description</td>
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<td>User Plan Prescription</td>
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<td>User Research Prescription</td>
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<td>User Implementation Prescription</td>
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</table>

Case Studies

The success of DSS development, implementation, and ultimate usage largely depends on the target (Watson, 2006) the service-based organization is aiming toward. However, the selection and successful implementation of a target (i.e. infrastructure to support one or multiple DSS applications) are influenced by factors such as the external market, internal focus, source of sponsorship, resources, politics, funding, and approval processes, to name a few. The authors of this study uncovered a plethora of case studies available within the services industry, to include IT services, medical services, government services, amongst others.

Four case studies are offered in this study as a mixed approach to synthesizing scholarly research, practical experiences, and elements of the Value Based Methodology that are already in practice. However, the Value Based Methodology is not in use in totality. One successful case study is from the airline industry and the other from the marketing service industry. The two
unsuccessful case studies both stem from the financial services industry, as experienced by one author of this study.

Successful Case Studies within Service Industries

**Airline Industry.** Case Study A’s planning and budgeting forecast DSS provides marketing managers with the ability to select on price and routes, based on a data-driven (Power, 2004) framework. The key deliverable of the PBF DSS, in the lenses of Case Study A’s users, is to observe the impact of price and route selections on overall profits. Users of the system consider the PBF DSS a success based on two merits, 1) technical implementation of the model-base, and 2) an evolutionary state of keeping them involved throughout the DSS Development Lifecycle (Hogue & Greco, 1990).

**Marketing Service Industry.** Case Study B’s organization developed a Corporate Forecast Model (CFM) DSS to help them synthesize their six stage modeling forecast into one logical communication-driven (Power, 2004) system. The deliverable of the CFM DSS is to determine market demand for electric energy. Users of the CFM DSS equally determine the success of the application stems from 1) involving them in the selection process of the DSS application, and 2) integration of their six-stage CFM models into one model-based component (Hogue & Greco, 1990).

Unsuccessful Case Studies within Service Industries

**Financial Services.** Case Study C’s Loss Data Infrastructure (LDI) DSS was the inaugural data warehousing and DSS project for the organization. The key deliverable of the LDI DSS was to help insurance analysts determine and differentiate fraudulent loss claims from actual loss claims as a means of operating more efficiently (MicroStrategy, Inc., 2007). The project became more of a data-driven (Power, 2004) infrastructure project, as opposed to pure LDI DSS due to the lack of skilled resources in the development of broad scope. As a result, the project continued using the SDLC approach spanning six years to develop the infrastructure, and never fully realizing the development of an actual LDI DSS. In a “build it and they will come” (Verastigui, 1997) mentality, users
never flocked to the LDI DSS due to the large scope and over commitment toward infrastructure success by IT.

Financial Services. Case Study D’s Premium Data Infrastructure (PDI) DSS followed as a successor to Case Study C’s failed LDI DSS attempt. As a means of not repeating the LDI DSS failures, Parsons (1998) suggested that a focus on the DSS as opposed to the infrastructure was warranted. There was no key deliverable for the PDI DSS, beyond a possible determination that the DSS would help identify proper premium prices for classifications of insured customers. Unfortunately, no users were ever identified nor invited into the development methodology. As a result, the knowledge-driven (Power, 2004) PDI DSS failed on the merits of a lack of a true user, despite the infrastructure being in place.

Analysis of Case Studies. Each of the four case studies presented share a commonality element of targeting each DSS with a data warehouse development effort, for one specific purpose, as identified in Table 4. Where the case studies diverge lies in the two successful case studies involved the user community early in the process. Case Study A identified the evolutionary state of keeping the DSS up to date, and keeping the users involved throughout the process, as their needs changed. The marketing services industry DSS identified their commitment to involving the users in the selection process and orientation of the DSS prior to full blown development.

The two financial service industry case studies differed from the successful case studies in that the scope of the project grew from a DSS project, to a combined data warehousing and DSS project. Inevitably, this transitioned the target, as discussed by Watson (2006) from a one DSS implementation, to multiple DSS implementation. Thus, the same project team worked on two DSS efforts, and one data warehousing project within one costly effort. Furthermore, the users of the two DSS applications, weren’t involved until IT’s definition of implementation was complete. Thus, all prior knowledge of the DSS development and implementation methodologies involved training the IT community, as opposed to involving and training the user-based community.
These findings further suggest a lack of a real problem to solve, beyond the notion of identifying possibilities for the system’s uses, as opposed to pure user-based requirements and processes. A Value Based Methodology approach can further help to prescribe a potential problem and solution through descriptive means.

Table 4

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Successful/Unsuccessful Factor</th>
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<tr>
<td>• Case Study A</td>
<td>User Involvement</td>
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<td>Evolutionary State</td>
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<tr>
<td>• Case Study B</td>
<td>User Involvement</td>
</tr>
<tr>
<td></td>
<td>DSS Orientation</td>
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<tr>
<td>• Case Study C (LDI)</td>
<td>No User Involvement</td>
</tr>
<tr>
<td></td>
<td>Scope Creep</td>
</tr>
<tr>
<td>• Case Study D (PDI)</td>
<td>Lack of a Target/Problem</td>
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<tr>
<td></td>
<td>No User Involvement</td>
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Discussion

As organizations invest in users, and users invest in their DSS, decision makers at a department level should be given control to choose the screens and flows according to their needs. The following benefits are suggested to achieved a greater control through a symbiotic prescriptive/descriptive method, a) every department would only see the data which is relevant to them; therefore data clutter would be eliminated, b) the system would be designed with effectiveness if every major department could design the UI intuitive to them, and c) segregation of the department specific functionality makes implementation of enterprise wide authentication and authorization much easier to accomplish and control. Viewing the Value Based Methodology of DSS Development and Implementation through consumer lenses suggests a customized DSS product this is holistically based on their needs with a temporal perspective.
As the software industry moves towards making Software’s Available as a Service (Saas) in the cloud, a DSS within the services industry would be less dependent on a platform and more dependent on the information distribution mechanisms made available as a service. The data metrics and analytics could be pre-collected, stored, and displayed via customizable views according to consumers needs (visual or dialectic). Anticipation of further development via cloud computing suggests a push toward customization, service-based orientation, and a more specific need for users and IT collaboration. As discussed by IBM (2009), focus of cloud computing is the user experience and the essence is to decouple the delivery of computing services from the underlying technology. Beyond the user interface, the technology behind the cloud remains invisible to the user, making cloud computing incredibly user friendly.

Tying these findings with the growth of the services industries within the past 15 years presents service based organizations with a newfound ability in analyzing their data via a DSS. While service based organizations, within the services industry, has grown to the equivalency of primary and secondary sectors, use of a DSS in analyzing their data has recently begun to grow in proportionate order. As a result, the services industry continues to explore traditional and more descriptive methodologies in developing a DSS in relation to their intended uses of the DSS.

This study has focused on the DSS Development and Implementation phases by analyzing the various models, methods, and techniques used within several organizations, presented as case studies, in the services industry. The findings show, 1) no agreed upon definition of a DSS, 2) no agreed upon methodology in developing a DSS for the services industry, and 3) a suggestion toward a more user-centric Value Based Approach to the DSS development and implementation phases as a means of further justifying success. Discussions regarding service based organization applicable utilization of a DSS identified an overwhelming critical need to involve users in the design and development processes of a DSS.
As service based organizations seek to further their ability in servicing customers, placement of value on more descriptive methods of developing a DSS has become a heightened factor in the DSS development process. In addition, the true measure of development and implementation success lies not in the lenses of the IT effort, but more so in utilization and user satisfaction throughout the development process. The need for more cognitive and task oriented input as it relates to a users mentality in decision making can serve in supporting the placement of value on the DSS.

The questions of how to develop a DSS in the service based industry have been answered through a suggested user based design science approach which encompasses a user-centric model, prescriptive methods, descriptive methods, and the need for user satisfaction throughout the development process. However, questions regarding the future direction of prescriptive methods for DSS development, through the lenses of IT professionals in the service industry have yet to fully be explored. Models for other organizations within the service industry are strongly dependent on their own individual research and recommendations of third party vendors whom they contract with, assuming the DSS is purchased.

This study finds a prescriptive measure as a key ingredient for the future of descriptive DSS development and implementation within the services industry. Recommendations for descriptive DSS model development include exploiting the existing research and practitioner lessons learned in a consortium format. Synthesis of third party and DSS developers are required for software improvement purposes, however a need for process development and improvement is warranted in tandem with the technology. Moving beyond case studies, this study further recommends a collection of process best practices in a framework similar to SEI’s Capability Maturity Model, whereby those who are in the initial stages can benefit from their predecessors activities, and those in the latter stages can begin the continuous process improvement documentation for the future of service based DSS development and implementation efforts.
This study discusses four case studies providing an understanding of how vital the user is to the success of a DSS, throughout the DSS development and implementation process. However, the amount of researchable case studies that purely follow a combined prescriptive and descriptive method is limited. This limitation further strengthens these authors’ recommendation for documentation and process improvement standards regarding service based DSS development and implementation. Furthermore, identification of a target for the DSS, as discussed by Watson (2006) leads these authors to believe the one development effort at a time approach to development and implementation will yield a higher utilization rate. In addition to target identification, a process improvement or actual problem to solve, as defined by the users, will further support the overall development, implementation, increase in utilization rate, and increase in user satisfaction level of the DSS.

Through the lenses of the users, a similar process whereby best practices and DSS user satisfaction level measurements would strengthen the service based trend towards user-centric development. These concepts present a gap in today’s existing DSS development and service based industries research. This study further recommends a consortium of users, through competitive and generic benchmarking, would support organization’s business process improvement efforts as they relate to DSS development and implementation. It is suggested that further research be conducted on the effects of change, and the impact of the speed of change, based on user’s cognition, as it correlates to an information technology’s department means of reacting. As a final recommendation of this study, the outcomes of the user-based consortium and IT consortiums would require synthesis to ensure users comprehend and understand IT initiatives, while the IT professionals consider the DSS needs for process improvement directly relating to specific problems within service based organizations.

Conclusion

This study has focused on the user characteristics to consider in the development and implementation efforts of service-based DSS’.
descriptive methods toward DSS development exist, to include traditional and life cycle approaches, a more user based design science approach is discussed as a means of helping the IT community and user community jointly assess value. Overall, user involvement, independent of the DSS development and implementation methodology is posited as the fundamental criteria in determining overall success and utilization of the DSS in service based organizations.

Identification of specific service industry DSS uses (i.e. IT, Financial, Medical, etc.) were available to the authors of this study. However, a combination of DSS development and implementation methodologies of the many sub-industries that make up the services industry was not identified by these authors. While broad in scope, these authors have identified a potential limitation within research in identifying DSS development and implementation methodologies and applicable uses aggregated within the tertiary services sector. Results of this recommended future research study may suggest a combined prescriptive and descriptive approach to Value Based DSS development and implementation methodologies that have proven successful within the services industry.

The limitations within this study stem from a lack of prescriptive methodologies for both IT professionals, and users alike in their quest to resolve specific problems along with providing user satisfaction. This study recommends documentation of process improvement programs, through consortiums, for IT scholars, professionals, and users alike. A synthesis of these improvement programs will prescriptively support service based industries in their DSS development, implementation, usage, and satisfaction level goals through increased communication and continuous process progression efforts. While there is no one DSS development or implementation standard, a need for more specific and prescriptive standards present future researchers with IT and user-centric lenses to conduct research with prescriptive recommendations as outcomes of the research.
References


