

A Frame Work for Decision Support System for the Banking Sector – An Empirical Study of State Bank of Patiala

Dr. Ambika Bhatia
Assistant Professor,
Punjabi University Regional Centre for IT and Management, Mohali
ambika_2216@yahoo.co.in

Abstract

Developing a DSS has been a challenging task and it has been found that many systems fail either during their development or immediately after their development or after surviving for some time. There could be many reasons for the failure of these systems. A review of literature has highlighted a research gap in the area of developing a DSS. This study is an attempt to find and analyze the relevant parameters for the development of a Frame Work for DSS in Indian Banking Sector in general and in State Bank of Patiala in India, in particular. The study is based primarily on the data collected from the respondents from the various branches, regional offices, zonal offices and head office of the State Bank of Patiala. The study will be useful for the persons engaged in the design and development of DSS.

Key Words: DSS; Decision Support Systems; Decision-making; Banking Industry; Quality of Information; Applications of DSS; management involvement.

1. Introduction

Decision support systems (DSSs) are such applications of Management Information Systems where it aims at helping a decision maker to analyze, manipulate and evaluate the multitude of complex factors before arriving at a decision. DSS, which is a specialized kind of information system, helps the decision makers in the organizations at handling semi-structured and unstructured decisions. It supports the decision maker in evaluating various alternatives and selecting one most optimum alternative and also supports the decision-makers in what-if analysis. Purpose of DSS is to establish an integrated framework between the problem, machine and decision maker. It allows the manager to interactively query large reservoir of data and to isolate information that was of particular interest to a specific problem.

By the late 1970s, a number of researchers and companies had developed interactive information systems that used data and models to help managers analyze semi-structured problems. These diverse systems were all called Decision Support Systems. From those early days, it was recognized that DSS could be designed to support decision-makers at any level in an organization. DSS could support operations, financial management and strategic decision-making [8].

In the early 1990s, a major technology shift occurred from mainframe-based DSS to client/server-based DSS. Some desktop OLAP tools were introduced during this time. In 1992-93, some vendors started recommending object-oriented technology for building "re-usable" decision support capabilities. In 1994, many companies started to upgrade their network infrastructures. DBMS vendors "recognized that decision support was different from OLTP and started implementing real OLAP capabilities into their databases" (Powell, 2001). Paul Gray asserts that around 1993 the data warehouse and the EIS people found one another and the two niche technologies have been converging. In 1995, data warehousing and the World Wide Web began to impact practitioners and academics interested in decision support technologies.

The history of Decision Support Systems covers a relatively brief span of years, and the concepts and technologies are still evolving. Emerging DSS is a powerful tool and has considerable promise to take care of need of the end-user and thus should be used intensively by the decision-makers in organization [9].

2. Banking Industry: An Overview

Banks have formally been in existence for over 200 years. In the post-industrialization era, banks became the hub of economic activity. This was witnessed widely in the commercial sector or what

may be termed as B2B (Business-to-Business). Banks also had a significant growth in the development of society at large by way of changes in attitude brought about by personal banking shifting assets from individuals to the public domain. Advancements in technology, particularly computerization and data communication, brought in an unprecedented dynamism to the banking business [2]. There have been changes in the outlook of society from that of protectionism (saving assets for a rainy day) to that of entrepreneurial consumerism. Investments, which were treated as expenditures earlier, are now viewed as the means to maximize wealth and attain higher levels of advancement. The trend has evolved in terms of generating funds from loans for housing and healthcare to education and, today, even for entertainment and leisure!

The banking industry is challenged to address the varied needs and expectations of diverse segments of society and business such as youth, working people and retired personnel. Businesses may range from small to medium to large, from process to discrete industry, from rural to urban, from national to global and so on. Each segment has unique demands for a customized range of products and services, combined with convenience, at low cost, "any time, anywhere" [7].

This paper allows to look into the broad framework for Decision support system in State Bank of Patialaby studying various constructs and analysing the various parameters and further studying the ranking of these parameters for the development of DSS.

2.1. Use of Technology in Banking Sector

There have been significant advances in the usage of technology in the banking sector in general. The technology used in the banks is normally in the following broad areas: Core Banking System, Internet Banking, Phone Banking, and Mobile Banking ATM's, Smart Cards, Credit Cards, Debit Cards, and Prepaid Cards, Intra Branch transactions, Intranet, Mail Messaging Systems, Intra Branch Network and Inter Bank Network, Electronic Funds Transfer (EFT), User Level Security - Access Permissions, Authorizations, Application Security - Transactional & Inter Application Security, Systems Administration Level & Perimeter Security, and Physical Security [3].

3. Review of Literature

Researchers attempting to measure IS success have observed the factors related to DSS characteristics like system planning, information quality, information use and user satisfaction with the

information De Lone & McLean, 1992; Li, [6] The technical quality of the DSS may influence DSS usage. The quality and accessibility of information is important. User-friendliness, ease of use, size and cost of DSS, range of alternatives, timeliness, accuracy and relevancy of output have important influence on the effectiveness and usage of DSS The following paragraphs give details of the further research in the area of decision support systems.

Santhanam Harit et al. [14] in their research article on 'A decision support system for container design in production systems' describe a user-friendly decision support tool to select near optimal containers for specific manufacturing scenarios relative to all the constraints associated with the use of the container. The article guides the user through a dialogue to input constraints and scenario-specific information and shows how the decision support tool iterates between an expert system and a simulation model, to produce a near optimal container with respect to internal and external dimensional requirements. It also explains the methods by which the system is tested and validated in a realistic environment and discusses future research directions.

Christian N. Madu and Chu-hua Kuei [4] in an article on 'A Group Decision Support Systems (GDSS) Framework for Adjusting System Availability Levels' presents a new approach to adjust system availability levels which is based on the integration of total quality management principles with mathematical models for system availability. It is shown here that system availability levels can be improved and operating costs reduced if teams are used to evaluate and modify the operations of a system. The technique used here encourages continuous improvement and evaluation of systems, and demonstrates how coherent and consistent team judgements may be reached. A real case study that involves six engineers from a worldwide manufacturer of business computer systems is used to illustrate the application of the approach.

Sean B. Eom [15] carried out a study on 'Decision support systems research: current state and trends'. This study investigates the changing intellectual structure of the decision support system (DSS) field by means of an empirical assessment of the DSS literature over two successive time periods, 1971-1990 and 1991-1995. A multivariate data analysis tool, cluster analysis, is applied to an author cocitation frequency matrix derived from a large database file of comprehensive DSS literature over the two consecutive periods. The study concludes that the core areas of DSS research have shifted to group decision support systems, model management, and design and implementation, while the study of foundations and individual differences has faded

away. Moreover, DSS researchers have diversified their reference disciplines in an effort to improve their research. Influence of organization science has been diminished, while cognitive science and psychology have emerged as the most influential contributing disciplines.

William J. McDonald [16] in his article on 'Influences on the adoption of global marketing decision support systems' develops a model of the influences on adopting global marketing decision support systems (MDSS) by global marketing organizations. The focus is on the expectations, beliefs, concerns, experiences, and implicit theories about global MDSS adoption of 144 senior marketing managers at 43 global firms. From a quantitative analysis of personal interviews, argues for an adoption model which includes controllable, uncontrollable and personal influences. Finds personnel, marketing mix, consumer trends, competitive pressures, economic conditions, technological change, corporate culture, and personal expectations are associated with adoption, while financial issues are associated with non-adoption. Governmental policies and personal experience are associated with both adoption and non-adoption. Delone and Mclean [6] in their paper on "The Delone and Mclean Model of Information Systems Success", present Information systems (IS) Success Model as a framework and model for measuring the complex-dependent variable in IS research. They discussed the utility of the model for measuring e-commerce system success. The study was focused on measuring e-commerce system success through a proposed model.

Claire Cassie [5] in an article on 'Marketing decision support systems' discusses the application of decision support systems (DSS) to assist in solving marketing decisions. As the marketing environment becomes more competitive the pressure to gain the "edge" over your competitors becomes more intense. Marketing decision support systems (MDSS) are valuable tools to assist in making marketing decisions to do just that! MDSS can be used to support, rather than replace, decision makers in the complex, semi or unstructured situations which are common in marketing problems. They incorporate the personal judgement and experience of the user to improve the effectiveness, rather than the efficiency of decision making. This means that managers will have more "quality" time to spend on analysis and planning for the future, rather than merely reflecting on the past. Discusses different types of DSS within an environment where there are discrepancies over definition, jargon and suppliers' claims.

A.E. Smith et al. [1] in their research on 'Implementation of intelligent decision support systems in health care' concluded that DSS are valuable tools available to the marketing decision-makers. They allow the decision-maker to make objective and consistent decisions by supporting the fast solution of complex and semi/unstructured problems. They allow the user to experiment with strategies under different scenarios using simulation or sensitivity analysis.

By improving the effectiveness of decision making, considerable cost reductions may be made and the cost of making a "wrong" decision may be completely eliminated [11]. The most beneficial characteristics of a DSS within the marketing environment are:

The synergy that is created between the decision maker and the computer. This enables the system to be used to assist in solving a semi-structured problem and improved the performance of the decision-maker.

4. Objectives of the Study

The present study has been undertaken to analyze the parameters for developing a framework for decision support system in State Bank of Patiala.

5. Scope of the Study

The study has been confined to State Bank of Patiala (SBOP). It is one of the oldest banks in the country, which was founded in 1917 by Maharaja of Patiala and named as Patiala State Bank. The bank became a subsidiary of State Bank of India in 1959. Presently it has 759 branches, 62 extension counters and more than 5500 ATMs. It has its glorious past of serving banking needs of people. A leading banking magazine "Asian Banker" has ranked SBOP as the 5th bank out of top 300 Asian banks.

This bank undertook computerization of its various offices and branches in 1980 realizing the need of information systems for controlling the various activities related with banking operations, exercising control, and policy formation etc. with a special emphasis on improvement in productivity, efficiency and profitability at all levels [17].

The nature of activities, size, spread and complexity of SBOP clearly establishes a large scope for DSS applications. Secondly, SBOP in particular has been an early adopter of Information Systems and thus the concept and applications of information system are better understood by the users of this organization. Third, the high-risk decision-making problems of the banking industry in India are more or less the same. Fourth banking being a service sector its effectiveness has a direct bearing on the economy

of the nation as a whole. Keeping these facts into consideration, SBOP has been taken as representative of the banking industry as a whole and has been chosen for undertaking the present study.

6. Research Methodology

For conducting this study Primary data has been collected from the respondents, who were selected scientifically from Head office, Zonal office, Regional office and the various branches of the State Bank of Patiala. Sample distribution of is given in Table 1. The following norms were adopted for the selection of respondents from three levels of management:

Lower Level	10% of Population
Middle Level	20% of Population
Top Level	50% of Population

Table 1. Level wise Distribution of Respondents

Management level	Population	Sample	Actual Response	Response Rate (%)
Top Level	34	17	14	82.35
Middle Level	398	80	54	67.50
Lower Level	1015	102	90	88.23
Total	1447	199	158	74.37

Primary data was collected through a well-designed questionnaire and conducting personal interviews from the selected respondents. A total of 158 respondents from the various offices and branches of the bank participated and responded to the questions enlisted in the questionnaire. Secondary data was collected from the records/reports, etc. of the respective organizations. In order to reach meaningful conclusions, collected data was analyzed by making use of appropriate statistical and mathematical tools. Figure 1 represents the level wise distribution of respondents and response rate.

7. Framework for Developing DSS:

The framework for developing DSS consists of four constructs as given below and represented in Figure 2:

1. Construct-I Environment & Organization's Need for DSS
2. Construct-II Business Processes & Functional Activities
3. Construct-III DSS Process Operation, & DSS Supported Activities
4. Construct-IV User Skills & DSS Capabilities

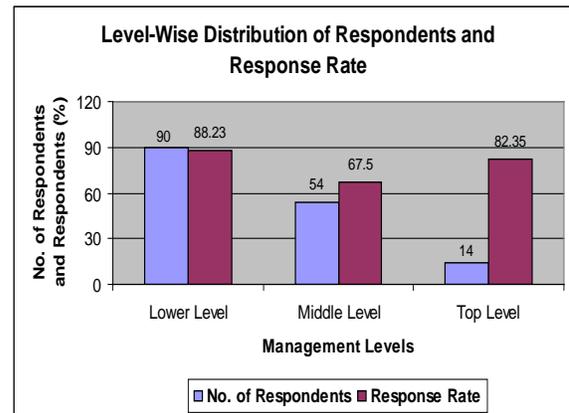


Figure 1. Level-Wise Distribution of the Respondents and Response Rate

7.1. Construct-I Environment & Organization's Need for DSS

In the cut-throat competition of the present day world, decision making plays an important role to meet the business goals, formulating the marketing strategies, cost reduction and improving the profits. In this study, the researcher has identified the main factors that determine the need of DSS for the long term benefits of an organization. This construct has been represented by a separate instrument for noting down the perceptions of the respondents. The various factors considered comprise from the industry/Market environment & organizational objectives. The industry/market environment plays a major role for an organization because it includes the customers, suppliers and competitors, while the organizational environment includes the optimum use of resources and strategic planning to meet long and short term objectives:

- Business Climate, Competition & Market Share
- Product, Value Added Services & Customer Relationship
- Management Planning, Work Efficiency & Utilization of Resources

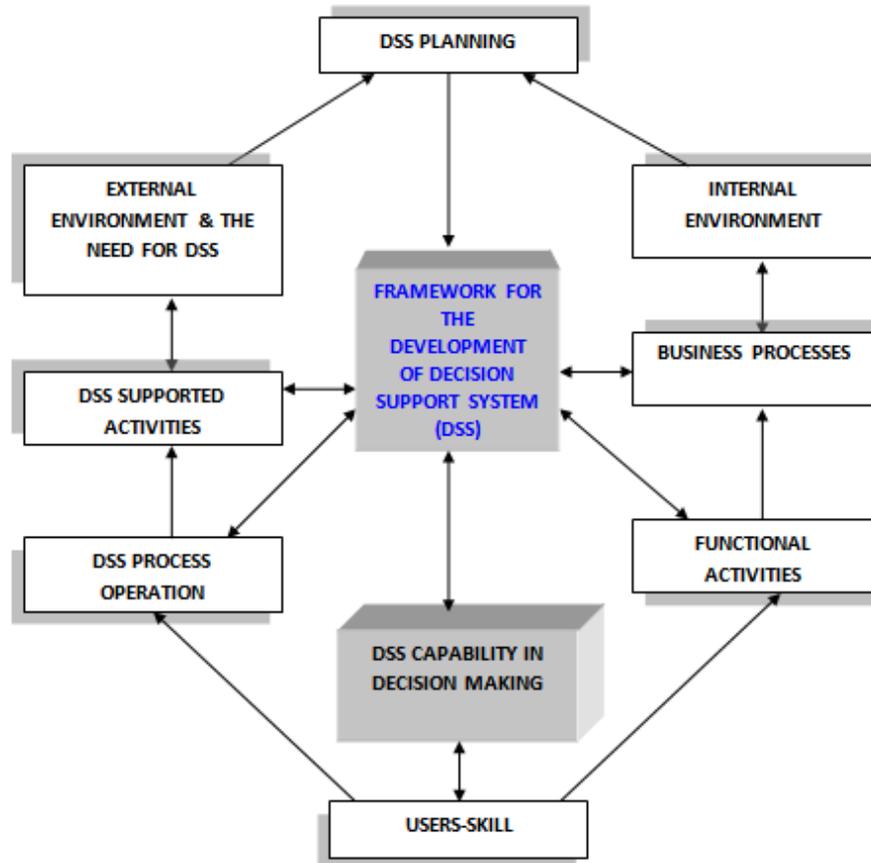


Figure 2. Pictorial View of the Framework for Developing Decision Support System

- Cost Reduction, Cash Management & Economic Performance
- Technological Advancements, Policies & Practices
- Government Regulation & Industry Standards

7.2. Construct-II Business Processes & Functional Activities

It's Scope includes

- Organization's Policies & Objectives
- Organizations Culture & Concern of Stakeholders
- Major Areas of Business, Business Processes & Functional Activities
- Requirement of Resources & Their Availability
- Information Technology Applications For Performing Business Operations

7.3. Construct-III DSS Process Operation, & DSS Supported Activities

This construct takes care of the tools, technological requirements and all the activities that

support decision making. The scope of this construct includes:

- Decision Making and the Main Areas of DSS Applications
- Identification of DSS Process Operations, Sequencing, Scheduling and Linkages Between These Operations
- DSS Architecture including Networking, Authorization and Authentication of Accesses and Hardware Requirements.
- Mathematical, Statistical & Financial Models, Databases and Application Software Requirements

7.4. Construct-IV User Skills & DSS Capabilities

Since DSS applications require a regular and frequent use of IT tools and the interface of users with the machines and databases, through the application software, is a necessary and a critical component, this construct has been separately included in the model for paying special emphasis on:

- Skill and Knowledge of Users for understanding Business as well as DSS processes
- Training and Development of the Users for enhancement of their Skills

8. Questionnaire Design

The questionnaire was designed by holding discussions with many academicians and professionals in the field with respect to comprehension, depth of study and relevance. To ensure the quality of the instrument, it was tested for its reliability, content validity and sensitivity. Similarly sensitivity of the questions was also found good as Likert scales were used to gather the responses on the perceptions of the respondents. Second, multiple questions pertaining to similar theme were incorporated to ensure the sensitivity.

Keeping in view the constructs of the framework for developing DSS the questionnaire was designed by grouping the relevant questions under following headings:

1. Organization’s Need of DSS
2. Business Environment
3. Working of Business Processes
4. Functional Activities
5. DSS Process Operations
6. User Skill
7. Quality of Information

9. Analysis of the Parameters for Decision Support System

9.1. Need for DSS

In all 17 questions were considered for analysis to determine the need of Decision Support System. Percent of the respondents giving average rating to all the factors under this group on a five point Likart Scale has been incorporated in Table 2.

Table 2. Need for DSS

Rating	Percent
Not at all Important	0.00
Not Important	0.84
Can’t Say	5.88
Important	51.26
Very Important	42.02

The above table shows that less than 1% of the 158 respondents considered the factors as either ‘Not at all important’ or ‘Not Important’, while the number of respondents that remained neutral was

only 5.88% of the sample size. The rest of the respondents (93.28%) considered all the factors either ‘Important’, or ‘Very Important’. This indicates that the respondents strongly feel the need of DSS for the organization and is being shown in Figure 3.

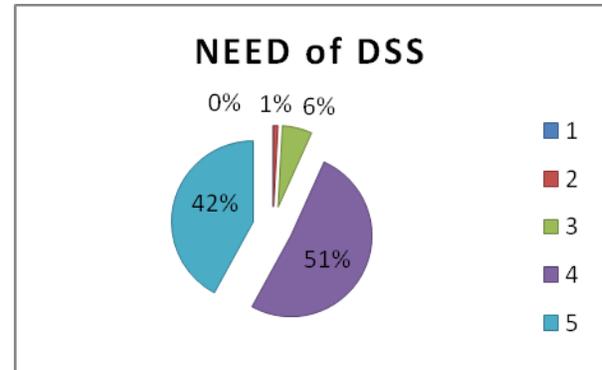


Figure 3. Rating of Need for DSS

9.2. Involvement in Functional Activities

Response regarding involvement in seven activities related with DSS was sought from the respondents. Involvement of average number of the respondents in terms of percent has been depicted in Table 3.

Table 3. Involvement in Functional Activities

Rating	Percent
No Involvement at all	10.20
Negligible Involvement	26.53
Frequent Involvement	16.33
Regular Involvement	30.61
Maximum Involvement	16.33

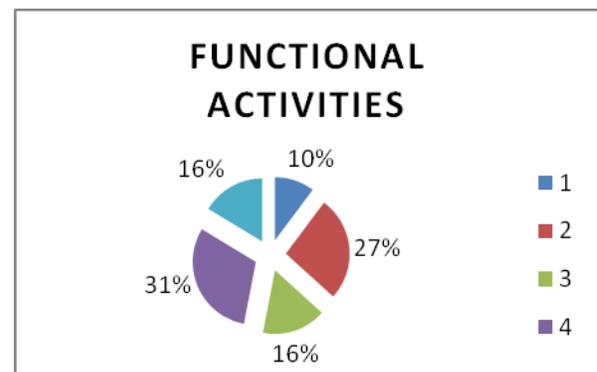


Figure 4. Rating regarding Functional Activities

As is evident from table 3, 36.73% of the respondents either had 'No Involvement' or 'Negligible Involvement' and 63.27% respondents had Frequent, Regular or Maximum involvement. This indicates that a good amount of respondents are involved in DSS related activities. Figure 4 represents the same.

9.3. DSS Process Operation

With regard to the importance of DSS Process Operations, the views of the respondents in terms of percent have been depicted in the Table 4 and Figure 5 represents it in pie diagram.

Table 4. DSS Process Operation

Rating	Percent
Not at all Important	0.00
Not Important	0.00
Can't Say	17.86
Important	39.29
Very Important	42.86

Table 4 shows that none of the respondents think that DSS operations are unimportant. Less than 18% respondents were not clear about the importance of DSS operation while more than 82% of the respondents gave considerable importance to these operations. It can thus be concluded that for developing the framework of DSS, these operations must be given due attention.

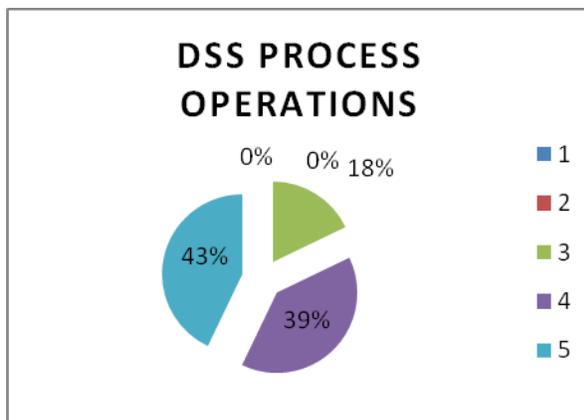


Figure 5. Rating for DSS Process Operations

9.4. Users-Skill

Perception of the respondents with regards to the degree Users-Skill matters in the development of a framework for DSS has been tabulated in Table 5.

Table 5. Users-Skill

Rating	Percent
Does not Matter at all	0.00
Does not Matter	7.14
Can't Say	7.14
Does Matter	28.57
Matters a Lot	57.14

Only 7.14% of the respondents were of the opinion that Users-Skill 'Does Not Matter' and the equal number were unable to express their view point in this matter and out of the remaining respondents 1/3rd felt that it 'Does Matter' and 2/3rd were of the opinion that it 'Matters a Lot'.

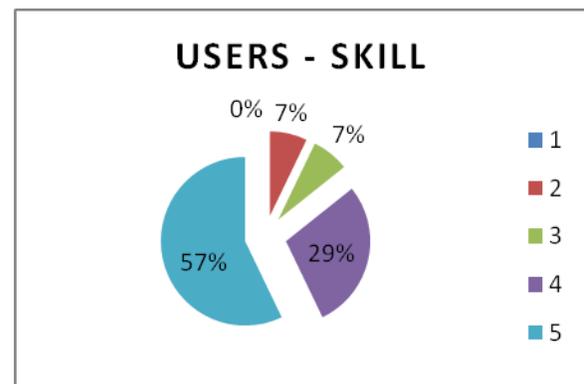


Figure 6. Rating regarding Users-Skill

Thus about 86% of the respondents held the view that Users-Skill is an important parameter for developing a framework of DSS also shown in Figure 6..

9.5. Working of Business Processes

In all 15 questions were considered to analyze the importance of working of business processes in the development of DSS. Percent of the respondents giving average rating to all the factors under this group has been depicted in Table 6.

Table 6. Working of Business Processes

Rating	Percent
Not at all Important	0.00
Not Important	7.62
Can't Say	15.24
Important	44.76
Very Important	32.38

In the eyes of less than 8% of the respondents working of business processes is not important while 15% remained neutral on the related issue. About 77% of the respondents opined that working of business processes was important for developing an effective DSS.

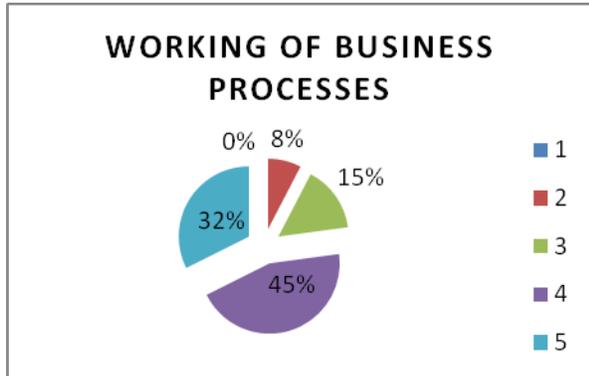


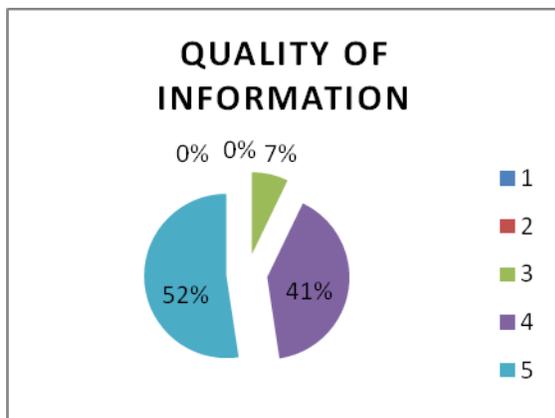
Figure 7. Rating regarding Working of Business Processes

9.6. Quality of Information

Perception of the respondents regarding the quality of information was recorded with respect to six parameters under this heading and the average rating of the respondents in terms of their percent has been displayed in the Table 7.

Table 7. Quality of Information

Rating	Percent
Does not Matter at all	0.00
Does not Matter	0.00
Can't Say	7.14
Does Matter	40.48
Matters a Lot	52.38



As is evident from table 7, none of the respondents expressed the opinion that quality of information does not matter. Although about 7% of the respondents had no opinion on this issue but 93% of the respondents opined that quality of information matters in developing of the Decision Support System.

9.7. Business Environment

In all nine factors were considered to analyze the impact of internal and external environment on the business of the organization. Percent of the respondents expressing their view is depicted in the Table 8.

Figure 8. Rating regarding Quality of Information

Table 8. Business Environment

Rating	Percent
Does not affect	0.00
Can't Say	1.59
Negligible	3.17
Moderate	52.38
Significant	42.86

One can easily conclude from the above table that the business of the organisation is highly influenced by the internal as well as external environment.

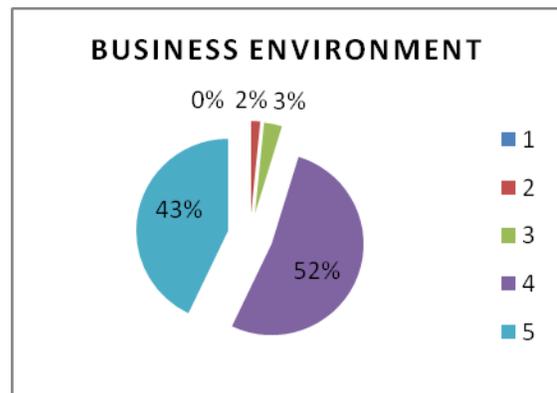


Figure 9. Rating regarding Impact of Business Environment

As represented by Figure 9 none of the respondents expressed the opinion that it does not affect. Less than 5% of the respondents were either undecided on the issue or felt that the effect is negligible while 95% of the respondents opined that the impact of environment is either moderate or significant.

10. Level Wise Analysis of the Parameters

Average Score and the Standard Deviation was computed for the battery of questions under each parameter for Top, Middle and Lower levels of Management as well as that for all the respondents taken together. The results of the computations have been tabulated in Table 10. Overall score of all the factors is found to be varying from 2.136 for 'Functional Activities' to 4.256 for 'Need of DSS'. Minimum and maximum rating of the various factors given by the respondents from the various levels of management have been indicated by bold figures in the Table 10 below.

It is observed from this table that different levels of management have given highest rating to different parameters. Middle Level of management gave the highest score of 4.476 to the parameter 'Need of DSS' which has also earned the highest over all score of 4.256. 'Users-Skill' earned a highest score of 4.217 from the Lower Level of management while the Top Level of management awarded the highest score of 4.452 to 'Quality of Information'. It is

further observed that the respondents at all levels of management have given minimum rating to the parameter 'Functional Activities' with a rating of 4.267, 4.593, and 4.857 by Lower, Middle and Top Level of management respectively.

Overall maximum consistency in responding was observed for the parameter 'Need of DSS', where the overall standard deviation was found to be 0.643. Maximum consistency at Middle Level with standard deviation of 0.565 was also observed for this parameter. Maximum consistency at Lower Level was observed for the parameter 'DSS Process Operation' with standard deviation of 0.585 while Top Level with standard deviation of 0.627 has shown maximum consistency for 'Business Environment'. It can further be observed that maximum inconsistency in responding is observed for overall and at all levels of management for the parameter 'Functional Activities' where the minimum average score has been observed.

Table 10. Parameters for Developing Framework for Decision Support System (DSS)

S. No.	PARAMETERS	TOP LEVEL		MIDDLE LEVEL		LOWER LEVEL		OVER ALL	
		Avg. Score	Std. Dev.						
1	Need for DSS	4.345	0.629	4.476	0.565	4.110	0.734	4.256	0.643
2	Functional Activities	3.163	1.274	2.476	1.260	1.771	1.050	2.136	1.194
3	DSS Process Operation	4.250	0.745	4.120	0.685	3.775	0.585	3.935	0.672
4	Users-Skills	4.357	0.903	4.120	0.780	4.217	0.636	4.196	0.773
5	Working of Business Processes	4.019	0.886	4.086	0.723	4.044	2.005	4.056	1.204
6	Quality of Information	4.452	0.629	4.167	0.661	3.978	0.643	4.084	0.644
7	Business Environment	4.365	0.627	4.099	0.708	3.926	0.804	4.024	0.713
8	Success and Hindrance Factors	3.459	1.337	3.627	1.207	3.721	1.104	3.666	1.216

10.1. Ranking of the Various Parameters

Based on the average score, overall and level wise ranking of the parameters has been depicted in the Table 11

Decision Support System plays a supportive and a strategic role in any organization. An attempt has

been made in the present study to find out the parameters that play an important role in the development of the Decision Support System in the banking sector.

Table 11. Ranking of the Parameters

Sr. No.	Parameters	Ranking			
		Top Level	Middle Level	Lower Level	Over All
1	Need for DSS	4	1	2	1
2	Functional Activities	7	7	7	7
3	DSS Process Operation	5	4	6	6
4	Users-Skills	3	3	1	2
5	Working of Business Processes	6	6	3	4
6	Quality of Information	1	2	4	3
7	Business Environment	2	5	5	5

11. Conclusion & Findings

The various parameters considered and analyzed for the development of Decision Support System in the present study reveal that:

1. Need of DSS is utmost important for better management planning at various levels of SBOP management, increasing work efficiency and optimum utilization of resources. It also helps effectively in the management of customer relationship and value added services. Analysis further concludes that management is quite aware of the latest technological advancements and its benefits for the organization.
2. User-Skill and DSS capabilities should be paid maximum attention for developing effective and efficient DSS. The DSS system should be more user-friendly and interactive so that at all levels of management the users do not encounter any problem in extracting the data and processing it for generation of the required information. Proper and regular training should be provided by SBOP to the users at middle level so as to better utilize the DSS. Also adequate staff should be recruited and provided at all the levels.
3. For helping the decision makers to take the right decisions and In order to achieve a high degree of success of the Decision Support System, the developers of the system should pay maximum attention that the system is able to generate Reliable and Timely Information that is

Performance Oriented and Enhance the Efficiency of Banking Operations to cope up with Competition in the Market. For this purpose the modules of the DSS should be modified.

DSS should have an in-built mechanism for analyzing the impact of internal and external environment on the working of business processes and suggest ways and means for strategic decision making and effective measures for their implementation.

References

- [1] A.E. Smith, C.D. Nugent and S.I. McClean (2002), 'Implementation of intelligent decision support systems in health care', Journal of Management in Medicine, Volume 16, Number 2/3, pp 206-218.
- [2] A.M. Rawani and M.P. Gupta, "Role of Information Systems in Banks: An Empirical Study in the Indian Context", Vikalpa, Vol. 27, No.4, October-December, 2002.
- [3] A.P. Sebastian Titus and Albin D. Robert Lawrence, "Customer Focus in Banking Services", Indian Journal of Marketing, January, 2004
- [4] Christian N. Madu and Chu-hua Kuei (1994), 'A Group Decision Support Systems (GDSS) Framework for Adjusting System Availability Levels', International Journal of Quality & Reliability Management, Volume 11, Number 9, pp: 90-100.
- [5] Claire Cassie (1997), 'Marketing decision support systems' Industrial Management & Data Systems, Volume 97, Number 8, pp 293-296.
- [6] Delone and McLean "The Delone and Mclean Model of Information Systems Success", Journal of Management Information Systems Volume 19 , Issue 4 Pages 9-30, 2003.
- [7] Dr. Vasant Godse, "Technology: An Impact Analysis", Journal of Indian Institute of Banking & Finance, Jan-March 2005
- [8] D.P. Goyal, "Information systems planning practices in Indian public enterprises", Information Management & Computer Security, Volume 15 Issue 3, pp 201 – 213, 2007
- [9] Goyal, D.P (1994) : "Management Information System: Concepts and Applications", Deep & Deep Publications.
- [10] Li, Fldon Y' Perceived Importance of Information Systems Success Factors: A meta Analysis of Group Differences, Information & Management, 1997.
- [11] Malik, K. and Goyal, D.P. (2001), "Information systems effectiveness – an integrated approach", IEEE Engineering and Management Conference (IEMC'01) Proceedings on Change Management and the New Industrial Revolution, Albany, New York, USA, pp. 189-94.
- [12] Malik, Kamna and Goyal, DP,(2003) "Organizational Environment and Information Systems", Vikalpa – The Journal for Decision Makers, Vol.20, No.1.
- [13] Palanisamy, R. and Sushil (2001), "User involvement in information systems planning leads to strategic

- success: an empirical study”, Journal of Services Research, Vol. 1 No. 2.
- [14] Santhanam Harit, G. Don Taylor, and C. Ray Asfahl (1997), ‘A decision support system for container design in production systems’, Integrated Manufacturing Systems, Volume 8, Number 4, pp 195-207.
- [15] Sean B. Eom (1999), Decision support systems research: current state and trends’, Industrial Management & Data Systems, Volume 99, Number 5, pp: 213-221.
- [16] William J. McDonald (1996), ‘Influences on the adoption of global marketing decision support systems’, International Marketing Review, Volume 13, Number 1, pp: 33-45.
- [17] Website “State Bank of Patiala, ‘www.sbop.com’”