Role of Decision Support Systems in Marketing Management

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Abstract
This paper is an extended paper showing the role of Decision Support Systems (DSS) in other fields of Marketing Management (M.Mgnt). DSS facilitates in decision making many M.Mgnt concepts and Customer Relationship Management (CRM) is one of them and it depends on the firm's tasks for developing and retaining customers while achieving their satisfaction and enhancing the sense of belongingness for their products and services. Profit maximization, the process of customer value, and building strategic values for the firm are the three empirical benefits of CRM that are achieved through analytical, operational, and direction (AOD) capabilities respectively. This research focuses on the application of DSS models of what-if analysis (WIA) for CRM at (AOD) and also shows the dependence on the Information Success model (ISM). Hypothetical data are analyzed for (AOD) by three types of (WIA) to attain CRM and profit maximization and this analytical method can be used by any customer-oriented firm as a general model.

Keywords:
CRM, DSS, Analytical, Operational, Directional, What if Analysis

1. Introduction

Customer relationship management (CRM) [1] is the branch of management that gives the scope of operational demonstration of relationship marketing and explains the characteristics of a customer, criterion and features for developing relationship between customers and firms, achieving customer loyalty and way of customers' retention, firms, therefore, apply CRM to explore prospects for their products and services, understand customer's requirements and their expectation for quality [1] [2]. CRM is particularly regarded as the firm's efforts to develop and retain customers through increased satisfaction and loyalty. DSS-based CRM systems have been applied in many business areas, and R&D is continuing to contribute to its expansion [3].

IS application is a collection of interrelated elements that work collaboratively to convert data into information that is used to support various organizations activities including control, planning, forecasting, decision making, coordination, and operational activities [4][5] and DSS is one of its important application that helps in the above tasks and besides, DSS can help organization's employees and managers in visualizing complex subjects, create new products, and problems analysis.Nowadays IS applications in the business area can be categorized into different types such as support of business operations or support of managerial decision making [6]. Any ideal organization applies six major applications of IS such as Transaction Processing System (TPS), Office Automation System (OAS), Knowledge Work System (KWS), Management Information System (MIS), Executive Support System (ESS), Decision Support System (DSS) [7] [8] [9]. Figure 1 shows the types and basic information about the IS applications.

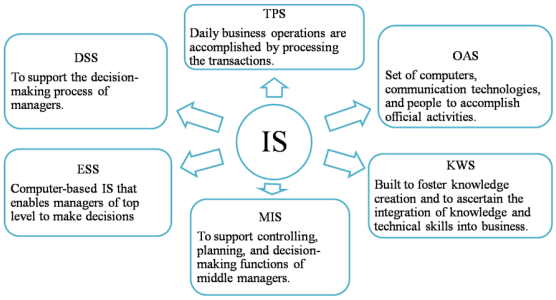
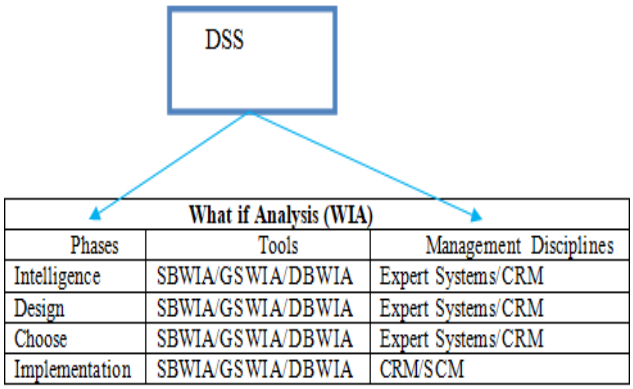


Fig.1 Types of IS Applications [9]



What if Analysis (WIA)		
Phases	Tools	Management Disciplines
Intelligence	SBWIA/GSWIA/DBWIA	Expert Systems/CRM
Design	SBWIA/GSWIA/DBWIA	Expert Systems/CRM
Choose	SBWIA/GSWIA/DBWIA	Expert Systems/CRM
Implementation	SBWIA/GSWIA/DBWIA	CRM/SCM

Fig 2. DSS(WIA) supporting the decisions [12]

This research is based on the application of (WIA) which is the DSS model-based analysis for three levels of (AOD) of CRM. DSS (WIA) is a computer-based application aiding in the decision making process for management related areas such as SCM, ERP, CRM, etc. (WIA) aids CRM in managing customers' inquiries and also in attracting, retaining, developing, and identifying customers and figure 2 gives a framework of DSS (WIA)

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for how decisions are supported for different management decisions [9][10].

This research paper is segmented into six parts; the first part gives an introduction and the second part covers the historical aspects of concepts used in this paper and previous studies showing the contribution of DSS (WIA) in management in general and specifically in CRM. The third part gives the details on conceptual hypothesis and Research methodology, the fourth part covers the major explanation of the research procedure and implications in Discussion. In the fifth and sixth part results and findings are illustrated followed by a conclusion. This research paper shows the application of DSS (WIA) in customer-oriented firms at three levels (AOD) for achieving profit and building relationships and eventually impacting CRM by the use of hypothetical data.

2. Literature Review

Before the 1960s, the IS role was simple, basically, were used to achieve the goals of electronic data processing (EDP), such as accounting and transaction processing. EDP is defined as the use of a computer to perform various processes on data including summarizing, classifying, manipulating, and recording. EDP is also called transaction processing systems (TPS) [10] [14].

In the 1960s, other functions were added to IS which were for processing of data into useful informative reports, and MIS was therefore introduced. MIS gave new roles to the managers, they started to use IS for making decisions and developing business applications with the IS contribution [10] [14].

By the 1970s, the IS reports produced by MIS were not enough to satisfy the management decision-making needs that were when (DSS) emerged and it provided computer-based interaction and specialized support for managers and end-users to facilitate decision-making processes [11] [15]. End users now could support their job requirements by using their own computing resources; they did not need to wait for a centralized corporate information services department to provide indirect support. In later years EIS [13] and AI were techniques introduced with different advantages and scope. ES and KMS gave a new role to IS in the late 90s and 1990 ERP emerged for corporate resource planning and allocation [13][15]. In the same era, internet growth started that gave a new significance to all the IS applications and DSS applications became very popular in the decision making process in management systems particularly for CRM [10] [14] [16].

Past researches have shown how firm's use CRM for motivating their employees to essentially develop customer-focused thinking [16] and here IS has played an important role as a technology solution. In the past, researchers have focused on methods of IS affecting customer-oriented firms for CRM profitability and also formulated models such as the CRM profitability model from relationship marketing and system efficiency perspective [15] [16] [17].

Previous studies have shown the importance of using software applications and technology for different types of management disciplines such as SCM, ERP, or CRM, but the expected results for CRM are not achieved because of its qualitative nature. However, CRM continued to apply IS applications for various purposes and identified different impact factors of IS applications for different levels of CRM but DSS is one application found to be most effective working for the achievement of CRM objectives [15] [16] [17]. Previous studies have shown the relationship of DSS for CRM but this research paper gives an analysis of the application of DSS (WIA) for showing the results for CRM at all three levels and suggests the same model for any customer-oriented firms for their applications [18].

Research also presents the dependence of ISM with CRM for building brand image, increasing sales, strategic planning but this research paper also covers the aspects of ISM for CRM and how both can be considered for providing the research findings.

3. Theoretical Perspectives Research Methodology

CRM provides its services to firms at three levels; Analytical, Operational, and Directional levels (AOD), and each level benefits the firm in some way that eventually contributes to achieving CRM. (WIA) facilitates in building these levels and offers decision-making solutions to structured, semi-structured, and unstructured decisions for these levels. Figure 3 depicts the research framework used for this paper.

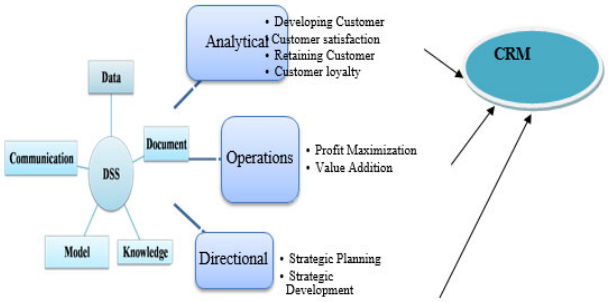

Fig3. Research Framework: Role of WIA in CRM

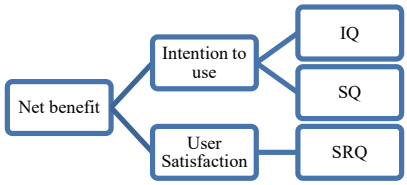

Fig4. ISM by Delone and McLean[19]

Three hypothetical examples are taken for showing the results, DSS decision-making models are applied to these three examples for all three CRM's levels and results are analyzed from (WIA) applications. The results are measured for three levels (AOD) by (WIA) and show its impact on CRM. To understand how the information from these three examples can be helpful for CRM, Delone, and McLean's perspective of ISM can be referred [19]. The ISM has been treated as a major issue of management research for any type of service for measuring satisfaction. DeLone and McLean have taken six major categories of measures of IS application like DSS success which are seen to form an integrated whole [19]. These measures are System Quality (SQ), Information Quality (IQ), Service Quality (SRQ), resulting to use and user satisfaction and finally to individual impact, and organizational impact and all these measures are a subpart of three levels (AOD) of CRM [19]. IQ, SQ, and SRQ measure A, SQ, and SRQ measure O, and SRQ measure D. Figure 5 depict how ISM is used in our study for preparing the criteria for measuring AOD. These criteria are used as inputs for decision-making processes by (WIA) based such as Scenario-based, Goal seeking, and Data-based for CRM. These criteria and information are extracted from the hypothetical data for three examples submitted for different services for three months (from March to May 2020) and show how the target of CRM can be achieved in the next month June 2020 for all three AOD levels using a classification of Information Success model.

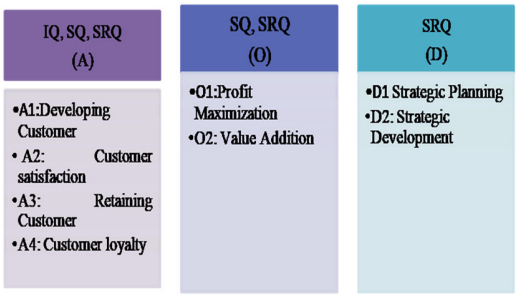

Fig 5. Criteria for ISM for (AOD)

Fig 6.: CRM scope [16]

4. Discussion

Most of the service-oriented firms focus on achieving CRM by having customer interaction and creating an opportunity for increasing satisfaction level, improving retention, increasing revenue or profit, attain brand loyalty, strengthen brand value, etc. CRM helps service firms in particular and all other businesses, in general, to optimize customer relationships by integrating at the AOD level.

4.1 The CRM Advantages for customer-oriented firms: CRM reduces the time and cost to deploy integrated advantages with a comprehensive set of solutions based on the principles of services and types of levels. These benefits help inefficient business operations, receiving updated and accurate information, vision for successful business applications [23]. Figure 6 gives the scope of CRM for customer-oriented firms that cover five major areas as given below.

(WIA) provides computer-aided decision-making solutions to CRM for (AOD) and helps in getting the following key benefits. Below given table 1 gives the key benefits that can be received by the CRM with an application of (WIA).

Table 1: DSS (WIA) Solutions to CRM Key Benefits

DSS (WIA) offering solutions to CRM	Key Benefits Achieved
	Identifying Customers' preferences.
	Integrate all Management services
	Increase Productivity and Revenue by providing customer vision
	Achieving Customer satisfaction and Retention
	Strengthen Brand image and increasing Brand loyalty

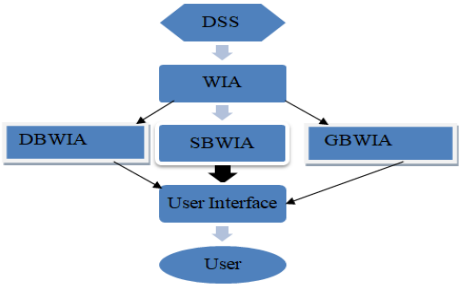

Fig7. WIA Framework for User Interface [24]

DSS (WIA) offers the advantages to CRM and that results in many benefits to the firm in general such as achieving competitive advantages, identifying business opportunities, receiving quick customers' responses, increasing sales, knowing demand value and customers' expectations. Figure 7 shows the framework of DSS (WIA) that can be applied for user interfaces for receiving users' reviews and expectations by its three types.

4.2 Types of Decision-Support Systems: There are major two types of DSS, data-based, and model-based. (WIA) are a model-based DSS and below given figure 8 shows the basic types of DSS [20] [21] [22].

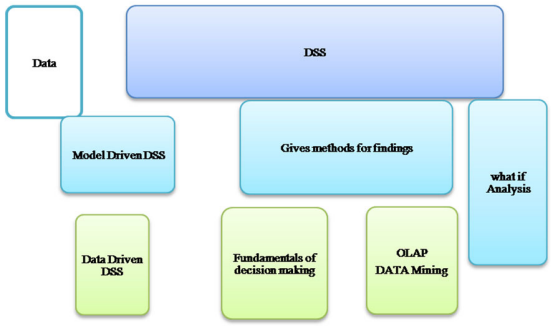

Fig 8.Types of DSS [25] [26]

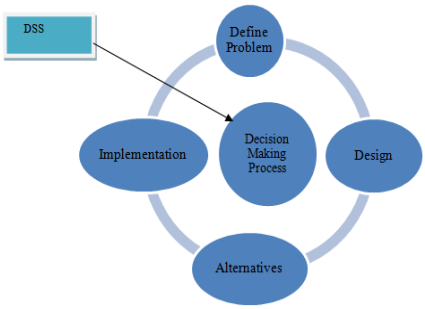

Fig 9.DSS Decision Making Process within [26]

5. Research Procedure

General scenario: Three sets of criteria are developed for each level as mentioned in figure 5, referring to these criteria hypothetical data for three examples are created and categorized in the DSS framework to find out how DSS (WIA) can facilitate the decision-making process from structure to unstructured for each CRM. It is important to notice that (WIA) makes only recommendations not the results in absolute terms; it facilitates the decision-making process but does not force to implementation of a particular scenario. As mentioned above there are three types of (WIA); Scenario based (SBWIA), Goal Seeking (GSWIA), and Data-Based (DBWIA), for the three levels of CRM aligned with Information success models, all three types of (WIA) can be implemented for showing its impact on CRM. Below given tables below show the three Examples for three levels (AOD) aligned for the information success model, criteria used by three different types of (WIA). Example-1 shows the analytical scenario for the month's March, April, and May for A1, A2, A3, A4, and the firm strives for higher growth for each criterion for the month of June. The firm can use SBWIA and while elaborating the target for each criterion and set a scenario to achieve that.

Table 2: Analytical by SBWIA

IQ, SQ, SRQ (A)[Analyzed by SBWIA]				
Criteria	Example-1			
	March	April	May	June[Target]
A1:Developing Customer	4000	5000	5500	8000
A2:Customer satisfaction	4000	5000	6000	8000
A3:Retaining Customer	4000	5000	5500	8000
A4: Customer loyalty	4000	5000	5500	8000

Table 3 depicts the profit for the example-2 for three months and by using DBWIA, the firm can predict O1 and O2 for the month of June and coming months. These figures are shown in sales and DBWIA helps in manipulating data for achieving the target sales. Example-2 also shows the variation as an increase and decrease in profit and value addition that usually occur in real situations so how DBWIA facilitated in predicting the Operational level CRM for all the criteria O1 and O2. It is important to mention that DBWIA at the operational level only provides values for prediction but possible decision-making analysis has to be conducted through SBWIA or GSWIA.

Table 3: Operation by DBWIA

SQ, SRQ (O)[Analyzed by DBWIA]				
Criteria	Example-2			
	March	April	May	June[Target]
O1:Profit Maximization	5000	6000	5500	8000
O2: Value Addition	5000	4500	6000	8000

Table 4: Directional by GBWIA

SRQ (D) [Analyzed by GSWIA]				
Criteria	Example-3			
	2010-13	2013-16	2016-19	2020-23
D1: Strategic Planning	4000	5000	5500	8000
D2: Strategic Development	4000	5000	6000	8000

Table 4 shows the directional level in CRM explains the strategic achievement for the products, services, and policies of the form in general. Usually, Directional level CRM focuses on short to long-term achievements, below given table shows two criteria such as D1 and D2 at Directional level CRM and measured by GSWIA. Goals are set for 2020-23 and analyzed from 2010-13 for criteria D1 and D2. Usually, data set for this level can be extracted from sales inferred through brand effectiveness or brand image. Data collected from these examples are analyzed by (WIA) for decision making for achieving CRM for all these three levels and recommendations are made in the results section. (WIA) suggests which area is weak and the firm's need to concentrate on changing their strategies for meeting their goals. In above given three examples (WIA) stresses the prompt changes with minimum efforts and also provides assumptions for future improvements and meeting the target for the month of June for all three levels for CRM. (WIA) is applied at three levels and presents how targets can be met by supporting strongly the tools of decision-making processes. From the above given three examples in tables 2, 3, and 4 customer-oriented firms can refer (WIA) for AOD and can achieve the following benefits specified as criteria for AOD in CRM and ISM. Below given table 5 gives a comprehensive view and derived benefits from interrelationships between CRM, ISM, AOD, and (WIA) but details on findings from above mentioned hypothetical data in three examples are discussed in the results' part and table 6 explains all benefits in detail aligned criteria of AOD in the result section.

Table 5: Derived Benefits from (WIA) models for AOD

CRM level and ISM	DSS Model based What if Analysis	Benefits Achieved
IQ, SQ, SRQ (A)	[Analyzed by SBWIA]	
A1:Developing Customer		Customer Orientation (CO)
A2:Customer satisfaction		Information Quality Perception (IQP)
A3:Retaining Customer		Value addition in Services (VAS)
A4: Customer loyalty		Supporting customers and Grievance handing. (SCGH)
SQ, SRQ (O)	[Analyzed by DBWIA]	
O1:Profit Maximization		Achieving profit through sales (PS)
O2: Value Addition		Value addition in Services (VAS)
SRQ (D)	[Analyzed by GSWIA]	
D1: Strategic Planning		Enhancing brand value and increase systems efficiency (SE)
D2: Strategic Development		Performance based policies for long run and offer systems support (SSP)

5. Results

The study covers the application of (WIA) for CRM for three levels of AOD using ISM. This study is based on a hypothetical data set that tried to explain how the DSS model-based can help in CRM for AOD.

Table 6: Details on Benefits from (WIA) for AOD

4.3 CRM (CO)	CO refers to the commitment of the firm to identify and satisfy customer concerns and develop more customers through providing quality services. SBWIA gives the situation like quality for longer period of time and meet demand for new services about the quality and measures if more customers are developed for the particular services or not. SBWIA also explains how the given target can be met through elaborating the contingent approach. Results section shows how A1 grows by using DSS model based SBWIA.
4.4 CRM (IQP	SBWIA facilitates at A level of CRM to measure if customers are satisfied or not for that SBWIA creates a scenario for customers related to quality, reliability of information and after sales services as well then make a target for achieving it after implementation of this scenario. SBWIA takes the data from the previous month to show the variations to meet the target.
4.5 CRM (VAS)	Customer retention is the results of customer satisfaction which can be achieved through values added services, technology has played a great role in adding values and increasing retention rate, SBWIA creates a scenario for the past data for customer retention rate and based on that gives the variation from the expected retention target. Results provide clear understanding through scenario analysis for hypothetical data for example -1. CRM (VAS) is also a benefit for level O2 which measures the values addition in quantitative terms and it is measured by DBWIA. The results will show its impact in Exmaple-2.
4.6 CRM (SCGH)	To achieve customer loyalty, there are many factors to be considered by CRM; therefore scenario for A4 needs to refer many dimensions such as providing services of good quality on time, listening to the customer complaints, their reactions and eventually attaining customers' loyalty. There are some philosophies that give a direct relation between customer reactions to customer loyalty in relation to CRM performance for identifying the scenario for A4, SBWIA considers many few situations such as reaction to overall results of the customer's awareness, appraisal, and psychological feedback to the utilization experience with the product or service. As customer loyalty is commonly acknowledged as one of the most useful measurements of level A of CRM as it measures profitability, satisfaction and retention. Results for Example-1 shows for A4 achieve its target while comparing from past data to expected data for the scenario created.
4.7 CRM (PS:	At the operational level of CRM and from an ISM perspective, business process improvement that assures efficiency and excellence of enterprise operations is an important to be measured, therefore DBWIA is used to analyze previous months' sales and revenue and based on past trends predict the future sales and revenue for the firms. In this analysis CRM needs DSS model based approach for marketing, sales and earning maximum profits for the firm.
4.8CRM (SE)	ISM and CRM work together at D level to build strategic planning for the firm where the major focus is brand loyalty, building brand image and strengthening the brand therefore GSWIA is the best DSS model to be implemented which sets the target and then make a plan for achieving it. GBWIA helps in decision making process and make possible recommendations for variations. Example-3 shows how data at D1 levels are aided by GSWIA for the successful of strategic planning. This process included many predetermined goals, parameters such as cost, time, function and efficiency in which they should be achieved. The assumption on which GSWIA works for D1 is that the relationships between CRM efficiency and customer reaction are managed by all CRM activities like customer reaction, perception, loyalty, retention and all contribute in strategic planning.
4.9 CRM (SSP)	D2 level of CRM is measured by GSWIA by measuring the performance of the firms based on what strategies were developed to attain that level. Also GSWIA studies the previous data for D2 and identifies that successful strategies bring more profits to the firm and contribute in customer satisfaction. Firms use GSWIA to measure of the D2 CRM for systems' performance and assume if the system has been implemented and adopted successfully all criteria such as resource utilization; reliability, response time, and ease of terminal use; data accuracy, reliability, completeness, system flexibility, and ease of use; consistency of the user interface, quality of documentation, and sometimes, quality and maintainability be able to reap its benefits.

The results show the high degree of relevance and dependence on (WIA) for three examples. Example in Table 7 shows the role of SBWIA in successfully predicting the values for the month of June at an analytical level for four criteria which are developing customers, achieving satisfaction, retention, and loyalty.

Table 7: Details on Benefits from (WIA) for AOD

Scenario Summary					
	Current Values:	Developing customer	Customer satisfaction	Retaining customer	Customer loyalty
Changing Cells:					
B4	4000	4000	4000	4000	4000
C4	5000	5000	5000	5000	5000
D4	5500	5500	5500	5500	5500
E4		8000			
B5	4000	4000	4000	4000	4000
C5	5000	5000	5000	5000	5000
D5	6000	6000	6000	6000	6000
E5			8000		
B6	4000	4000	4000	4000	4000
C6	5000	5000	5000	5000	5000
D6	5500	5500	5500	5500	5500
E6	8000	8000	8000	8000	8000

Highlighted cells show the successful application of SBWIA for A1, A2, A3, and A4. Example-2 focuses on operational benefits of CRM that are expressed in sale and revenue therefore DBWIA is here and Table 8 shows the variation in target and how DBWIA can help firms to know the areas where they need to work to achieve the target value that will result in achieving level O of CRM. The results show the variation for each month against the target value required to be achieved in the month of June, therefore after applying DBWIA firms can get the

variation at each level and needed values too for meeting the target as shown in table 8.

Table 8: DBWIA for Level O

SQ, SRQ (O)[Analyzed by DBWIA]									
Criteria	Example-2				Variation to the target			Applied DBWIA	
	March	April	May	June[Target]	March	April	May	June O1	June O2
O1:Profit Maximization	5000	6000	5500	8000	3000	2000	2500	8000	
O2: Value Addition	5000	4500	6000	8000	3000	3500	2000		8000

Table 9: GSWIA for Level D

SRQ (D) [Analyzed by GSWIA]						
Criteria	Example-3					
	2010-13	2013-16	2016-19	Average variation	Missing target to achieve	2020-2023
D1: Strategic Planning	4000	5000	5500	4833.333	-335544	8000
D2: Strategic Development	4000	5000	6000	5000	-335544	8000

6. Conclusion

CRM is one of the most important areas in management and DSS (WIA) is one of the relevant methods for the decision-making process. This research presents a general scenario for any customer-oriented firm for using (WIA) impacting CRM where this model facilitates in developing customer satisfaction, retention, loyalty and also to contribute in sales and revenue along with the measuring the effectiveness of strategic planning for future growth.

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