

UTILIZATION OF INFORMATION SYSTEMS TO ENHANCE CUSTOMER RELATIONSHIP MANAGEMENT

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ABSTRACT

Attaining and managing the Customer Relationship Management (CRM) is always a major objective of all types of firms especially the firms which are service oriented and customer centric. The issues of CRM are mostly unstructured problems because the results are derived from quantitative to qualitative analysis. Decision Support Systems (DSS) is an application of Information Systems (IS) has played a great role in the processing and solving the unstructured problems. The research works on three levels of CRM which are Directional, Operational and Analytical (DOA) and DSS is applied to predict and solve issues for each level. The technique applied in this research is what if Analysis (WAS) of DSS to achieve and solve all issues within DOA of CRM. The research considers different scenario to find the effectiveness of WAS for DOA and shows the results for model based statistics. This is a general diagnostic technique based on Information Success Model (ISM) and the technique of DSS (WAS) for DOA in CRM for customer-centric firms to predict the decisions and attain success.

Keywords: Customer Relationship Management, Decision Support System, Model Based Statistics, Analytical, Operational, Directional, What if Analysis.

INTRODUCTION

For the success of any firm, customer relationship is a vital tool and many projects as well as businesses fail because they either do not focus on CRM do not attain successful management for customers, therefore customer centricity is important for all types of firms for longer profit and growth (Monod et al., 2023). Application of IS has sorted most of the business related problems and also for CRM, IS has played a major role. It is observed that most of the issues in CRM are unstructured problems (UNSTCP) for which DSS applications are best to be applied (Krishna et al., 2022).

CRM has the ability to manage, solve ranks and give relevance to the business issues specifically for sales results (Alqahtani and Naim, 2022). CRM, or Customer Relationship Management, aids businesses in preserving and nurturing enduring relationships with their customers over the long term (Naim and Kautish, 2022). CRM focuses on building long term relationship, achieving customer loyalty and profit maximization. Generally, it is stated that application of CRM can help the firms to achieve objectives at DOA levels (Krishna et al., 2022).

Customer Relationship Management (CRM) presents the scope and characteristics of customer relationships, the criteria and characteristics for developing relationships between customers and companies, customer loyalty and the achievement of customer journeys (Monod et al., 2023). CRM is specifically perceived as a company's endeavor to cultivate and retain customers by enhancing satisfaction and fostering loyalty (Naim and Malik, 2022).

DSS-based CRM systems have been deployed across various business sectors, and ongoing research and development efforts continue to contribute to its widespread adoption (Rahman et al., 2023).

Information Success model helps the CRM to identify at what domain satisfaction should be attained for the achievement of CRM (Kamal et al., 2022).

An information system (IS) is conceived as an assembly of coherent fundamentals collaborating to transform data into information (Khashab et al., 2020). This information, in turn, serves to support a range of organizational activities, encompassing control, planning, forecasting, decision-making, coordination, and operational functions (Rahman et al., 2023). DSS is one of the important applications of IS that supports in the many operations given above and also helps any firms' workforce and stakeholders in envisaging complex subjects, create new products, and solve unstructured problems (UNSTCP) (Kamal et al., 2022). In the current scenario IS applications aid in all types of Business Process Management through its various applications (Khashab et al., 2020). Mostly firms are applying all six types of IS for different requirement of Business workings but for UNSTCP, IS experts suggest to apply DSS applications (Rapheal et al., 2023). The six primary applications of Information Systems (IS) comprise Transaction Processing System (TPS), Office Automation System (OAS), Knowledge Work System (KWS), Management Information System (MIS), Executive Support System (ESS), and Decision Support System (DSS) (Rapheal et al., 2023).

CRM relies on the Information Systems Success Model (ISM) for its practical outcomes (Khashab et al., 2020). ISM identifies six critical success factors, including information quality (IQ), system quality (SQ), service quality (SRQ), system use/usage intentions, user satisfaction, and net system benefits. In this study, only three ISM factors are applied at (DOA) levels to gauge user or customer satisfaction (Wang et al., 2019).

Information quality (IQ) pertains to the system's capability to store, distribute, or generate high-quality information, crucial for ensuring user satisfaction (Khatri et al., 2023). System Quality (SQ) works with the IQ, to achieve consolidated quality and indirectly benefits for achieving user satisfaction.

Service Quality (SRQ) is a bridging factor for achieving customer satisfaction by compiling IQ and SQ. The application of all the factors of ISM contributes to attain three levels of DOA in CRM and application of DSS help in the predicting and measuring their working (Yang and Babapour, 2023).

This study revolves around the implementation of What-If Analysis (WAS), a Decision Support System (DSS) model, at three levels within the (DOA) for CRM purposes. DSS (WAS) is a computer-based application designed to facilitate decision-making processes in management-related domains such as Supply Chain Management (SCM), Enterprise Resource Planning (ERP), and Customer Relationship Management (CRM). Within CRM, (WAS) plays a pivotal role in handling customer inquiries and is instrumental in the acquisition, retention, development, and identification of customers.

DSS (WAS) has three types of functions that can be applied to predict and apply for measuring CRM's three levels. These three types are Scenario based what if analysis (SBWAS), Database what if analysis (DBWAS) and Goal based what if analysis (GSWAS) (Yang and Babapour, 2023).

This research paper is structured into six sections. The introductory part provides an overview, while the second section delves into the historical aspects of the concepts employed in the paper, showcasing the role of DSS (WAS) in management at large and, more specifically, in CRM, drawing insights from prior studies. The third section elaborates on the conceptual hypotheses, and the fourth section provides a comprehensive explanation of the research procedure and methodology applied in this study.

Moving forward, the fifth section discusses the implications of the research in the context of a detailed discussion, and the sixth section presents the results and findings, followed by a conclusion. The paper highlights the application of DSS (WAS) in customer-centric firms across three levels (DOA), aiming to achieve profitability, build relationships, and ultimately influence CRM through the utilization of model data. This research paper has two objectives as given below:

RQ1: Application of WAS for solving unstructured problem in DOA of CRM

H1.1: Analytical CRM by SBWAS

H1.2: Operation by DBWAS

H1.3: Directional by GSWAS

RQ2: Relationship between WAS and ISM model to attain CRM

H2.1: A assesses SRQ, SQ and IQ

H2.2: O calculates the values for SRQ and SQ

H2.3: D provides statistics for SRQ

LITERATURE REVIEW

The role of IS was basic and goal oriented until 1960 and mostly focusing on the electronic data processing (EDP) (Khatri et al., 2023). This includes the branches such as such as accounting and transaction processing specifically. EDP is known for the application of machine for processing the statistics that include functions like summarizing, classifying, manipulating, and recording. It is more data and transaction based for routine decisions therefore the EDP is technique is a synonym to transaction processing systems (TPS) (Roba and Maric, 2023).

Same year in 1960 several applications were developed and included in the realm of IS which were very helpful in business process management (Roba and Maric, 2023). MIS was one of the functions which have a great significance in the business management (Pynadath et al., 2023). MIS created a new edge in the IS roles and relevance and in the same year, MIS became a major tool for solving problems in business management. Until this time IS and its applications were facilitating in different areas of Business Management but no specific application was identified for specific objectives (Pynadath et al., 2023).

During 1970s, the IS witnessed a revolution in the existing applications for the advantages and limitations in their applications for business. MIS was found to be not providing accurate results for UNSTCP (Yang and Babapour, 2023). This was the time in 1970 a new branch known as DSS started to emerge and was able to solve structured problems; semi structured problems and worked best for UNSTCP (Guerola-Navarro et al., 2021). For direct statistics collections and analysis other applications of IS worked very well but for CRM related issues and statistics, other IS applications were found to be have many challenges. DSS has already achieved its significance in UNSTCP; therefore, more research is necessary to identify the application of DSS in CRM (Guerola-Navarro et al., 2021).

Until 1980 the DSS is known as new application of IS and simultaneously few more applications started to work and their results were also effective in price predictions, building pricing strategies, supply chain management, etc (Yang and Babapour, 2023). These IS applications were EIS, KMS, ERP, etc (Naim et al., 2021). In late 90s Artificial Intelligence also showed several advantages in Business Process Management and during 1990, IS applications such as ERP and EIS emerged in resource allocations and planning. This is also the time of great commercialization of internet technologies and working model of Business witnessed new online platform for its working and operations. In this time CRM witnessed more attention because the marketers had to develop hybrid CRM model that could cover traditional as well as online CRM objectives (Chornous et al., 2023).

The information systems success model (ISM) is also called as by the name of DeLone and McLean. They have given the theorem of IS and explained the broad appreciative learning of factors for achieving user satisfaction. ISM model gave six factors for the success of user satisfaction that should be applied in the system. In 1992, William H. DeLone and Ephraim R. McLean were the original developers of this model (Naim et al., 2023).

After a decade in 2002 this model emerged as more sophisticated model for measuring user’s satisfaction and started to find its relevance in CRM (Yang and Babapour, 2023).

Past researches have shown the way organizations apply CRM for inspiring their personnel to fundamentally create customer-centric rational perspective (Priya et al., 2023). In this situation IS has contributed in a best way to provide solutions and economic outcomes for business problems (Priya et al., 2023). Previous studies show that the methods of IS affect the working of customer-centric firms for CRM profitability and also framed structures for CRM profitability (Chornous et al., 2023). Past literature presented the relevance of applying technological tools for various management courses and domains like ERP, CRM, SCM, Marketing Analytics and all areas received benefits in their own way however CRM still remained to receive the best advantages because of the nature of this discipline which is based on behavioral sciences. CRM needed a branch of IS to deal with UNSTCP and DSS had functions to meet these requirements (Guerola-Navarro et al., 2021). Past studies have shown the applications of DSS in business management generally and also for CRM but three levels of CRM remained not covered extensively by applications of IS (Chornous et al., 2023).

In past many researches have explained the association of DSS for CRM but the analysis part for DOA needed a special concentration through specific functional applications. To fill this gap, current study is conducted to measure the CRM three levels and ISM by the applications of DSS (WAS) under three categories.

The current research shows the reliance of ISM on CRM and vice versa for developing brand loyalty, image, satisfaction and enhance profit as an outcome.

Perspectives from Theory: An Exploration

CRM delivers its services to companies across three tiers. Directional, Operational and Analytical (DOA) which eventually helps in achieving CRM (Guerola-Navarro et al., 2021). DSS (WAS) aids in constructing these levels and proposes solutions to UNSTCP. Figure 1 illustrates the conceptual research framework employed in this paper.

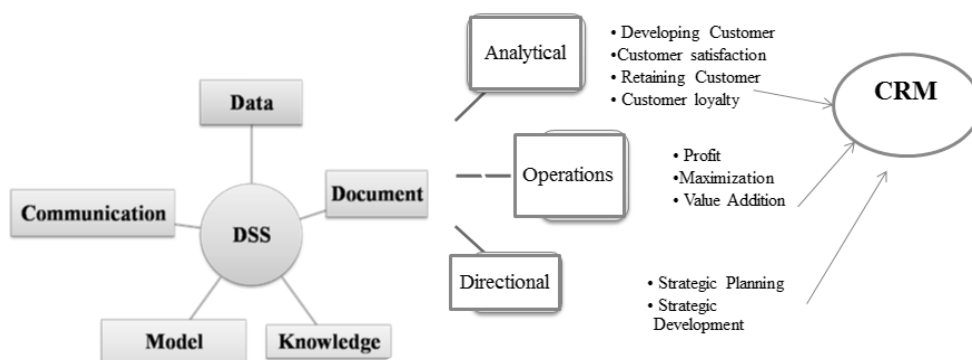


FIGURE 1
CONCEPTUAL FRAMEWORK FOR RESEARCH: THE IMPACT OF WHAT-IF ANALYSIS (WAS) ON CUSTOMER RELATIONSHIP MANAGEMENT (CRM)

ISM model is a functional requirement therefore three factors such as IQ, SQ, SRQ of ISM are applied for CRM. Figure 2 shows the ISM model and its critical factors.



FIGURE 2
DELONE AND MCLEAN'S INFORMATION SYSTEMS SUCCESS MODEL (ISM)
(Zhang et al., 2020)

This study examines the impact of Decision Support System (DSS) decision-making models on three levels of Customer Relationship Management (CRM) within the (DOA). The research focuses on three key factors from the Information Systems Success Model (ISM): System Quality (SQ), Information Quality (IQ), and Service Quality (SRQ). These factors are evaluated across three DOA levels, measuring individual and organizational impacts. The study applies What-If Analysis (WAS) to assess the effects of ISM factors on CRM at different DOA levels. The analysis includes Scenario-based, Goal-seeking, and Data-based approaches to formulate principles for evaluating DOA. The results, drawn from model data covering three service samples from March to May 2020, illustrate how the objectives of CRM can be achieved in the subsequent month, June 2020, across all three DOA levels (see figure 3).

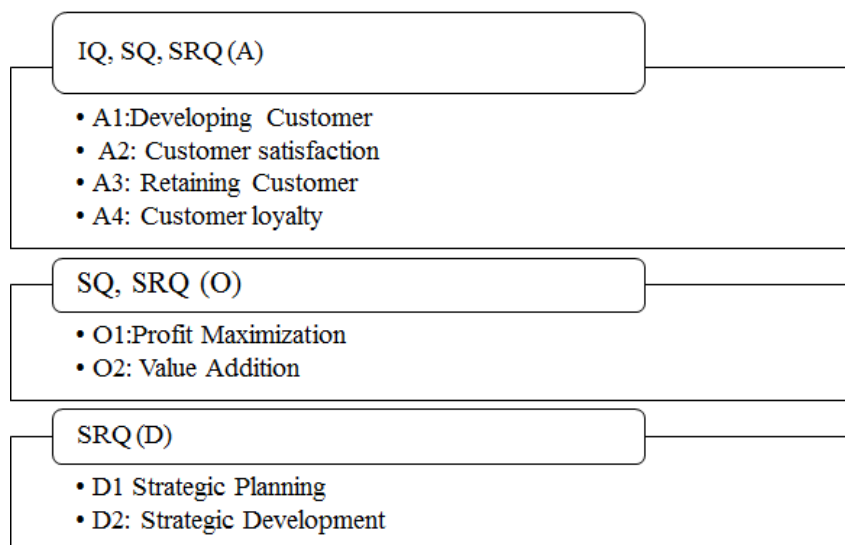


FIGURE 3
ISM SPECIFICATION IN THE (DOA) (Zhang et al. 2020)

Analysis

Many service-oriented firms prioritize achieving Customer Relationship Management (CRM) by fostering customer collaboration and generating prospects to enhance satisfaction levels, improve retention, increase revenue or turnover, establish brand loyalty, and strengthen brand value (Fatima et al., 2022). CRM plays a crucial role in supporting service firms, as well as businesses in general, by facilitating the enhancement of customer relationships through integration at the Department of Administration (DOA) level.

CRM Benefits for Customer-Centric Firms: CRM significantly reduces the time and costs associated with organizing cohesive benefits, offering a comprehensive solution based

on functional philosophies, services, and various stages (Baashar et al., 2020). These benefits contribute to streamlining business operations, obtaining updated and accurate information, and providing a vision for successful business applications. The integration of Workflow Automation Systems (WAS) into CRM aids computer-aided decision-making at the DOA level, resulting in key benefits outlined in Table 1.

DSS WAS offering solutions to CRM	Key Benefits Achieved
	Identifying Customer's Preferences
	Integrate all Management Services
	Increase Productivity and Revenue by providing Customer vision
	Achieving customer Satisfaction
	Strengthen Brand Image and Increase Brand loyalty

DSS provides explanations and rewards to CRM and applies its (WAS) functions. There are three (WAS) functions applied in this research to measure the CRM at three levels of DOA. Figure 4 provides a (WAS) framework for user interface for this study.

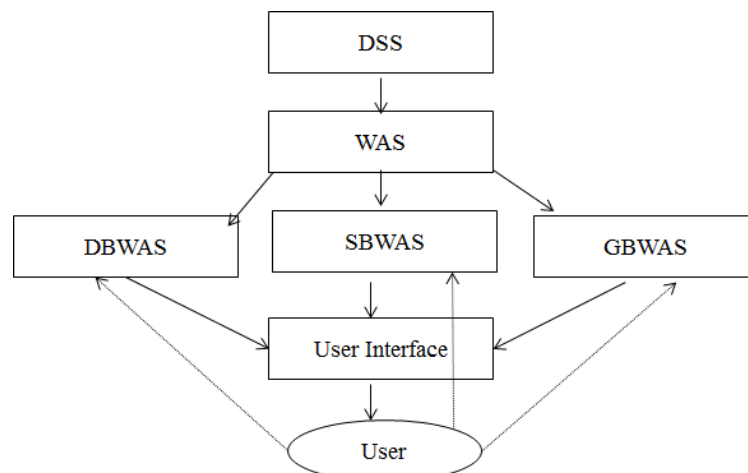


FIGURE 4
USER INTERFACE FRAMEWORK UTILIZING WHAT-IF ANALYSIS (WAS)
(BAASHAR Et AL 2020)

The Decision Support System with What-If Analysis (DSS WAS) presents significant advantages for Customer Relationship Management (CRM), offering numerous benefits to the company (Naim et al., 2021). These include achieving distinct objectives, identifying business opportunities, obtaining prompt customer feedback, boosting sales, understanding demand dynamics, and meeting customers' requirements (Hoda and Naim, 2023).

The underlying philosophy is that the Decision Support System (DSS) furnishes users with a robust and user-friendly interface. The process is facilitated by What-If Analysis (WAS), is instrumental in processing decisions for external domains such as Customer Relationship Management (CRM) (Fatima et al., 2022).

RESEARCH METHODOLOGY

The research is based on quantitative as well as qualitative analysis. For quantitative values we have taken model based statistics and data tested for predictions and qualitative

analysis is based on referring to focusing on criteria in level of Direction and Analytical of CRM.

The statistics for predicting the values are set for DOA in CRM and then WAS for three scenarios are applied to find the results. Results for Level (D and A) are prepared from quantitative as well as qualitative analysis whereas level (O) is completely based on quantitative analysis. Figure 5 shows the research framework and relationship between research questions and factors to achieve them.

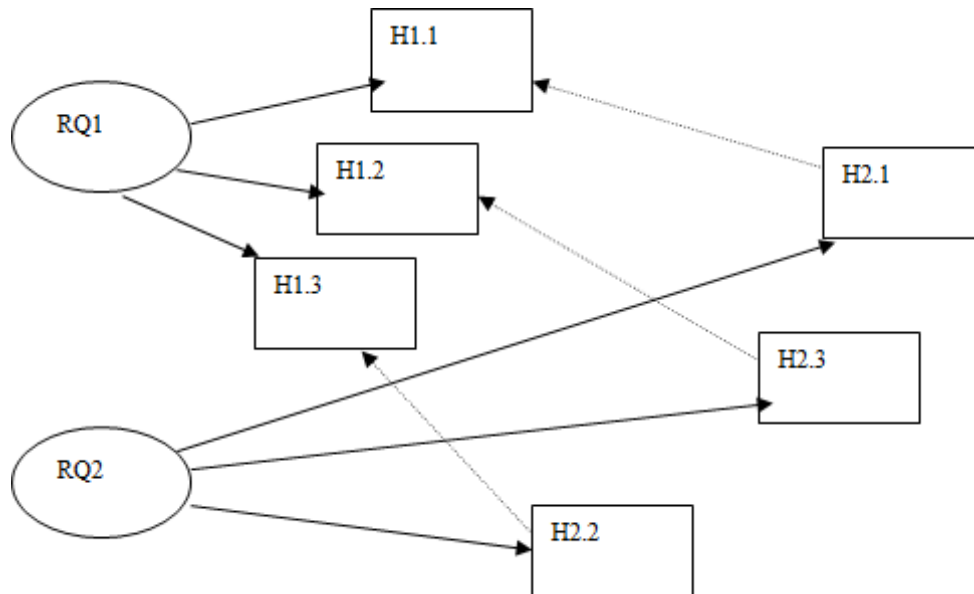


FIGURE 5
RESEARCH FRAMEWORK SHOWING THE RELATIONSHIP AND DEPENDENCE FOR THE RESEARCH QUESTIONS

Three procedural sets are devised for each level, referencing specific criteria. Model data is then created and characterized within the Decision Support System (DSS) framework for three samples. The aim is to understand how DSS with What-If Analysis (WAS) can facilitate the decision-making process for UNSTCP in the context of Customer Relationship Management (CRM).

It's essential to note that (WAS) endorses possibilities and solutions rather than providing specific quantifiable outcomes. While (WAS) aids in the decision-making process for UNSTCP in CRM, it does not dictate specific rules for its functions. Three types of (WAS) - (Scenario-Based What-If Analysis - SBWAS), (Goal-Seeking What-If Analysis - GSWAS), and (Data-Based What-If Analysis - DBWAS) - are applied to the (DOA) for CRM, considering three factors from the ISM model for user satisfaction.

In Sample-1, an analytical scenario is presented for A1, A2, A3, A4, and the firm's efforts for advancement in each standard for the month of June. SBWAS is suggested for elaborating targets for each criterion and setting scenarios to achieve them Table 2.

Table 2 ANALYTICAL CRM LEVEL UTILIZING SCENARIO-BASED WHAT-IF ANALYSIS (SBWAS)				
IQ,SQ,SRA (A) by SBWAS				
Criteria	Sample-1			
	March	April	Mav	June [Target]
A1: Developing Customer	4-000	5000	5500	8000
A2:Customer Satisfaction	4-000	5000	6000	8000
A3:Retaining Customer	4-000	5000	5500	8000
A4:Customer Loyalty	4000	5000	5500	8000

Table 3 illustrates the profit data for Sample-2 over 3 months. The application of Data-Based What-If Analysis (DBWAS), the company can project O1 and O2 values for June and subsequent months. DBWAS operates on sales statistics, aiding in achieving forecasted sales.

Sample-2 also highlights profit changes, both increases and decreases, showcasing how DBWAS contributes to calculating the Operational state of CRM for standards O2 and O1. It is important to emphasize that at the operational level, DBWAS offers values for forecasting, whereas effective decision-making analysis is better conducted through SBWAS or GSWAS.

Table 3				
CRM OPERATIONAL LEVEL UTILIZING DATA-BASED WHAT-IF ANALYSIS (DBWAS)				
SO,SRQ (O) Analysed by DBWAS				
Criteria	Sample-2			
	March	April	May	June [Target]
O1: Profit Maximization	5000	6000	5500	8000
O2: Value Addition	5000	4500	6000	8000

Table 4 outlines the CRM for Directional state, elucidating the success for long term planning and strategies for the firms’ outputs, services, and procedures on a broad scale. Directional level CRM typically focuses on short to long-term achievements. The table 4 displays two factors for directional state under D2 and D1 through the Goal-Seeking What-If Analysis (GSWAS). Target values are established for the three-year period from 2020 to 2023, with an analysis spanning from 2010 to 2013 for criteria D1 and D2.

Table 4				
DIRECTIONAL LEVEL OF CRM BY GSWAS				
SRQ(D) Analyzed by GSWAS				
Criteria	Sample-3			
	2010-2013	2013-2016	2016-2019	2020-2023
D1: Strategic Planning	4000	5000	5500	8000
D2: Strategic Development	4000	5000	6000	8000

(WAS) analyzes statistics derived from these samples to inform decision-making processes aimed at achieving CRM across all three levels, as detailed in the results section. It identifies areas requiring improvement and strategic breakthroughs, signaling necessary policy changes to meet long-term target values.

The three (WAS) Samples highlight rapid changes with minimal contributions, providing insights for future advancements and accomplishing objectives in June for all three CRM levels. By applying (WAS) functions, the study demonstrates how objectives can be attained through decision-making tools for UNSTCP at three different levels.

RESULTS

This study explores the utilization of What-If Analysis (WAS) for three levels of CRM and three standards of ISM. It is grounded in a model dataset aimed at illustrating how the DSS model can contribute to ISM and CRM within the (DOA).

Research Questions (RQ1 [H1.1], RQ2 [H2.1]): The results demonstrate a substantial application and reliance on (WAS) across three samples. Table 5 showcases the use of Scenario-Based What-If Analysis (SBWAS), positively predicting values for one month at four scale on analytical CRM.

Table 5

CMR IN SBWAS FOR LEVEL A					
Scenario Summary					
	Current Values	Developing customer	Customer satisfaction	Retaining cusomer	Customer loyalty
Changing Cells					
SBS4	4000	4000	4000	4000	4000
SCS4	5000	5000	5000	5000	5000
SDS4	5500	5500	5500	5500	5500
SES4		8000			
SBSS	4000	4000	4000	4000	4000
SCSS	5000	5000	5000	5000	5000
SD\$5	6000	6000	6000	6000	6000
SESS			8000		
SBS6	4000	4000	4000	4000	4000
SC\$6	5000	5000	5000	5000	5000
SD\$6	5500	5500	5500	5500	5500
SE\$6	8000	\$000	\$000	8000	8000

Highlighted cells showcase the impactful role of Scenario-Based What-If Analysis (SBWAS) for criteria A1, A2, A3, and A4. Figure 6 shows the chart representation for SBWAS for Level A for IQ, SRQ and SQ. The model predicts the gaps shown between two dotted lines to achieve the target value for the month of June. The customer centric firms will focus on the areas projected by SBWAS to achieve CRM at level A.

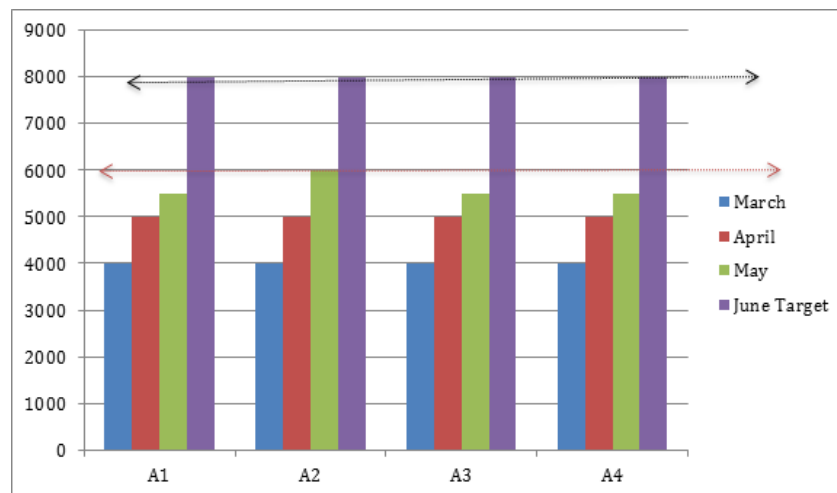


FIGURE 6
SBWAS AT LEVEL A FOR IQ, SRQ AND SQ

Research Questions (RQ1 [H1.2], RQ2 [H2.2]): Sample-2 underscores the operational benefits of CRM, specifically in sales and revenue. Data-Based What-If Analysis (DBWAS) calculates predicted sales values for the firms. Table 6 illustrates the modifications necessary to meet sales objectives and how DBWAS can help identify areas for improvement, strengths, and weaknesses. The results detail changes for each month to achieve the target values in the month of June. Utilizing the DBWAS, research companies are able to discern the changes on the scale and identify when desired profit can be achieved.

Table 6
DBWAS FOR LEVEL O

Criteria	Example2			Variation to the target			Applied DBWAS		
	March	April	May	June Target	March	April	May	June O1	June O2
O1:Profit Maximization	5000	6000	5500	3000	5000	2000	2500	8000	
O2 Value Addition	5000	4500	6000	3000	3000	3500	2000		8000

Research Questions (RQ1 [H1.3], RQ2 [H2.3]): The measurement of the dimensional domain shows the anticipated impact of What-If Analysis (WAS) exhibits a relatively positive returns in terms of coherence and profitability. These findings can be employed to assess the factors influencing CRM profitability and devise strategies for the decision-making process in achieving UNSTCP for CRM Table 7.

Table 7 GSWAS FOR LEVEL D						
SRQ (D) [Analysed by GSWAS]						
Criteria	Example-3					
	2010-13	2013-16	2016-19	Average Variation	Missing Target to Achieve	2020-2023
D1: Strategic Planning	4000	5000	5500	4833333	-335544	8000
D2: Strategic Development	4000	5000	6000	5000	-335544	8000

GSWAS is applied for the long term functions; therefore, the statistics is shown for years from 2010 to 2013. The variation in goal seeking target is shown for three years' statistics such as 2010-2013, 2013- 2016, until 2020-2023. In this research the standards of impact of CRM are critically analyzed and implicated for ISM as well. This measurement aid firms to enhance user satisfaction and profitability, and develop strategies for long term benefits.

Table 8 DERIVED BENEFITS FROM (WAS) MODELS FOR DOA		
CRM Levels and ISM	Benefits Achieved	DSS Model based WAS
IQ, SQ, SRQ (A)	Success factors of applied Scenarios	Analyzed by SBWAS
A1: Developing Customer	Customer orientation	
A2: Customer Satisfaction	Information Quality Perception	
A3: Retaining Customer	Providing Value addition Services based on the situations	
A4: Customer loyalty	Help in dealing issues, solving problems, grievance handing, supporting customers	
SO,SRQ(O)	Applied statistics and data	Analyzed by DB\VAS
O1: Profit Maximization	Achieving Profit through sales	
O2: Value Addition	Providing Value addition Services based on the statistics	
SRQ (D)	Goal based scenario as well statistics applied	Analyzed by GSWAS
D1: Strategic Planning	Enhancing brand value and increase systems efficiency	
D2: Strategic Development	Performance based policies for long term benefits.	

Table 8 provides a comprehensive perspective on the derived benefits resulting from the interconnections between CRM, ISM, DOA, and (WAS). It concludes by offering insights into the benefits accrued through the application of What-If Analysis (WAS) across three

levels of the (DOA) in CRM and ISM. The table analyzes the application of three types of WAS and identifies the factors contributing to the achievement of CRM at DOA and ISM.

CONCLUSION

Many firms fail in developing successful customer centric services and therefore witness loss and are not able to achieve even break even for their business processes. This is mainly due to not achieving CRM at the best levels and not applying the ISM critical success factors. This research has provided the IS application which is DSS for measuring three levels of CRM for UNSTCP. DSS (WAS) function is the most applied to solve the UNSTCP of CRM and ISM factors. The study facilitated the firms to predict sales, identify weak areas that need policies to develop and improve, enhance user's satisfaction, loyalty, build brand image, and strategies to improve other business operations. This research is a scenario and model based implications that can benefit all types of customer centric organizations in services.

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