

# What IF Analysis Impacting CRM in Medical Sector

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## Abstract

Decision Support Systems (DSS) is an Information Systems (IS) application that aids in decision-making processes for many business 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 and for the purpose of the study we have compared the CRM between patients and hospital management.

## 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, and in this paper patients are considered to be patients in the Healthcare centers. DSS-based CRM systems have been applied in many medical 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.

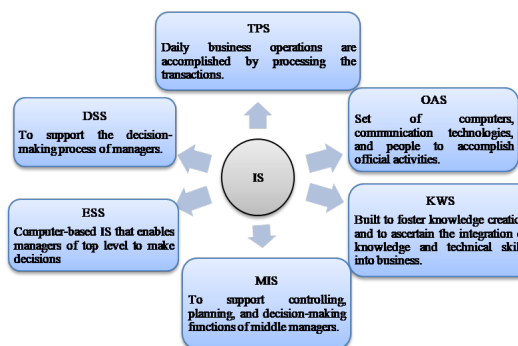


Figure 1: Types of IS Applications [9]

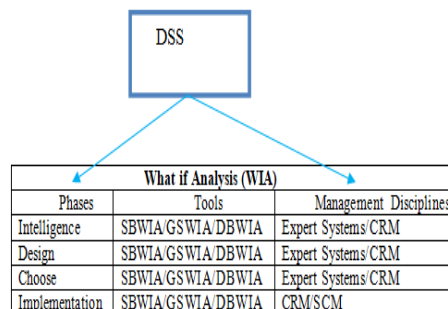


Figure 2: DSS(WIA) supporting the decisions [12]

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 patients inquiries and also in attracting, retaining, developing, and identifying customers for Healthcare centers and figure 2 gives a framework of DSS (WIA) for how decisions are supported for different management decisions in medical sector [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 Healthcare firms at three levels (AOD) for achieving profit and building relationships with patients 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 [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 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 [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 Healthcare firms (HF) at three levels; Analytical, Operational, and Directional levels (AOD), and each level benefits the HF 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 for medical services. Figure 3 depicts the research framework used for this paper.

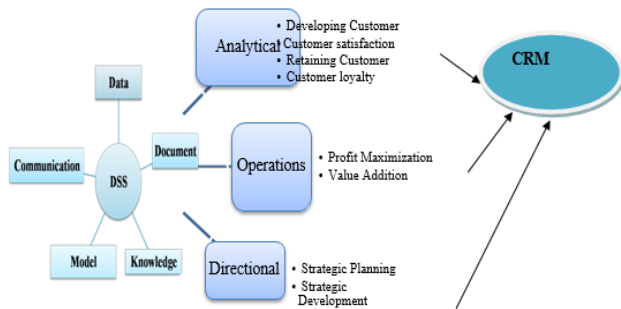


Figure 3: Research Framework: Role of WIA in CRM

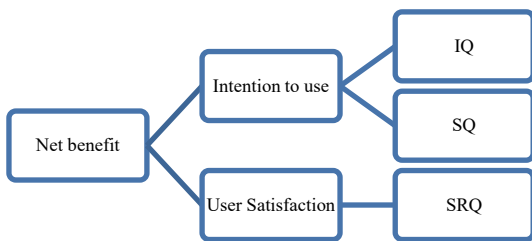


Figure 4: ISM by Delone and McLean [19]

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 HF 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.

| IQ, SQ, SRQ<br>(A)   | SQ, SRQ<br>(O)   | SRQ<br>(D)   |
|--|--|--|
| <ul style="list-style-type: none"> <li>•A1:Developing Customer</li> <li>• A2: Customer satisfaction</li> <li>•A3: Retaining Customer</li> <li>•A4: Customer loyalty</li> </ul> | <ul style="list-style-type: none"> <li>•O1:Profit Maximization</li> <li>•O2: Value Addition</li> </ul> | <ul style="list-style-type: none"> <li>•D1:Strategic Planning</li> <li>•D2: Strategic Development</li> </ul> |

Figure 5: Criteria for ISM for (AOD)

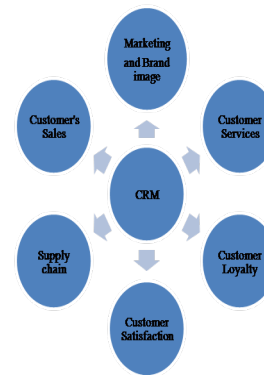


Figure 6: CRM scope [16]

#### 4. DISCUSSION

Most of the service-oriented HF 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 for various medical services such as patient care, medical examinations, diagnosis of diseases and patients recovery rate. CRM helps service HF in particular and all other Medical sectors such as small clinics and dispensaries, in general, to optimize customer relationships between patients and medical practitioners by integrating at the AOD level.

### 4.1 The CRM Advantages for customer-oriented Healthcare 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 HF 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            |

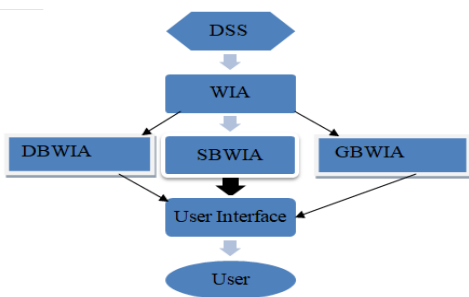


Figure 7: WIA Framework for User Interface [24]

DSS (WIA) offers the advantages to CRM and that results in many benefits to the firm in general such as achieving competitive advantages for medical facilities, identifying business opportunities in health sector, receiving quick customers' responses (Patients reviews), increasing sales ( for over the counter medicines), knowing demand value and customers' expectations such as patient's attendants and other medical area related people, 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].

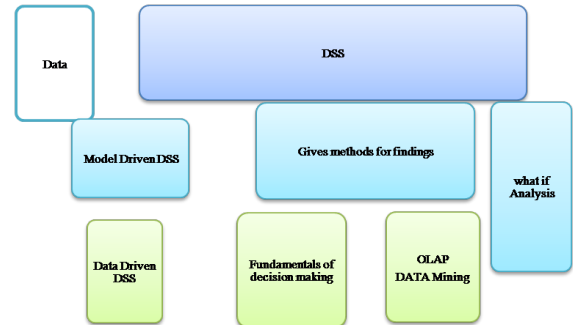


Figure 8: Types of DSS [25] [26]

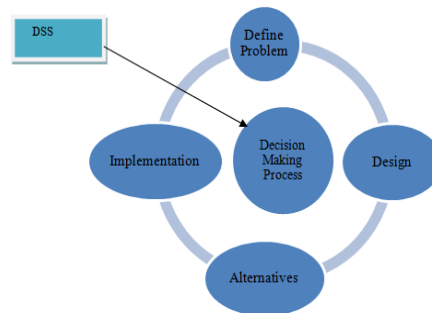


Figure 9: DSS Decision Making Process within [26]

The philosophy is that DSS provides a strong and easy to use interface to the users based on (WIA) figure 9 shows the decision-making process that takes place within the DSS [20] [21] [22] that are accounted by (WIA) for processing decisions for external disciplines like CRM.

### 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 in HF. 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 HF strives for higher

growth for each criterion for the month of June. The HF can use SBWIA and while elaborating the target for each criterion and set a scenario to achieve that.

Table 2: Analytical by SBWIA for HF

| 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 HF can predict O1 and O2 for the month of June and coming months for patient's intake. These figures are shown in sales and DBWIA helps in manipulating data for achieving the target sales (Hospital's profit). Example-2 also shows the variation as an increase and decrease in profit in medical

centers 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.

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 HF 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.

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 HF's need to concentrate on changing their strategies for meeting medical's goals. In above given three



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

5. Results

The study covers the application of (WIA) for CRM for three levels of AOD using ISM in Healthcare

firms. This study is based on a hypothetical data set that tried to explain how the DSS model-based can help in CRM for AOD in medical sector as an example of service providers.

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 sections 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 Exmnanple-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 -1 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 for HF.

Table 7: SBWIA for Level A of CRM

| Scenario Summary       |                     |                       |                    |                  |      |
|------------------------|---------------------|-----------------------|--------------------|------------------|------|
| Current Values:        | Developing customer | Customer satisfaction | Retaining customer | Customer loyalty |      |
| <b>Changing Cells:</b> |                     |                       |                    |                  |      |
| \$B\$4                 | 4000                | 4000                  | 4000               | 4000             | 4000 |
| \$C\$4                 | 5000                | 5000                  | 5000               | 5000             | 5000 |
| \$D\$4                 | 5500                | 5500                  | 5500               | 5500             | 5500 |
| \$E\$4                 |                     | 8000                  |                    |                  |      |
| \$B\$5                 | 4000                | 4000                  | 4000               | 4000             | 4000 |
| \$C\$5                 | 5000                | 5000                  | 5000               | 5000             | 5000 |
| \$D\$5                 | 6000                | 6000                  | 6000               | 6000             | 6000 |
| \$E\$5                 |                     |                       | 8000               |                  |      |
| \$B\$6                 | 4000                | 4000                  | 4000               | 4000             | 4000 |
| \$C\$6                 | 5000                | 5000                  | 5000               | 5000             | 5000 |
| \$D\$6                 | 5500                | 5500                  | 5500               | 5500             | 5500 |
| \$E\$6                 | 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 for the hospitals and Table 8 shows the variation in target and how DBWIA can help HF 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 HF 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      |

The analysis of the measurement model indicates that the proposed (WIA) has a relatively high degree of validity and reliability. These measures can be used to evaluate what influences CRM profitability and strategies that can be a vision for the decision making process. Table 9 shows a successful application of GSWIA for the directional level of CRM. GSWIA is a backward assessment method that explains the missing value for the target value as given in the table for two criteria D1 and D2. It is important to notify that strategies do not work for months rather than be analyzed for a minimum of three years to five years therefore values for directional analysis are expressed in three years' timeline and GSWIA gives the results for 2020 to 2023 which means that target should be achieved in these three years. In this study, we identified the criteria that influence CRM and the use of ISM for patients' satisfaction and profitability measured by (WIA) which proved to be

intuitively appealing and reliable for medical service providers.

## 5. 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 but as an example we have considered Healthcare services for using (WIA) impacting CRM where this model facilitates in developing patients' satisfaction, retention, loyalty and also to contribute in sales and revenue for the hospitals along with the measuring the effectiveness of strategic planning for future medical growth.

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