# Data Warehouse Success Lead towards Supply Chain Efficiency

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**Abstract--- Data warehouse management is crucial challenge due to which most of the supply chain companies are facing the issues of data management. These challenges effect adversely on data warehouse success and ultimately effect negatively on supply chain efficiency. Different studies are carried out by different researchers on the area of supply chain, however, these studies are missing with the element of data warehouse management. Therefore, the objective of the study is to examine the factors that influence on data warehouse success and supply chain efficiency. Data were collected from warehouse employees working in Indonesian supply chain companies. Results of the study shows that data warehouse success is based on various factors such as system quality, information quality, service quality and relationship quality. These factors have positive association with data warehouse success and data warehouse success increases the supply chain efficiency. Thus, companies should focus on these elements to promote data warehouse success. This study is helpful for practitioners to promote supply chain efficiency through data warehouse success.**

***Keywords:*** *supply chain efficiency, data warehouse, system quality, information quality, service quality, relationship quality.*

## 1. Introduction

A data warehouse is a system of information that delivers the resources to extract the information from the operational data stores of the business. Data warehouse provides the access to get information related to suppliers, markets and customers. IT provides the ability for an organization to adapt various strategies from past and determined the position for future [1]. A data warehouse is a group of data from numerous sources, combined into a shared repository and extended by brief information for the purpose of analysis [2].

This warehouse enables businesses to gather, arrange, interpret and use the data for decision making [3, 4]. It gives the establishment to worthwhile business insight and help to get competitive advantage [5]. Fame of the data warehouse for data investigation has developed enormously, as the traditional transection system have matured after gaining fast speed and stability [6, 7].

A data warehouse offers data coordination arrangements and enhanced access to suitable, exact and reliable data [8, 9]. The data warehouse prepares its clients with feasible decision-making support by coordinating company data into a repository from which clients can run reports and perform unprepared data examination. In addition, the data warehouse uses the investment effectively and gives business clients the possibility to a lot more noteworthy use of resources [10]. Moreover, the data warehouse decreases the cost; promote value added actions and enhance overall productivity [11]. The data warehouse influence by the various factors which has effect on success as well as implementation [4, 12]. A comprehensive data warehouse system is shown in Figure 1.


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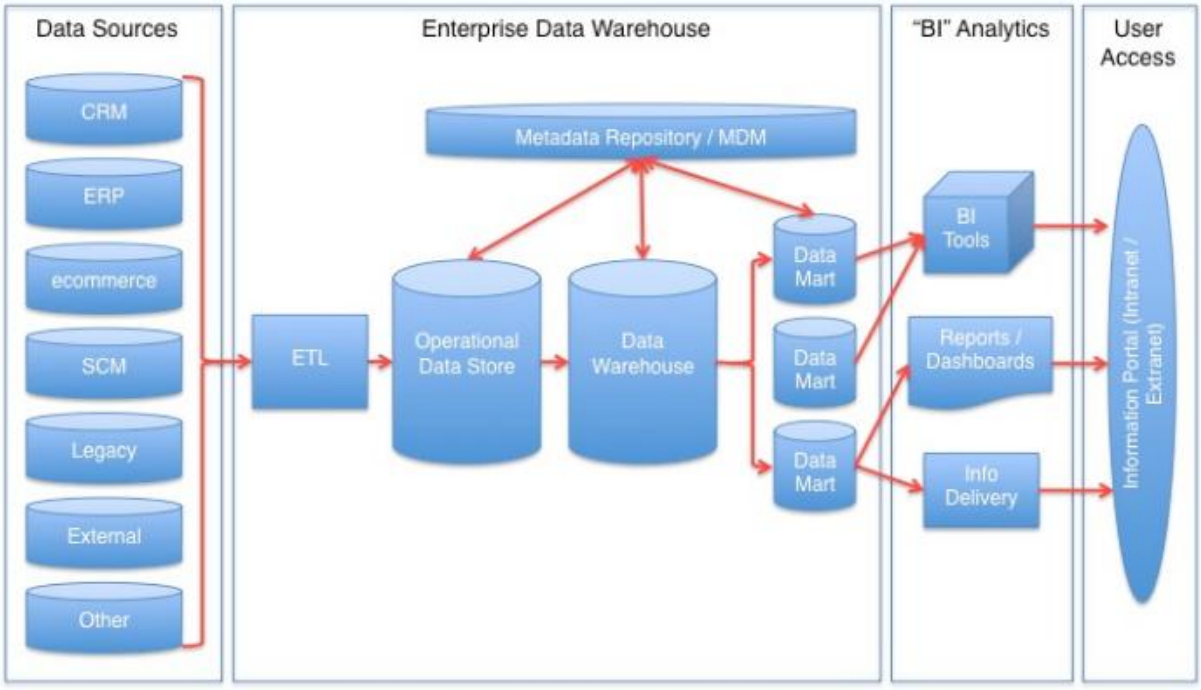


**Figure 1.** Data Warehouse

The factors that effect on data warehouse success include; quality of system, quality of information, quality of service and relationship quality [13]. All these factors effect on the overall performance of data warehouse. Data warehouse is more important in supply chain companies. Supply chain performance has important link with data warehouse performance. As various studies revealed that data warehouse and supply chain have relationship [14-17].

Most of the supply chain companies are facing the issues of data warehouse management. It is one of the challenge for companies [18, 19]. Particularly Indonesian supply chain companies are facing these issues, due to which the performance is suffering. Indonesian companies are facing the issues of data warehouse system quality, information and better service quality. These issues of data can be resolved through big data system [20]. All these factors affect the supply chain efficiency as it is shown in Figure 2.

Different studies are carried out by different researchers on the area of supply chain, however, these studies are missing with the element of data warehouse [21-24]. Thus, this study filled this literature gap and examined the data warehouse success and its effect on supply chain efficiency in Indonesian firms. Hence, the objective of study is to observe the factors that influence on data warehouse success and supply chain efficiency.

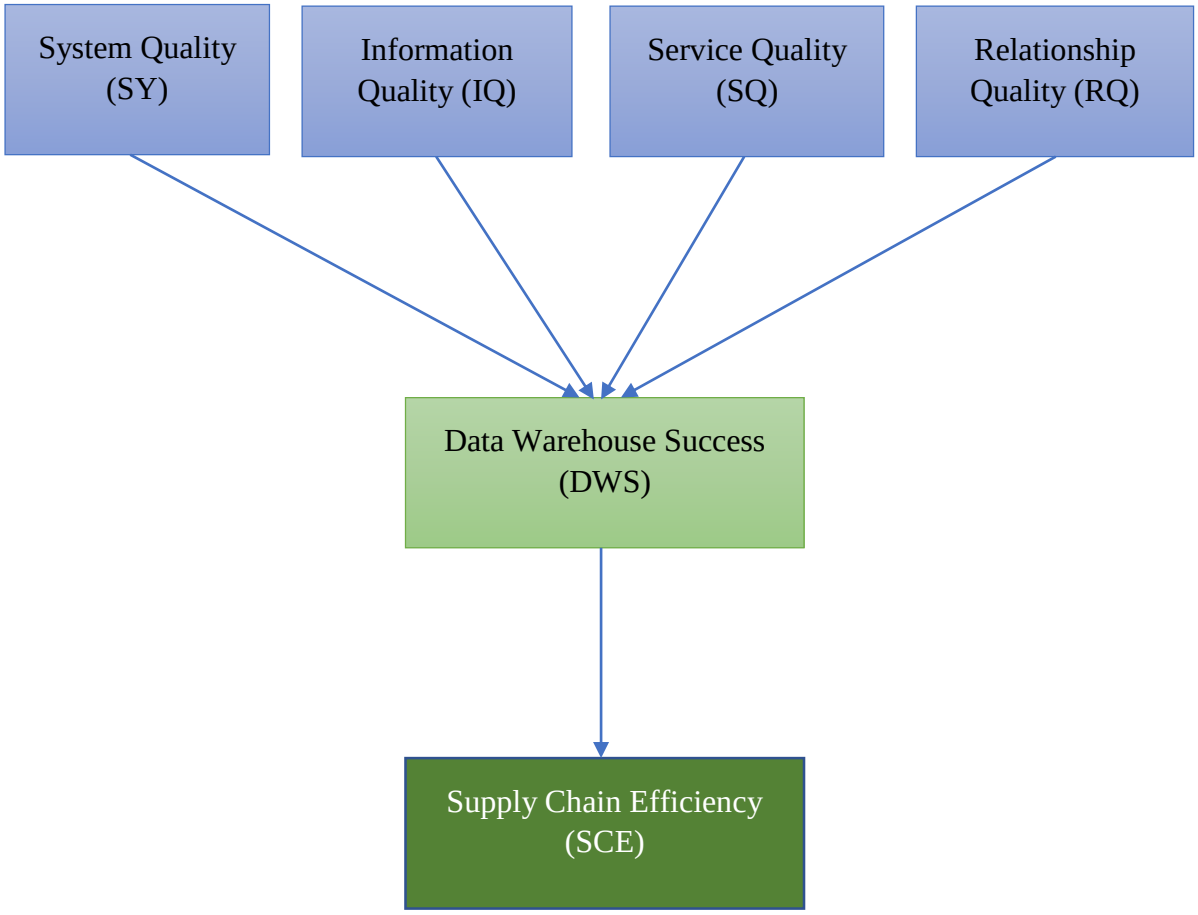


**Figure 2.** Theoretical Framework

## 2. Literature Review

The outcomes from data warehouse arrangements are possibly problematic to measure and to draw success metrics [4, 25, 26]. It involves numerous users ranging from top administrators to end workers; numerous applications as well as data integration (i.e. ETL), analysis of data (i.e. Cube), business intelligent, and applications of data mining. However few studies draw the data ware house model such as Hwang and Xu [25] and Wixom and Watson [4].

Wixom and Watson [4] focused on three major factors to get success in data warehousing. These factors include; various factors related to implementation, implementation success and system success. Further, implementation factors consist of support from management, various resources, participation of user, team skills, source system and development of technology. Implementation success include; organizational implementation success, project implementation success and technical implementation success. Finally, system success includes; data quality, perceived net benefit and system quality. In this direction, current study focusing our four factors includes; quality of system, quality of information, quality of service and relationship quality to check effect on warehouse success.

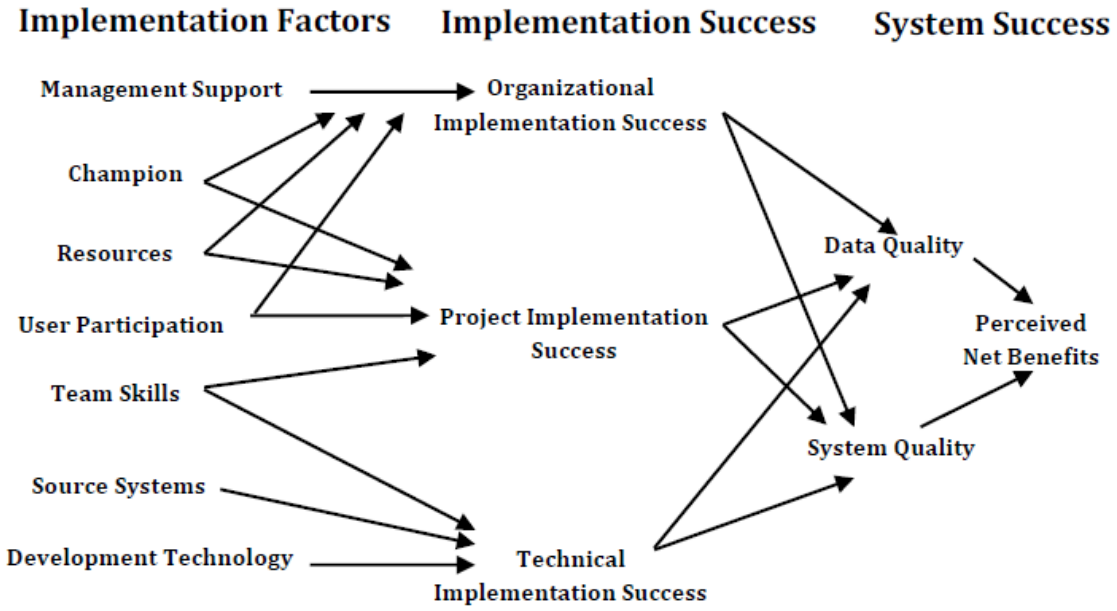


**Figure 3.** Data Warehouse Success Model
**Source:** Wixom and Watson [4]

*2.1 System Quality (SQ) and Data Warehouse Success*

System quality is perceived as an imperative factor in effective data warehouse usage [27] in spite of the fact that issues identifying with it got less consideration than data quality in the literature [28]. Previous researchers recognize criteria for the system quality, which include important elements related to warehouse [27].

Park [29] agrees with Seddon [27] that quality of system is one of the variables in success. They examine the impacts of data warehouse on decision-making performance and discover the proof that help the essential ideas of the framework that proposes positive effects of system quality and data quality on decision performance through system use. With regards to data warehouse, Wixom and Watson [4] observational work demonstrated the specific significance of quality (i.e., system dependability and quality of data) in securing profits by the data warehouse. Moreover, Shin [26] recognizes system quality factors, for example, system output, easy in use, capacity to find data, and data quality, which were viewed as urgent for the accomplishment of the data warehouse success.

**H1:** System quality has significant effect on data warehouse success.

*2.2 Information Quality and Data Warehouse Success*

A few investigations [4, 25, 30] propose that quality of information is an essential element in data warehouse achievement as business choices depend on information drawn from data warehouse. It appears that a data warehouse is required to empower development of information of advanced quality just as new information that might be put to creative use. In the most recent decade, quality information required to achieve needs of organization and improve quality of information [31]. Moreover, information (or data) quality is evaluated routinely as a best concern in data warehouse systems [32, 33].

The information quality alludes to the quality of results produce by the data warehouse system [25]. In an investigation on the causes of information system achievement, Delone and McLean [34] shows the status of timeliness, as well as accurateness of information. For instance, Sakaguchi and Frolick [35] examine one of the benefits of a data warehouse as its capacity to give quantitative qualities, or measurements that enable an organization to benchmark performance with an end goal. Both the quality as well as amount of information are critical. As depicted by Watson and Haley [36], better information is one of the advantages of data warehousing. LeRouge and Gjestland [37] address the subject of large data

warehouse quality. They screen the subject of data warehouse quality into the investigation of information quality as well as system quality. Therefore, information quality has relationship with data warehouse success.

**H2:** Information quality has significant effect on data warehouse success.

*2.3 Service Quality and Data Warehouse Success*

Grover, et al. [38] characterize the service quality as the level of irregularity between the service beneficiary's desire for service and perception of genuine service. The idea of service quality has attracted increasing interest which has relationship with data warehouse. A good quality information has significant role in data warehouse success and ultimately supply chain efficiency.

The significance of service quality and the difficulties confronting data warehouse services require knowledge with respect to customers about what traits clients use in their assessment of services given by data warehouse system. Estimation tool of data warehouse service quality has not been accessible. Shin [26] utilizes a measurement “user training” to measure the quality of service in the data warehouse setting. Various studies shows a relationship between service quality and warehouse success [39].

**H3:** Service quality has significant effect on data warehouse success.

*2.4 Relationship Quality and Data Warehouse Success*

The idea of relationship quality emerges from theory as well as research in the area of relationship marketing [40, 41] having prime objective is to support strong relationships as well as to adapt indifferent customers into reliable ones [42]. Relationship quality is multidimensional construct having various dimension [43] which has relationship with data warehouse system.

Good relationship quality has the ability to promote data warehouse success. As it has significant relationship with relationship quality [44]. Relationship quality is key to work smoothly by data warehouse system. Data warehouse success mainly based on knowledge and information and this information heavily based on good relationship. Thus, relationship quality is vital in warehouse success.

**H4:** Relationship quality has significant effect on data warehouse success.

*2.5 Data Warehouse Success and Supply Chain Efficiency*

Data warehouses has important role in supply chain efficiency. Increase in data warehouse success increases the supply chain operations which ultimately increases the efficiency in supply chain. Services quality through data warehouses, information of data warehouses, relationship quality of data warehouses and system quality of data warehouses has significant relationship with supply chain activities which increases the supply chain efficiency as the data warehouses is the important element of supply chain [17].

Various studies supported the argument that proper warehouse management increases supply chain practices [45, 46]. Thus, warehouse success has key role in supply chain efficiency.

**H4:** Data warehouse success has significant effect on supply chain efficiency.

## 3. Research Methodology

Research method is one of the comprehensive process which determine that how a research study will be carried out and how to approach the objectives. Therefore, it is most important part of every research study. In the social sciences research, generally three type of research approaches are used, 1) quantitative research approach, 2) qualitative research approach, 3) mixed method approach. By following the nature of this study, a quantitative research approach is used to approach the results.

Thus, survey method is sued to collect the data. Data were collected from the warehouse employees of supply chain companies. Only those employees were selected having direct relationship with warehouse management. Total three hundred questionnaires are distributed with the help of self-visit to the supply chain companies in Indonesia.

In this study, three hundred questionnaires were distributed. From these three hundred distributed questionnaires, total 210 were returned. These responses were entered in excel sheet and analysed with the help of Partial Least Square version three. Additionally, preliminary analysis was also performed to check the collected data. Additionally, preliminary analysis is shown in Table 1.

**Table 1.** Preliminary analysis

| | No. | Missing | Mean | Median | Min | Max | SD | Kurtosis | Skewness |
|---|---|---|---|---|---|---|---|---|---|
| SCE1 | 1 | 0 | 4.978 | 6 | 1 | 7 | 1.976 | -0.986 | -0.56 |
| SCE2 | 2 | 0 | 5.015 | 6 | 1 | 7 | 2.018 | -0.958 | -0.661 |
| SCE3 | 3 | 0 | 3.993 | 3 | 1 | 7 | 2.16 | -1.48 | 0.247 |
| SCE4 | 4 | 0 | 4.978 | 6 | 1 | 7 | 2.08 | -1.101 | -0.546 |
| SCE5 | 5 | 0 | 5.146 | 6 | 1 | 7 | 2.006 | -1.039 | -0.637 |
| SCE6 | 6 | 0 | 4.752 | 5 | 1 | 7 | 2.003 | -1.152 | -0.403 |
| DWS1 | 7 | 0 | 3.54 | 3 | 1 | 7 | 2.033 | -0.984 | 0.505 |
| DWS2 | 8 | 0 | 4.949 | 6 | 1 | 7 | 1.983 | -1.14 | -0.525 |
| DWS3 | 9 | 0 | 4.891 | 6 | 1 | 7 | 2.133 | -1.117 | -0.54 |
| DWS4 | 10 | 0 | 4.883 | 6 | 1 | 7 | 2.033 | -1.175 | -0.493 |
| DWS5 | 11 | 0 | 2.752 | 2 | 1 | 7 | 1.729 | -0.336 | 0.733 |
| DWS6 | 12 | 0 | 4.861 | 5 | 1 | 7 | 2.114 | -0.822 | -0.214 |
| RQ1 | 13 | 0 | 4.847 | 5 | 1 | 7 | 2.137 | -1.221 | -0.447 |
| RQ2 | 14 | 0 | 4.847 | 5 | 1 | 7 | 1.933 | -1.054 | -0.394 |
| RQ3 | 15 | 0 | 3.847 | 4 | 1 | 7 | 1.929 | -1.007 | 0.306 |
| RQ4 | 16 | 0 | 4.869 | 5 | 1 | 7 | 1.933 | -1.178 | -0.407 |
| RQ5 | 17 | 0 | 4.905 | 6 | 1 | 7 | 2.201 | -1.108 | -0.617 |
| SQ1 | 18 | 0 | 4.949 | 6 | 1 | 7 | 2.108 | -1.112 | -0.57 |
| SQ2 | 19 | 0 | 4.657 | 5 | 1 | 7 | 2.059 | -1.132 | -0.433 |
| SQ3 | 20 | 0 | 2.839 | 3 | 1 | 7 | 1.817 | 0.139 | 0.957 |
| SQ4 | 21 | 0 | 5.146 | 6 | 1 | 7 | 1.866 | -0.772 | -0.617 |
| SQ5 | 22 | 0 | 5.248 | 6 | 1 | 7 | 1.886 | -0.814 | -0.674 |
| IQ1 | 23 | 0 | 5.292 | 6 | 1 | 7 | 1.801 | -0.604 | -0.741 |
| IQ2 | 24 | 0 | 4.263 | 4 | 1 | 7 | 1.873 | -1.217 | 0.124 |
| IQ3 | 25 | 0 | 5.212 | 6 | 1 | 7 | 1.901 | -0.825 | -0.676 |
| IQ4 | 26 | 0 | 5.007 | 5 | 1 | 7 | 1.854 | -1.021 | -0.455 |
| IQ5 | 27 | 0 | 4.153 | 4 | 1 | 7 | 1.918 | -1.126 | 0.193 |
| SY1 | 28 | 0 | 5.27 | 6 | 1 | 7 | 1.814 | -0.587 | -0.698 |
| SY2 | 29 | 0 | 5.168 | 6 | 1 | 7 | 1.893 | -0.901 | -0.603 |
| SY3 | 30 | 0 | 5.168 | 6 | 1 | 7 | 1.823 | -0.617 | -0.691 |
| SY4 | 31 | 0 | 5.547 | 6 | 1 | 7 | 1.73 | -0.272 | -0.979 |
| SY5 | 32 | 0 | 5.416 | 6 | 1 | 7 | 1.745 | 0.275 | -1.091 |

## 4. Data Analysis and Results

The analysis of this study is carried out with the help of most prominent research analysis technique, namely; Partial Least Square-Structural Equation modeling. This is most appropriate technique and widely used in social sciences research. It is also most recommended by previous studies [47, 48]. Various steps of PLS-SEM are recommended by Henseler, et al. [49] which are compiled by Hameed, et al. [50] as shown in Figure 4.

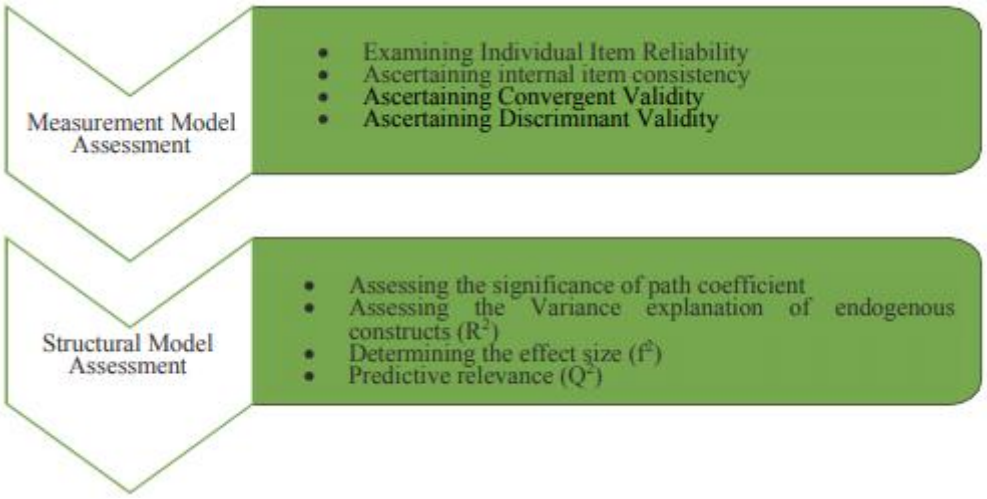


**Figure 4.** PLS-SEM steps
**Source:** Hameed, et al. [50]

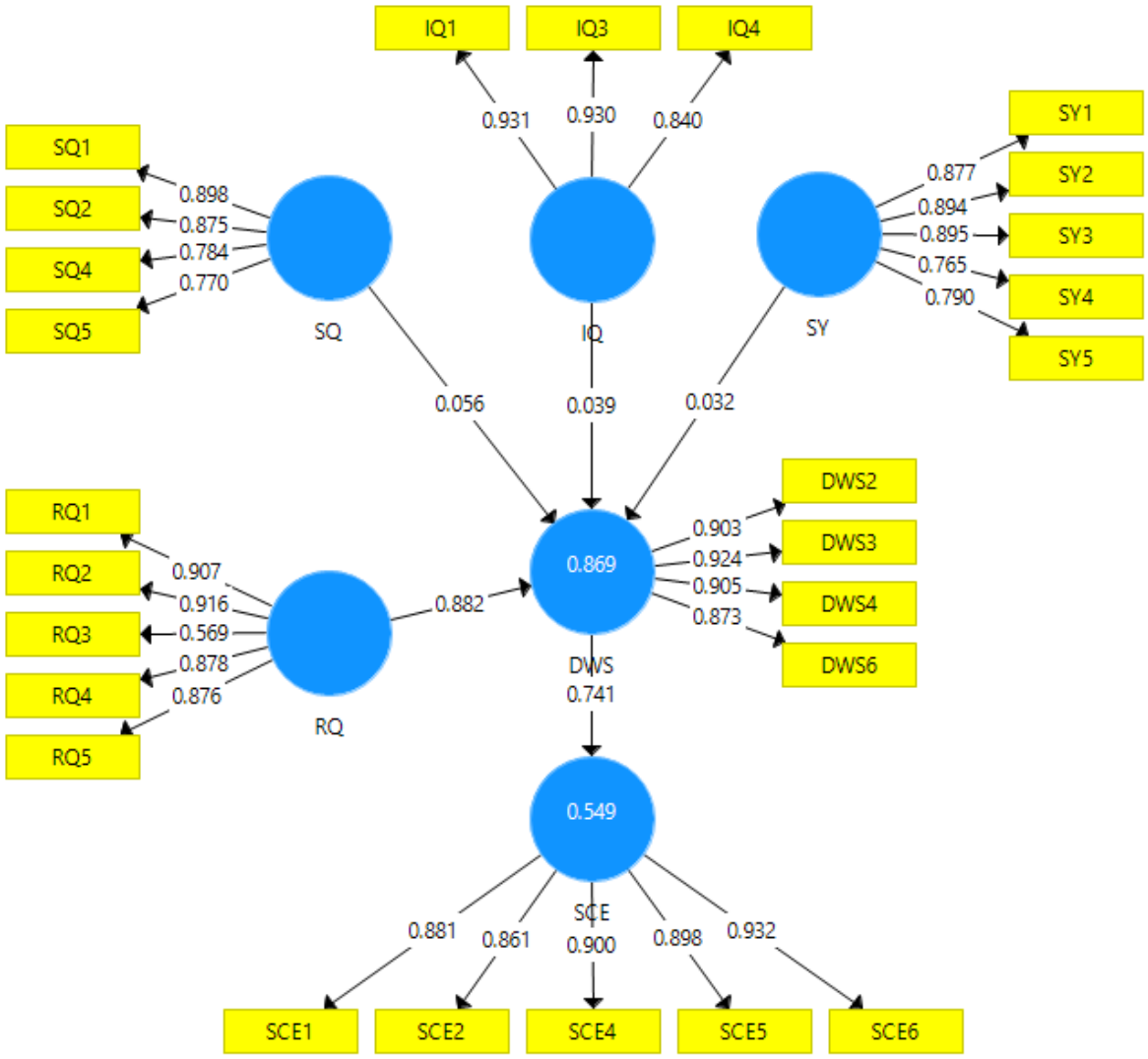


**Figure 5.** Confirmatory Factor Analysis

From the Figure 5, the first step of PLS-SEM is shown. This step is based on measurement model which is based on reliability and validity. Figure 5 and Table 2 highlights the factor loading which is above 0.5 a minimum acceptable level. Additionally, it also shows the composite reliability (CR) and average variance extracted (AVE) given in Table 3. Finally, the discriminant validity is shown in Table 4 which is achieved through square root of AVE. CR is also above 0.7 which is minimum level [51].

**Table 2.** Factor Loadings

| | DWS | IQ | RQ | SCE | SQ | SY |
|---|---|---|---|---|---|---|
| DWS2 | 0.903 | | | | | |
| DWS3 | 0.924 | | | | | |
| DWS4 | 0.905 | | | | | |
| DWS6 | 0.873 | | | | | |
| IQ1 | | 0.931 | | | | |
| IQ3 | | 0.93 | | | | |
| IQ4 | | 0.84 | | | | |
| RQ1 | | | 0.907 | | | |
| RQ2 | | | 0.916 | | | |
| RQ3 | | | 0.569 | | | |
| RQ4 | | | 0.878 | | | |
| RQ5 | | | 0.876 | | | |
| SCE1 | | | | 0.881 | | |
| SCE2 | | | | 0.861 | | |
| SCE4 | | | | 0.9 | | |
| SCE5 | | | | 0.898 | | |
| SCE6 | | | | 0.932 | | |
| SQ1 | | | | | 0.898 | |
| SQ2 | | | | | 0.875 | |
| SQ4 | | | | | 0.784 | |
| SQ5 | | | | | 0.77 | |
| SY1 | | | | | | 0.877 |
| SY2 | | | | | | 0.894 |
| SY3 | | | | | | 0.895 |
| SY4 | | | | | | 0.765 |
| SY5 | | | | | | 0.79 |

**Table 3.** Composite reliability and AVE

| | α | rho_A | CR | (AVE) |
|---|---|---|---|---|
| DWS | 0.923 | 0.924 | 0.945 | 0.813 |
| IQ | 0.883 | 0.886 | 0.928 | 0.813 |
| RQ | 0.889 | 0.919 | 0.921 | 0.705 |
| SCE | 0.937 | 0.939 | 0.952 | 0.8 |
| SQ | 0.857 | 0.89 | 0.901 | 0.695 |
| SY | 0.9 | 0.909 | 0.926 | 0.716 |

**Table 4.** Square Root of AVE

| | DWS | IQ | RQ | SCE | SQ | SY |
|---|---|---|---|---|---|---|
| DWS | 0.901 | | | | | |
| IQ | 0.517 | 0.901 | | | | |
| RQ | 0.732 | 0.528 | 0.84 | | | |
| SCE | 0.741 | 0.509 | 0.735 | 0.895 | | |
| SQ | 0.702 | 0.726 | 0.742 | 0.705 | 0.834 | |
| SY | 0.545 | 0.865 | 0.567 | 0.563 | 0.775 | 0.846 |

Hypotheses testing results are given in Table 5. In this study, minimum level of t-value was 1.96. All the hypotheses found t-value above 1.96 was accepted and the hypotheses found t-value below 1.96 was rejected by the study. While analysing the data, the relationship of four independent variables (system quality, information quality, service quality, relationship quality) is found significant positive with data warehouse. Moreover, the relationship between data warehouse and supply chain efficiency was also found significant positive [52]. The results of the study supported all hypotheses.

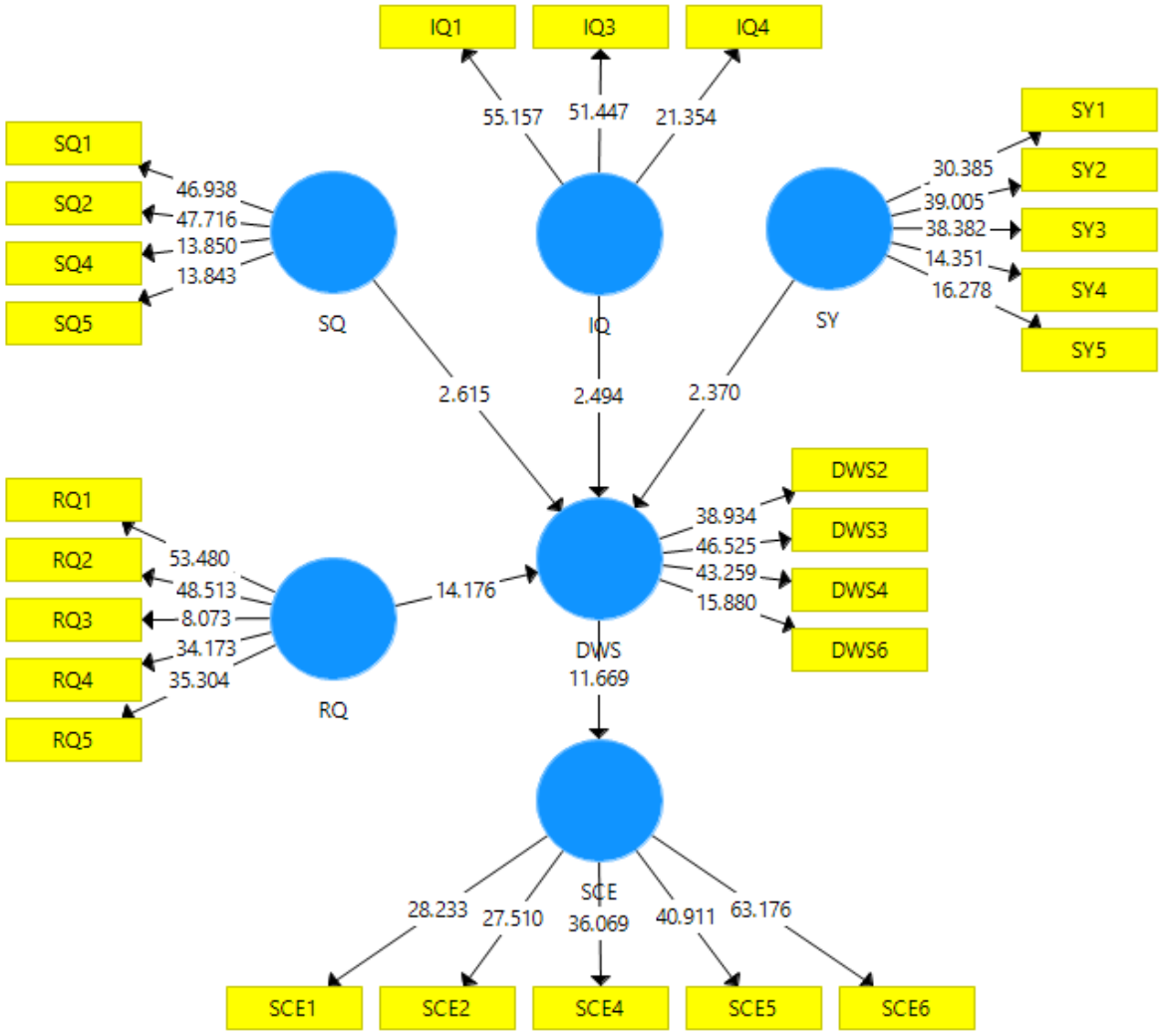


**Figure 6.** Hypotheses Testing

Thus, these indicates that system quality, information quality, service quality and relationship quality have direct relationship with data warehouse and data warehouse has direct relationship with supply chain efficiency [53--61]. Any change in these variables causes to change in

supply chain efficiency in same direction. Figure 5 shows hypotheses testing.

**Table 5.** Hypotheses testing results

| | (O) | (M) | (STDEV) | T Statistics | P Values |
|---|---|---|---|---|---|
| DWS -> SCE | 0.741 | 0.744 | 0.063 | 11.669 | 0 |
| IQ -> DWS | 0.039 | 0.03 | 0.016 | 2.494 | 0.02 |
| RQ -> DWS | 0.882 | 0.882 | 0.062 | 14.176 | 0 |
| SQ -> DWS | 0.056 | 0.055 | 0.022 | 2.615 | 0.01 |
| SY -> DWS | -0.032 | -0.023 | 0.014 | 2.37 | 0.023 |

Moreover, the r-square value in this study is 0.549 for supply chain efficiency. In indicates that all the variables are expected to bring 54.9% change in dependent variable, namely; supply chain efficiency. It is shown in Figure 5 and Table 6.

**Table 6.** R-square value

| Variable | Variance expected |
|---|---|
| Supply chain efficiency | 0.549 |

## 5. Conclusion

The current study is carried out to examine the effect of data warehouse success on supply chain efficiency. This study based on Indonesian supply chain companies. A survey was used in this study to examine the effect of data warehouse success on supply chain efficiency.

Findings of the study highlighted that data warehouse success has vital role to boost supply chain efficiency. Increase in data warehouses success increases the supply chain efficiency among Indonesian supply chain companies. Data warehouse success expediates the operations of supply chain which effect positively on supply chain efficiency. Moreover, various other factors effect on the data warehouse success. These factors include; system quality, information quality, service quality and relationship quality. A good system quality shows positive outcomes. Service quality and relationship quality also has important role to enhance data warehouse success. In this direction, quality of information is crucial. Thus, system quality, information quality, service quality and relationship quality increase the data warehouse success and data warehouse success increases the supply chain efficiency. Therefore, Indonesian supply chain companies should insure good data warehouse system to promote supply chain efficiency.

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