

# An Empirical Analysis on Critical Success Factors for Enterprise Resource Planning (ERP) Implementation in Automobile Auxiliary Industries

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## Abstract

The aim of this study is to investigate Critical Success Factors (CSFs) for Enterprise Resource Planning (ERP) Implementation in Automobile Ancillary Industries (AAIs). Therefore, an in-depth and systematic literature review is done to find out the existing reviews of CSFs. Based on the review, several Discussions, Interviews and Benchmarking with experienced ERP consultants and Project management team with ERP implementations in AAIs. Thus, we showed that all factors found in the literature also affected the success of ERP projects in AAIs. CSFs Training and development, Top Management Support and commitment and Project Management, Advanced Hardware and Software and Change Management will optimize the business Process and improve the business performance and make success of the ERP Implementation. Friedman's ranking analysis and correlation analysis were applied and detailed analysis were submitted on this study. However, within those projects, Advanced Hardware and Software gained much more importance compared to the factors that most influence the success of ERP Implementation in AAIs, factors like Training and Development and Top Management Support and Commitment were even more important than Change Management and which were the most important factors in Success of the ERP Projects. This practical guidance will be helpful for the company owners, senior executives, managers and ERP consultants to be more proactive, efficient and better prepared for making Successful implementation of ERP with their limited resources especially in AAIs.

**Keywords:** Enterprise resource planning, automotive ancillary industry, business performance.

## 1. Introduction

Today's global business environment has brought in new competitions with new opportunities and new challenges. This has resulted in decreasing product life cycles and reducing profit margins. To anticipate and respond quickly to the changing business conditions, the organization needs a solid information system that supports all aspects of business with power and flexibility. Global ERP market has registered huge growth in the past decade. The market witnessed a double-digit growth rate in the past few years indicate that over 30,000 firms worldwide have implemented ERP systems and the vast majority of these deployments have taken place in the period between mid-1990s and 2000 [1]. Research firm Gartner recently released a report saying companies will spend 14.9 percent more on enterprise social software in the year 2010 than in 2009, with the total reaching \$664.4 million (about Rs. 2989 Cr.). According to the report in the year 2011, that figure will jump 15.7 per cent to \$769.2 million (about Rs.3461 Cr.) [2].

ERP market had a spectacular year, with total revenue growing by 14 per cent and license revenue up by 18 per cent from 2005. Also, the sale of traditional applications was very healthy in 2006. Many ERP vendors saw substantial revenue growth from acquisition of other software companies. The ERP application

revenue estimates from 2006 to 2011, as per the report are as follows: for the year 2006 the estimated revenue was 28.8 Billion US \$ which was expected to rise to 32.3 Billion US \$ in 2007, 35.8 Billion US \$ in 2008, 39.4 Billion US \$ in 2009, 43.4 Billion US \$ in 2010 and for the year 2011 the estimated revenue was 47.7 Billion US \$ [3].

The automotive industry across the world has been under tremendous pressure during the past decade due to excess supply and volatile demand in developed countries. As a result, the auto companies across the world are looking for markets with growing demand and locations for cheaper sourcing. Developing countries such as Mexico and the Czech Republic were until recently favorite low cost sourcing options for the top automakers of the world. However, in recent years' Asian countries like India and China have emerged as the markets for low price automobiles and low-cost sourcing options for auto components. Currently, India is the fourth largest car market in Asia and offers a cost saving of up to 30% in the labor cost alone compared to countries like France, England, Germany, Japan, and the US [4].

India has started to pull in noteworthy consideration as an assembling goal, following the climb of China's assembling industry. The following flood of off shoring will happen in the

aptitude serious businesses and India has favorable position in this portion NMCC (2005) [5]. As the

Indian economy started to unwind exchange confinements, in part amid the mid-1980s and all the more exhaustively in the mid 1990s, the car business experienced a progression of key changes.

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The most vital change happened in 1983, when the Indian government permitted a joint wander (JV) between a Japanese automaker (Suzuki Motor Corporation) and an Indian open division organization (Maruti Udyog Limited), through incomplete advancement of the auto segment. The JV "Maruti Suzuki India Ltd." (MSIL) was enabled finished access to a secured advertise, by guaranteeing no other traveler vehicle creators could enter the market, which built up MSIL as a prevailing player. Since Suzuki was constantly high on outsourcing in its Japanese market, it needed to receive a comparable practice in India. Along these lines, the MSIL association started building up an auto segment inventory network in India, encouraging organizations between Indian segment providers and Suzuki's Japanese providers, and now and again going into value organizations to help little scale Indian firms (Gulyani, 2001; Okada, 2004)

## 2. Review of Literature

Automotive Ancillary Industries is a vital industry in manufacturing sector that comprise continuous movement of material from the raw material, intermediate material or finished product that are procured, transformed, stored and sold. Manufacturing costs are rising. Demands are dynamically changing. Business globalization changing the competitor, manufacturers, distributors, dealers and suppliers landscape. They are responding to these challenges by looking the demand and supply of the current trend. ERP extensively helpful in active supply chains in automotive logistics to manage, monitor and reduce the cost. It clarifies the business processes, and improves delivery accuracy to the customer [7]. The Man, Machine, money, method are integrated in ERP. ERP helps the organization to build a supply chain in such a way that easier to manage, anticipate and respond quickly on dynamic changes in the market conditions [8]. It also makes the organization more competitive, like service, productivity and innovation.

Al-Sabaawi, M. Y. M. (2015), projected the paper to study current CFS for Cihan University. Also, suggested the critical success factors in execution of ERP as follows: Support of top management, project management, communication, and organization structure and transfer knowledge to user. It conducted analysis about the factors and found that all the factors for success are acceptable for the ERP execution at higher studies [9].

The critical success factors for implementation of ERP are balanced project team, ERP system configuration and tests, user training, project supervision and organization fit for ERP system. This factor shows the assets of success in the ERP implementation. Also, stated that focusing on the technical aspects of the ERP implementation rather than the organizational aspects to be awareness of the aspect of success [10]. ERP implementation have some constraints to find out the CSF's for ERP. This research identified some factors as the previous as others done by doing interviews and concluded that factors have a great influence on the successful implementation of the ERP [11], ERP implementation in SME's in India stated that development of the

They described the CSF for ERP execution in SME's. They collected the data from 219 SME's to analysis of the efficacy of the CSF's. This study identifies the factors by comparing the value of the aspects which the analysis has done. It also helps to reduce great risks in the execution of ERP in the SME's [12].

Upadhyay, P. & Dan, P. K. (2008), gives the factors for implementation of the ERP in SME's and also a survey on the client firms which are operational on the ERP system. This research points the particular issues as follows: simplicity in goals and purposes behind the implementation, capability of user training, ability of project execution team, acceptance of changes about the implementation and satisfactory vendor support and external consultant support. These factors are mainly affects in the ERP execution in SME's [13].

Automobile Ancillary industries need to implement ERP system as a solution. By implementing ERP systems, it attains a number of benefits include coordination of enterprise-wide operations between or within the organization, inventory control functionality for storage product, rapid real-time data sharing and accessing the information at any time anywhere, customizable interfaces, and scalable for growing business [14]. Therefore; AAI's has been selected for this study. In order to analyze the Critical Success Factors to make the ERP Implementation as Successful. The result of the study will be helpful for the company owners, senior executives, managers and ERP consultants to be more proactive, efficient and better prepared for making Successful implementation of ERP with their limited resources especially in AAI's.

### Problem Statement

The literature reviews reveal that simplicity in goals and purposes behind the implementation, capability of user training, ability of project execution team, acceptance of changes about the implementation and satisfactory vendor support and external consultant support. These factors are mainly affects in the ERP execution in SME's [15]. Unavailability of proper technology, lack of adequate knowledge, ineffective marketing strategy, low production capacity, constraints on expansions and modernization, identification of new markets, increase in levels of exports [9], This study helpful for the company owners, senior executives, managers and ERP consultants to be more proactive, efficient and better prepared for making Successful implementation of ERP with their limited resources especially in AAI's.

### Objectives of this Study

The objectives of this study are as follows:

- To identify and analyze the measures for Critical Success Factors (CSFs) of the ERP Implementation in automobile ancillary industries
- To identify Most Critical Success Factor among the measured Critical Success Factors (CSFs) during the ERP Implementation
- To develop a conceptual model to identify relationship between the measured Critical Success Factors (CSFs) of the ERP Implementation and various factors influencing the success of the ERP Implementation.

## 3. Conceptual Design For Identifying the Critical Success Factors in Erp Implementation in Automobile Ancillary Industries

### Critical Success Factors (CSFs)

For a wide set of activities supported by the multi-module application, ERP system is a generic software that helps

organizations to manage their resources. The ERP system has been shown to provide major developments in efficiency, productivity and service quality and also to lead to a decrement in service costs as well as to more effective decision making. Instead of focusing on individual CSFs, to ensure smooth ERP system deployments studies indicate that firms developed unified CSF models. [15]. An in-depth and systematic literature review was done on CSFs in order to find out the existing reviews of CSFs. Based on the review several Discussions, Interviews and Benchmarking with experienced ERP consultants and Project management team with ERP implementations in AAI. Thus, we showed that all factors found in the literature also affected the success of ERP projects in AAI. Therefore, an in depth understanding about the CSFs Training and development, Top Management Support and commitment and Project Management, Advanced Hardware and Software and Change Management will optimize the business Process and improve the business performance and make of success of the ERP Implementation.

### 1. Extensive Education and Training

Education and training are possibly the most broadly recognized critical success factor, due to the user understanding and buy in is also essential. To enable people to solve problems within the framework of the system ERP implementation requires a critical mass of knowledge. The employees will invent their own processes when they do not understand how a system works using those parts of the system they are able to manipulate. The full benefits of ERP cannot be realized unless end users use the new system properly. The training should start early, preferably well before the implementation is initiated in order to make the end user training successful. Executives often underestimate the level of education and training required to implement an ERP system and the associated costs. Top management must be fully committed to pay enough money on education, end user training and incorporate it as part of the ERP budget. It has been suggested that reserving 10% to 15% of the total ERP implementation budget for training will give an organization an 80% chance of implementation success.

### 2. Top Management Support and Commitment

Top administration support and duty Top administration support and association is a standout amongst the most vital achievement factors for an ERP usage [14]. Conferred administration at the best administration level is the reason for the consistent achievement of each venture [15]. In this manner, developments, specifically new advances, are all the more immediately acknowledged by workers if these developments are advanced by top administration. Prior to the undertaking begins, top administration needs to recognize the idiosyncrasies and difficulties of the arranged ERP execution. Since numerous choices that must be made amid the venture can influence the entire endeavor, these choices will require the acknowledgment and the dedication of the senior administrators and frequently must be made by them. The responsibility of best administration is critical all together for the allotment of vital assets, fast and powerful basic leadership, arrangements of contentions that need venture wide acknowledgment, and supporting collaboration from every unique division.

### 3. Excellent Management Project

Brilliant task administration ERP usage wants that, the associations are occupied with magnificent undertaking administration. This incorporates an unmistakable meaning of goals, improvement of work design, asset design and watchful following of venture advance. Furthermore, the task design ought to set up forceful, achievable, plans that ingrain and furthermore keep up a feeling of desperation. A reasonable meaning of task

targets and an impeccable arrangement will enable the association to maintain a strategic distance from the very basic degree crawl which can strain the ERP spending plan, undermine the undertaking progress and confuse the usage. The venture scope must be obviously characterized at the start of the task and furthermore ought to distinguish the modules chose for the execution and the business forms that are influenced. On the off chance that the administration chooses to execute an institutionalized ERP bundle with no significant changes, this will decrease the need to redo the essential ERP code. This, thus, will lessen the venture many-sided quality and help to keep the usage on plan.

### 4. Organizational Change Management

Hierarchical change administration the current authoritative structure and practices recognized in the majority of the organizations are not versatile with structure, devices, and classifications of data gave by ERP frameworks. Indeed, even the most adaptable ERP framework forces its own particular rationale on an organization's way of life, methodology, and association. 3 Thus, executing an ERP framework may compel the re-building of significant business procedures and creating it to help the association's objectives. The re-planned procedures require comparing realignment in authoritative control to proceed with the adequacy of the re-building endeavors. This realignment more often than not impacts most useful zones and numerous social frameworks inside the association. The subsequent changes

fundamentally influence authoritative approaches, structures, procedures, and workers. Numerous CEOs see ERP as a product framework and the usage of ERP as an essential mechanical test. They don't comprehend that ERP may on a very basic level adjust the manner by which the association works. This is one of the tricky issues looked by the current ERP frameworks. The principle objective ought to be to improve the business not to execute the product. The execution ought to be business driven and coordinated by business needs and not the IT office. ERP usage may trigger genuine changes in corporate culture.

Refusal, opposition, and bedlam will be unsurprising results of the progressions made by the usage, if individuals are not appropriately arranged for the plausible changes. In addition, in the event that legitimate change administration strategies are used then the organization ought to be set up to grasp the open doors gave by the new ERP framework and ERP will make more accessible data and make achievable upgrades that appeared to be conceivable.

To take full preferred standpoint of these open doors the association must be adaptable.

### 5. Advanced Hardware & Software

Using of advanced hardware & latest version of the software will function Faster performance of the ERP with in the network in the organization. The ERP applications, and interface between MES system and ERP System performance would be faster. The Upgraded ERP System might be fixed the current bugs and more features and new functions would be added. So, the new functions, can increase productivity of the business. The business run more faster and more efficient. The latest ERP System software's have Improved security. Upgrading software/Hardware would add more security for the usage of ERP System. It is always important that a company keeps their computers and database safe and up to date with antivirus software. This stops the viruses from catching onto the network computers with in the organization Prevent hackers from getting into company's computers and ERP System, The Organization must get a firewall so that they won't catch a virus

from a website. All unused ports should closed and close won't be any gaps for the hackers to get in.

By installing new ERP software, you would be able to get a new hardware installed onto your network computer in the organization. The upgraded software and hardware have the flexibility to access and whereas the old software won't work to open files None of the organization pay much for a ERP system or waste money if they don't satisfy with the business needs and requirement mapping in the ERP System. Because every business has invested huge budget for the ERP and they need to get the ROI and the business should

1. Integrates all the department of an organization viz. finance, marketing, sales, human resource, purchase, manufacturing, quality control, maintenance, etc.,
2. Retrieves of Management information can be viewed from anywhere at anytime
3. Improves IT infrastructure capability, IT business flexibility, etc.
4. Improves cooperation between the stake holders within and outside the organization.

Based on the objectives the following hypotheses have been framed and tested. For the purpose of testing Friedman Test and Regression Model Analysis were used to find the Most Critical factors and relationship between the Critical Success Factors for successful ERP Implementation.

Null Hypothesis	Alternate Hypothesis
H <sub>0</sub> 1: There is no association between CSFs Training and development with Top Management Support	H <sub>1</sub> 1: There is highly association between CSFs Training and development with Top Management Support
H <sub>0</sub> 2: There is no association between CSF Training and Development with Project Management	H <sub>1</sub> 2: There is highly association between CSF Training and Development with Project Management
H <sub>0</sub> 3: There is no association between CSF Training and Development with Advanced Hardware and Software	H <sub>1</sub> 3: There is highly association between CSF Training and Development with Advanced Hardware and Software
H <sub>0</sub> 4: There is no association between CSF Training and Development with Change Management	H <sub>1</sub> 4: There is highly association between CSF Training and Development with Change Management
H <sub>0</sub> 5: There is no association between CSF Top Management Support with Commitment with Project Management	H <sub>1</sub> 5: There is highly association between CSF Top Management Support with Commitment with Project Management
H <sub>0</sub> 6: There is no association between CSF Top Management Support with Advanced Hardware and Software	H <sub>1</sub> 6: There is highly association between CSF Top Management Support with Advanced Hardware and Software
H <sub>0</sub> 7: There is no association between CSF Top Management Support with Change Management	H <sub>1</sub> 7: There is highly association between CSF Top Management Support with Change Management
H <sub>0</sub> 8: There is no association between CSF Project Management with Advanced Hardware and Software	H <sub>1</sub> 8: There is highly association between CSF Project Management with Advanced Hardware and Software
H <sub>0</sub> 9: There is no association between CSF Project Management Support with Change Management	H <sub>1</sub> 9: There is highly association between CSF Project Management Support with Change Management
H <sub>0</sub> 10: There is no association between CSF Advanced Hardware and Software with Change Management	H <sub>1</sub> 10: There is highly association between CSF Advanced Hardware and Software with Change Management

## 4. Research Methodology

### Survey Design

The survey instrument was designed and used for data collection for this study. This study used both primary and secondary data. Secondary data was collected from websites, thesis, various journals and books. The primary data is collected for the performance measures CSFs from the Business Process owners [BPOs], Top level Management and middle level managers and various business users involved in the ERP Implementation & Usage. A five-point scale (5 indicating strongly agree and 1 indicating strongly disagree) was used in preference to a seven-point scale to increase the sensitivity of the measure.

The various Success factors were identified by the researcher in her pilot study. They were: Training and development, Top Management Support and commitment and Project Management, Advanced Hardware and Software and Change Management. The ranking given by the ERP Business users per their opinions were analyzed with the help of Friedman ranking techniques and the mean scores are presented in Table.

### Data Collection and Sampling Method

Data were collected from 281 respondents who are all having very good knowledge in business process and ERP usage in Automobile ancillary industries who are all manufacturing. The data is collected from Top 20 component manufacturing organization in Tamilnadu with different manufacturing parts. like Drive and Transmission parts, suspension and breaking Systems, Engine and Engines parts, Electrical Parts and Glass Parts. Multistage Random Sampling method used to collect the data from 1100 ERP users.

### Data Analysis and Hypothesis Testing

Collected data were analyzed with the help of software package SPSS and Analysis of Moment Structure (AMOS) Version 20.0. Statistical techniques like descriptive analysis Friedman Test and Regression Analysis were used for data analysis.

## 5. Discussion

### Critical Success Factors for ERP Implementation in Automobile Ancillary Industries

In order to Analyze the different Critical Success factors for ERP Implementation in Automobile Ancillary Industries in India, Friedman's ranking analysis was applied.

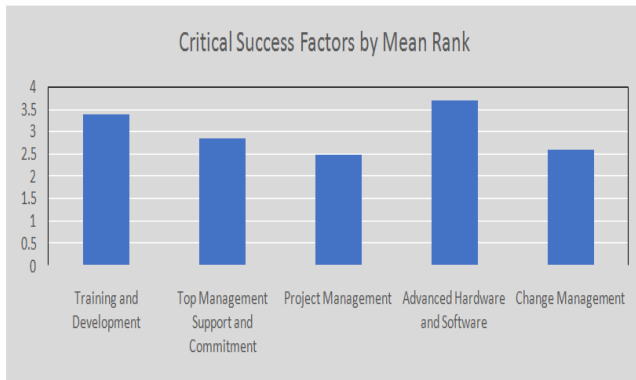
**Table 1:** Friedman Test for Significant Difference among Mean Ranks towards the Critical Success factors in ERP Implementation in Automobile Ancillary Industries

Critical Success Factors	Mean Rank	Rank	Chi square Value	P Value
Training and Development	3.38	II	189.299	0.000**
Top Management Support and Commitment	2.85	III		
Project Management	2.47	V		
Advanced Hardware and Software	3.70	I		
Change Management	2.60	IV		

Note: 1. \*\* Denotes significant at 1% level

From the Table 1, P value is less than 0.01. Hence the null hypothesis is rejected at the 1 percent level of significance. Thus, it is concluded that there is a significant difference among mean ranks towards the different Success factors of ERP Implementation. From the mean rank, Advanced Hardware and Software (3.70) ranked first followed by Training and Development (3.38). Top Management Support and Commitment occupies the third rank with the mean rank of 2.85. Change Management is the fourth rank with the mean ranks 2.60. Project Management is found to be the least Success factors of ERP Implementation in Automobile Ancillary Industries. It has the lowest mean rank of 2.47.

Figure 1 shows critical success factors by mean value. Even though we have 5 factors advanced hardware and software gained much more importance and influence factors compared to the others for the success of ERP Implementation in AAIs,



**Figure 1:** Correlation analysis on critical success factors in ERP implementation

**Table 2:** Showing Pearson Correlation Coefficient between Critical Success Factors in ERP Implementation in Automobile Ancillary Industries

Critical Success Factors	Training and Development	Top Management Support and Commitment	Project Management	Advanced Hardware and Software	Change Management
Training and Development	1.000	0.905**	0.693**	0.702*	0.574**
Top Management Support and Commitment	-	1.000	0.692**	0.633*	0.550**
Project Management	-	-	1.000	0.647*	0.766**
Advanced Hardware and Software	-	-	-	1.000	0.571**
Change Management	-	-	-	-	1.000

Note: \*\* Denotes Significant at 1% level

The correlation coefficient between Critical Success factors on Training and Development and Top Management Support and Commitment is 0.905, which indicate 90.5 percentage positive relationships between Critical Success factors on Training and

Development and Critical Success factors on Top Management Support and Commitment and is significant at 1% level.

The correlation coefficient between Critical Success factors on Training and Development and Project Management is 0.693, which indicate 69.3 percentage positive relationships between Critical Success factors on Training and Development and Critical Success factors on Project Management and is significant at 1% level.

The correlation coefficient between Critical Success factors on Training and Development and Advanced Hardware and Software is 0.702, which indicate 70.2 percentage positive relationships between Critical Success factors on Training and Development and Critical Success factors on Advanced Hardware and Software and is significant at 1% level.

The correlation coefficient between Critical Success factors on Training and Development and Change Management is 0.574, which indicate 57.4 percentage positive relationships between Critical Success factors on Training and Development and Critical Success factors on Change Management and is significant at 1% level.

The correlation coefficient between Critical Success factors on Top Management Support and Commitment and Project Management is 0.692, which indicate 69.2 percentage positive relationships between Critical Success factors on Top Management Support and Commitment and Critical Success factors on Project Management and is significant at 1% level.

The correlation coefficient between Critical Success factors on Top Management Support and Commitment and Advanced Hardware and Software is 0.633, which indicate 63.3 percentage positive relationships between Critical Success factors on Top Management Support and Commitment and Critical Success factors on Advanced Hardware and Software and is significant at 1% level.

The correlation coefficient between Critical Success factors on Top Management Support and Commitment and Change Management and Commitment is 0.550, which indicate 55 percentage positive relationships between Critical Success factors on Top Management Support and Commitment and Critical Success factors on Change Management and is significant at 1% level.

The correlation coefficient between Critical Success factors on Project Management and Advanced Hardware and Software is 0.647, which indicate 64.7 percentage positive relationships between Critical Success factors on Training and Development and Critical Success factors on Advanced Hardware and Software and is significant at 1% level.

The correlation coefficient between Critical Success factors on Project Management and Change Management is 0.766, which indicate 76.6 percentage positive relationships between Critical Success factors on Training and Development and Critical Success factors on Change Management and is significant at 1% level.

The correlation coefficient between Critical Success factors on Advanced Hardware and Software and Change Management is 0.571, which indicate 57.1 percentage positive relationships between Critical Success factors on Advanced Hardware and Software and Critical Success factors on Change Management and is significant at 1% level.

## 6. Conclusion

From the Friedman’s ranking analysis, Advanced Hardware and Software gained much more importance compared to the factors that most influence the success of ERP Implementation in AAIs, factors like Training and Development and Top Management Support and Commitment were even more important than Change Management and which were the most important factors.

From the Pearson Correlation Coefficient Analysis, Critical Success Factors Training and Development, Advanced Hardware

and Software, Project management, Change Management and Top Management Support and Commitment are highly Correlated in ERP Implementation in Automobile Ancillary Industries [28] The Implications of Research for Automobile Ancillary Industries are as follows.

Many executives or directors of Automobile Ancillary Industries were suspicious about implementing the ERP system successfully to achieve the Business Performance, KPIs set by the organization and benefits of modern information systems like ERP. Findings through systematic study, design, analysis and result, will be helpful for the company owners, senior executives, managers and ERP consultants to be more proactive, efficient and better prepared for making Successful implementation of ERP with their limited resources. This will encourage such type of implementations in Indian Automobile Auxiliary Industry.[29]

This research work develops action plan for switching over of organization from legacy system to Advanced ERP solutions like cloud based system, open source ERP systems for Automobile Ancillary Industries in order to face the global challenges.

In knowledge based economy, Indian Automobile Ancillary Industries are more challenges to provide high quality product at low cost, to remain more competitive in world. Automobile Ancillary Industries represent the spinal cord of Indian economy. To improve productivity and overall business performance, Enterprise Resource Planning (ERP) is one of the best solutions for the Automobile Ancillary Industries in order to face the global challenges.

From the above systematic study, design, analysis and result, this study met the stated objectives.

1. Identified and analyzed the measures for Critical Success Factors (CSFs) of the ERP Implementation in automobile ancillary industries.
2. Identified Most Critical Success Factor among the measured Critical Success Factors (CSFs) during the ERP Implementation.
3. Developed a conceptual model to identify relationship between the measured Critical Success Factors (CSFs) of the ERP Implementation and various factors influencing the success of the ERP Implementation.

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