An Application of Senge’s Learning Model

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Abstract
The present study adopted Senge’s Learning Organization that captures OL under five constructs: Systems thinking, Personal mastery, mental models, Building shared vision, Team learning to investigate the characteristics of learning organization. This study confirmed that organization with the development of their learning process could able to increase their organization performance directly.

Keywords: Organization learning, organization performance, India, South India

Introduction
In the past decade, technological innovation is evidently shown to play a crucial role in the international competition. Hence, scientific and technological capacity decides the export performance of the country (Castells and Laserna, 1989; Drucker, 1993). Senge (1990), suggests that a building up of a continuous learning and improvement -based organization is the best way to keep up with the competition. Senge also suggest that further argues that Organization Learning (OL) controls many factors of an organization that includes manufacturing activities also.

In spite of the crucial requirement of theoretical models, organizational learning and technological advance are important qualification to study the dynamic process of capability building and consequently inform the policy makers on the design of appropriate strategies for industrial progress. Thus, the need was felt in the present study to examine the impact of organizational learning on the organizational performance of South Indian automobile industries.

The Indian Automobile Industry
The manufacturing equipment used in the industry’s plant are the result of a learning process emphasizing the competence and the dynamic capabilities of the industry. The investment on the manufacturing technologies is non-reversible or sunk costs as it represents the long-term commitments (Ghemawat, 1991).

In any organization, resistance to innovation probably results in the business collapse. Employees working in the innovative environment are more likely to share and transfer knowledge and novel ideas efficiently among individuals which is crucial for new product innovation (Cohen and Levinthal, 1990; Hansen, 1999). Researchers ( Stata, 1989; Whipp and Pettigrew, 1991) argue that growing numbers of organizations have realized that the approach in which an organization learns is the key to innovation and for making a beneficial enterprise. Organizations tend to increase their malleability and efficiency during times of change, as exemplified by innovation, collaboration, culture shifts and high morale, especially during times of uncertainty and external challenge (Pentland, 1995).

Theoretical background and Hypothesis
Organizational learning and Organizational performance
Senge (1990) defined OL as a “Continuous testing of experience and its transformation into knowledge available to whole organization and relevant to their mission”.

According to Senge (1990) learning organizations are: organizations wherein people continuously develop their capability to invent the desired results; where novel and expansive patterns of thinking are cultivated, where there is freedom for collective ambition, and where people are
continuously learning to perceive the whole together. The five component technologies five that Senge (1990) identified are Systems thinking, Personal mastery, mental models, Building shared vision, Team learning.

In this respect, several studies applied OL in technology intensive industries as a main factor to maintain innovation. The model is shown in Figure 1. This Senge model has the capacity to react to the changes in the external environment, and then provide the source to alter and change the existing rules and strategies.

By utilizing the Senge (1990) model, the present study applies the model in automobile industry. Therefore it has been hypothesized as follows:

**H1:** Significant positive relationship between Systems thinking and Organizational performance

**H2:** Significant positive relationship between Mental Models and Organizational performance

**H3:** Significant positive relationship between Building Shared Vision and Organizational performance.

**H4:** Significant positive relationship between Team Learning and Organizational performance

**H5:** Significant positive relationship between Personal Mastery and Organizational performance

**H6:** Significant positive relationship between Organizational Learning and Organizational performance

**Research Methodology**

The present empirical research study was based on data collected from Indian automobile manufacturing industries. For the purpose, the random sampling method was employed not only to select a representative sample but also to minimize sample error in the study. The questionnaires were given to 400 participants in South India. Only 335 participants completed with a response rate of 84.0 per cent. The data collection was made during the year 2012-2013 using paper-pencil method and email with gentle reminder calls to the participants.

**Research Instruments**

The research instrument in this study was a structured Closed-Ended questionnaire with 59-items to measure the employee’s perceptions on learning organization. The questionnaire was developed based on the concept of five key disciplines proposed by Senge’s (Senge, 1990) model. The questionnaire was classified into 6 segment, namely: Systems Thinking, Mental model, Building Shared Vision, Team Learning, Personal Mastery they are considered as independent variables, whereas Organizational performance (financial and non-financial measures: are taken as dependent variables in the study. The questionnaire consisted of four sections and the responses were collected on a 5-point Likert Scale ranging from “1-strongly disagree” to “5-Strongly Agree”, which was employed for uniform grading of responses.

**Sample**

The survey population includes employees of top Indian automobile manufacturing industries according to Society of Indian Automobile Manufacturers (SIAM) report. The sample industries were from South India Region, which includes Hyundai, Toyota, Ashok Leyland, Caterpillar, Ford, Tafe and Renault-Nissan. The participants were selected based on the method of systematic random sampling. At the first stage, lists of firms were obtained from SIAM and using a computer generated numbers, eight leading companies were identified. Further, after obtaining permission from the industry, a list of employees was obtained from Human Resource Department (HRD) of each automobile sector, based on systematic sampling method. Hence, every 3rd employee in the list was chosen again using computer generated random sampling method. In subsequent stages, non-probability sampling also been followed, especially when the response rate was poor, the non-probability sampling method was adopted. The minimum sample size based on a 95% confidence interval (z value= 1.96) was found to be 354. However, sample size was rounded to 400, the convenience of the study. At the end of the process, only 335 respondents were responded for the study.
Data Analysis
The collected data from the study sample were subjected to data analysis using SPSS software (IBM Corp. Released 2012, version 21.0, Armonk, NY: IBM Corp). Descriptive statistics was used to compute the mean and standard deviation of the study variables. Reliability and validity of the dimensions were tested using Cronbach’s alpha and exploratory factor analysis respectively. The determination of normality was checked using Skewness and Kurtosis. Factor analysis was used to identify dimensions and the underlying patterns of Structural Equation Modeling (SEM). The model is a combination of econometric modeling and confirmatory factor analysis (CFA), which aimed to analyze the relationship among latent constructs and it allows for simultaneous testing for multiple endogenous variables. All measurement items were standardized and missing values were replaced by sample means to examine validity, reliability, and statistical power and the existing relationships. The impacts of each factor were represented by the path coefficients and corresponding levels of significance. P value <0.05 was considered significant in the study.

Results

Characteristics of the participants
The demographic characteristics of participants (n=335) who responded to the study were as follows: Majority of the participants were in less than 30 years age group (62.7%) with qualification of bachelor’s degree (49.9%). The highest percentage of respondents had the designation of middle management (41.8%), followed by supervisory and technical persons with 30.1 and 19.7 percent respectively. Further, 59.7 per cent of the participants had at least 5-10 years of experience in their current organization under general shifts (65.1%) system.

Reliability and validity tests
Reliability and validity tests were conducted on constructs with multivariate measures. Cronbach’s reliability estimates were applied to measure the internal consistency of these multivariate scales (Nunnally, 1978). The reliability of various dimensions of organizational learning ranged from 0.78 – 0.918. Thus testing instrument is highly applicable to the present sample in the study. The results (Table 1) show that the Cronbach’s alpha for all dimensions is greater than 0.7, which indicates higher level of reliability for the survey instrument in the study (Cuieford,1965). In addition, the item-to-total correlations for each measure were tested and was found to be at least 0.78. Based on Kerlinger (1999) measures with item-to-total correlations larger than 0.60, it is believed to have high-criterion validity. In conclusion, the criterion validity of each scale is well suitable for the present study.

Further, Table 2 presents the coefficient of correlation between the five latent factors and with organizational performance. Overall, the findings shows low correlation between the independent variable of OL and dependent variable of organizational performance though, it is statistically significant. The correlation values of the study indicates that the inter correlation among the sub variables of OL were found to be with the range 0.212 to 0.68. Thus, it was found the adequacy of the testing instrument for the further proceedings.

To validate the theoretical model of the learning organization suggested by Senge (1990), CFA with AMOS was applied. CFA requires an assumption of the non-existence of collinearity among variables. Collinearity exists when “absolute values of one or more of the zero-order correlation coefficients between independent variables are relatively high, say 0.70 or larger” (Mueller, 1996). Inspection of the correlation matrix in the Table 1 shows no correlation coefficients was found not greater than 0.70. Therefore, the problem of collinearity did not exist in the study.

Analysis of the Structural Equation Model
This section deals with the construction and analysis using the structural equation model. Table 2 demonstrate the model fit, which was assessed using global fit (seven different fit indices) and ‘r’ to determine the degree to which the hypothesized model is consistent with the data in hand. In other
words, the degree to which the implicit matrix of co-variances, (based on the hypothesized model), and the
sample covariance matrix, based on data it seems to fit (Bollen, 1989). The structural model, the
quality of fit was acceptable representation of the sample data (S-B \( x^2 \) (355) = 0.198, \( p=0.91 \), GFI
(Goodness of Fit Index) =1.000, AGFI (Adjusted Goodness of Fit Index )=0.998), which is much larger
than the criteria of 0.90 as recommended by (Joreskog and Sorbom, 1981) and (Hu and Bentler, 1999).
Similarly, CFI=1.000, RMR (Root Mean Square Residuals) =0.001 and RMSEA (Root Mean Square
Error of Approximation) =0.000, values are below the critical value of 0.05 proposed by (Steiger,
1989).

The Table 3 shows the variables in SEM analysis. The inspection of the table support for the
first five hypotheses (H₁ – H₅) made in the study. In particular, Systems thinking (H₁: standardized path
coefficient = 0.248, robust \( t \)-value = 4.205; \( p<0.001 \), Mental Model (H₂: standardized path coefficient
= 0.182, robust \( t \)-value = 3.100; \( p<0.001 \), Building Shard Vision (H₃: standardized path coefficient = 0.294, robust \( t \)-value = 4.822; \( p<0.001 \), Team Learning (H₄: standardized path coefficient = 0.249, robust \( t \)-value = 3.954; \( p<0.001 \), Personal Mastery (H₅: standardized path coefficient = 0.259, robust \( t \)-value = 4.360; \( p<0.001 \) positively influences on Organisational Performance (OP). Results indicated
that organizational learning has a whole accounted for 31.7 percent variance to predict organizational
performance in Indian automobile manufacturing firms.

Discussion and Conclusion
The important claims made by the Indian learning organization literature from Automobile Industries,
is that developing a learning capability can improvise organizational performance. The results of this
empirical study showed that there is a significant and positive relationship between organizational
learning and organizational performance variables. It lends support to the claim that having learning
capability has positive payoffs for an organization in respect to a number of desired performance
outcomes. The findings of the current study are in line with the findings of prior studies concerning
a causal relationship exists between variables of organizational learning (Such as System thinking,
mental model, Building shared vision, Team learning, Personal mastery) and organizational
performance (García-Morales et al., 2008; Jyothibabu et al., 2010; Wang et al., 2010), particularly
establishment of positive and significant relationship (Bontis et al., 2002; García-Morales et al., 2008;

Organizational learning is the fundamental aspect of competitiveness and links with knowledge
acquisition and performance improvement. In Organizational learning, people are constantly
developing their capacities to attain the favorable results. New modes of learning were develop based
on the needs of the organization (Fallah and Amirtash, 2010; Senge, 1990). In the present study, the
findings from SEM analysis revealed that Building shared vision has greater influence on organizational performance followed by personal mastery, Team learning, system thinking and mental
model. The findings of the present study provided a different viewpoint in regard to the influence of
variables of organizational learning on organizational performance. The building shared vision and
personal mastery enhances the organizational performance to yield higher profits and extended the
product range (Alegre and Chiva, 2008; Van Gils and Zwart, 2004). Empirical evidences suggest that
personal mastery influences organizational performance directly and indirectly through organizational
learning (Blackler and McDonald, 2000; García-Morales et al., 2007; García-Morales et al., 2006).
There is a desire to gain an organizational knowledge which establishes the importance of the
organizational learning and creates a shared vision that can unite the members of the learning
organization (King, W., & Marks, 2008; Treleaven, 2004; Wheatley, 2001). Team learning practices is
related to activities which are designed to enhance the acquisition of shared knowledge, skills and
attitudes by a collective work group (Edmondson, 2002; Ellis et al., 2003).

The present study emphasized the positive relationship between the organizational learning and
organizational performance. The finding is in line with the previous empirical studies were the
organizational learning has positive impact on the organizational performance (Bontis et al., 2002;
Kassim et al., 2013; Škerlavaj et al., 2007). In a study by Jyothibabu et al. (2010) learning as a team or
as a group mediates the organizational performance. There is a causal relationship between
organizational learning and organizational performance (García-Morales et al., 2008; Jyothibabu et al., 2010; McElroy, 2000; Wang et al., 2010). Organizations learn more effectively from failures rather than successes as the knowledge gained from failure depreciates gradually than knowledge from success. The experiences obtained from the failures influences the learning of the organization effectively. Thus, the adopted conceptual framework in the study of organizational learning can be adaptation and implemented through the study was executed in south Indian the frame work can be implemented at various geographical area in a particular industry can determine validate the concept of organizational learning.

Conclusion
The basis for new concepts and solutions developed are based on the manufacturing systems progression placed in the firm’s plant. This study utilized the theoretical frameworks on organizational learning for adaptation in the automobile industry and also determined the validity of the concept. Hence, this present study offers the foundation for testing the validity of the concept of organizational learning. Development of organizational learning attributes in the present study includes Systems thinking, Personal mastery, Mental models Building shared vision and Team learning. A different innovative organizational learning factor creates impact on the function of an organization and suggested the suitable recommendations for the Indian automobile companies. Hence the current pragmatic research has clearly indicated the positive impact of Systems Thinking, Mental Model, Building Shared vision, Team Learning, Personal Mastery on organizational performance.

Practical Implications
An implication for managers is that the results of this empirical study can provide a stronger business case for investing time and manpower resources into developing a learning capability in an organization. The results of the present empirical study suggest that there are positive benefits that can accrue to an organization in developing a learning capability, such as increases in innovation capacity, competitiveness, and job satisfaction of employees. As a result of building the individual’s learning capability increased the organizations performance. Thus the managers has to assess these financial and non-financial performance measures to support their argument that learning capability which is also can be linked to tangible results.

Even though the empirical results of the study largely support the current model with proved hypotheses, at least two limitations should be carefully considered. Firstly, since individual informants/ participants provide the empirical data, possible biases may exist. Second, the data were collected only from the South Indian automobile industries; the characteristics of the firms surveyed may be quite different from those in other regions or countries. Hence, the present results should not be assumed / justified to represent the general case. However, it may provide a fundamental reference for the firms located in other regions or countries whose environmental factors are similar to those of South India.

References


Tables and Figures

Tables

Table 2: Reliability Analysis (N=335)

<table>
<thead>
<tr>
<th>Factors</th>
<th>No. of items</th>
<th>Mean±SD</th>
<th>Cronbach's alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Thinking</td>
<td>15</td>
<td>3.48±0.54</td>
<td>0.856</td>
</tr>
<tr>
<td>Mental models</td>
<td>28</td>
<td>3.47±0.55</td>
<td>0.918</td>
</tr>
<tr>
<td>Building Shared Vision</td>
<td>8</td>
<td>3.85±0.52</td>
<td>0.780</td>
</tr>
<tr>
<td>Team Learning</td>
<td>8</td>
<td>4.09±0.51</td>
<td>0.791</td>
</tr>
<tr>
<td>Personal Mastery</td>
<td>10</td>
<td>3.65±0.54</td>
<td>0.826</td>
</tr>
<tr>
<td>Organizational learning (Overall)</td>
<td>69</td>
<td>3.71±0.41</td>
<td>0.951</td>
</tr>
<tr>
<td>Organizational performance</td>
<td>9</td>
<td>4.01±0.60</td>
<td>0.918</td>
</tr>
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</table>

Table 2: Pearson Correlation Coefficient between Dimensions of Learning and Organizational Performance

<table>
<thead>
<tr>
<th>Dimensions of OL &amp; OP</th>
<th>Systems Thinking</th>
<th>Mental Models</th>
<th>Building Shared Vision</th>
<th>Team Learning</th>
<th>Personal Mastery</th>
<th>Organizational Performance (OP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systems Thinking</td>
<td>1.00</td>
<td>0.679**</td>
<td>0.488**</td>
<td>0.371**</td>
<td>0.552**</td>
<td>0.225**</td>
</tr>
<tr>
<td>Mental Models</td>
<td>-</td>
<td>1.00</td>
<td>0.550**</td>
<td>0.517**</td>
<td>0.616**</td>
<td>0.167**</td>
</tr>
<tr>
<td>Building Shared Vision</td>
<td>-</td>
<td>-</td>
<td>1.00</td>
<td>0.551**</td>
<td>0.461**</td>
<td>0.255**</td>
</tr>
<tr>
<td>Team Learning</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.00</td>
<td>0.315**</td>
<td>0.212**</td>
</tr>
<tr>
<td>Personal Mastery</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.000</td>
<td>0.232**</td>
</tr>
<tr>
<td>Organization Performance (OP)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Note: 1. ** Denotes significant at 1% level 2. * Denotes significant at 5% level

Table 3: Structural Equation Model Analysis for dimensions of Organizational Learning and Organizational performance

<table>
<thead>
<tr>
<th>Variables</th>
<th>Unstandardised co-efficient</th>
<th>S.E</th>
<th>Standardized co-efficient</th>
<th>'t' value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Thinking ← Organizational Performance</td>
<td>0.248</td>
<td>0.059</td>
<td>0.225</td>
<td>4.205</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>Mental Models ← Organizational Performance</td>
<td>0.182</td>
<td>0.059</td>
<td>0.167</td>
<td>3.100</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>Building Shared Vision ← Organizational Performance</td>
<td>0.294</td>
<td>0.061</td>
<td>0.255</td>
<td>4.822</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>Team Learning ← Organizational Performance</td>
<td>0.249</td>
<td>0.063</td>
<td>0.212</td>
<td>3.954</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>Personal Mastery ← Organizational Performance</td>
<td>0.259</td>
<td>0.059</td>
<td>0.232</td>
<td>4.360</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>Organizational Learning ← Organizational performance</td>
<td>0.072</td>
<td>0.030</td>
<td>0.120</td>
<td>2.369</td>
<td>0.018*</td>
</tr>
</tbody>
</table>

Note: 1. ** Denotes significant at 1% level 2. * Denotes significant at 5% level
Table 4: Model fit summary

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Suggested value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMSEA</td>
<td>0.000</td>
<td>&lt; 0.08 (Hair et al., 2006)</td>
</tr>
</tbody>
</table>

**Figure 1** Conceptual Model

**Figure 2** Dimension on overall Organizational Performance (South Indian Automobile Industries)