CRITICAL SUCCESS FACTORS OF ENTERPRISE RESOURCE PLANNING
POST-IMPLEMENTATION SUCCESS IN AUTOMOTIVE INDUSTRY

EHSAN KISH HAZRAT SOLTAN

UNIVERSITI TEKNOLOGI MALAYSIA
CRITICAL SUCCESS FACTORS OF ENTERPRISE RESOURCE PLANNING
POST-IMPLEMENTATION SUCCESS IN AUTOMOTIVE INDUSTRY

EHSAN KISH HAZRAT SOLTAN

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DEDICATION

I dedicate this thesis to my honorable father and mother “Gholam Reza” and “Fereshteh”, Also my lovely sister “Atena” and supportive brother “Pezhman”. Your influence enabled me to pursue this journey and complete it. By you, I learned to nurture an inquisitive mind, find great joy in learning, and have the determination to complete what you started. You are the foundation for my achievement, thank you.
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ABSTRACT

Enterprise resource planning (ERP) has been widely used to improve productivity, increase the efficiency of business operations and reduce firm’s costs. ERP implementation is highly beneficial, however, sustaining those benefits are challenging for most organisations at post-implementation phase. Based on the reviewed literature, there is no clear evidence of comprehensive investigation done on the effects of critical success factors (CSFs) of ERP post-implementation success. This study uses past literature, as well as the existing theoretical and conceptual frameworks to illustrate a new conceptual framework that incorporates CSFs with technological, organisational and environmental theory (TOE). The CSFs are ERP technological factors, ERP organisational factors and ERP environmental factors. The data collection instrument used in this study is a questionnaire. Using cross-sectional survey method, data were collected from 290 suppliers in the Iranian automotive industry. They were identified through stratified sampling method. Hypothesised relationships were examined using partial least squares structural equation modeling technique (PLS-SEM). The results highlighted positive effects of some CSFs of ERP, namely ERP data accuracy, ERP communication and ERP training benefits. In addition, the results of the study were aligned with TOE and life cycle theory (LCT), underlining the roles of some key CSFs of ERP. Findings of this study have contributed theoretically to the ERP by demonstrating new insights on technological, organisational and environmental factors on ERP benefits particularly in Iran. Finally, the study could be used as a guideline to encourage managers to focus more on CSFs of ERP for organisations to obtain more benefits.
ABSTRAK

Perancangan sumber perusahaan (ERP) telah digunakan secara meluas untuk mempertingkatkan produktiviti, meningkatkan kecepatan operasi perniagaan dan mengurangkan kos firma. Pelaksanaan ERP adalah sangat bermanfaat, walau bagaimanapun, mengekalkan manfaat tersebut adalah mencabar bagi kebanyakan organisasi pada fasa pasca pelaksanaan. Berdasarkan semakan literatur, tidak terdapat bukti yang jelas mengenai siasatan menyeluruh dilakukan terhadap kesan faktor kejayaan kritikal (CSFs) bagi kejayaan pasca pelaksanaan ERP. Kajian ini menggunakan literatur yang lalu, serta rangka kerja teoretikal dan konseptual sediada untuk menggambarkan kerangka konseptual yang baharu dengan menggabungkan CSFs dengan teori teknologi, organisasi dan persekitaran (TOE). CSFs tersebut ialah faktor teknologi ERP, faktor organisasi ERP dan faktor persekitaran ERP. Instrumen pengumpulan data yang digunakan dalam kajian ini ialah borang soal selidik. Dengan menggunakan kaedah tinjauan keratan rentas, data telah dikumpulkan daripada 290 pembekal di dalam industri automotif Iran. Mereka telah dikenal pasti melalui kaedah pensampelan berstrata. Hubungan hipotesis telah diuji menggunakan teknik kuasa dua terkecil separa untuk pemodelan persamaan berstruktur (PLS-SEM). Keputusan menunjukkan kesan positif beberapa CSFs ERP iaitu ketepatan data ERP, komunikasi ERP dan manfaat latihan ERP. Di samping itu, hasil kajian adalah selari dengan teori TOE dan kitaran hayat (LCT) yang menggariskan peranan beberapa CSFs ERP yang penting. Hasil kajian ini telah memberi sumbangan dalam bentuk teori kepada ERP dengan menunjukkan sudut pandangan baharu berkaitan faktor teknologi, organisasi dan persekitaran ke atas manfaat ERP terutamanya di Iran. Akhir sekali, kajian ini boleh digunakan sebagai panduan untuk menggalakkan para pengurus memberi lebih tumpuan kepada CSFs ERP bagi organisasi memperolehi lebih banyak manfaat.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARATION</td>
<td>ii</td>
<td></td>
</tr>
<tr>
<td>DEDICATION</td>
<td>iii</td>
<td></td>
</tr>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>iv</td>
<td></td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>v</td>
<td></td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>vi</td>
<td></td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>vii</td>
<td></td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xvi</td>
<td></td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xix</td>
<td></td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>xxi</td>
<td></td>
</tr>
<tr>
<td>LIST OF APPENDICES</td>
<td>xxii</td>
<td></td>
</tr>
</tbody>
</table>

1 INTRODUCTION 1
1.1 Introduction 1
1.2 Background of The Study 1
1.3 ERP in Automotive Industry of Iran 5
1.4 Problems Statement 8
1.5 Research Questions 14
1.6 Research Objectives 14
1.7 Significance of The Study 15
1.8 Scope of The Study 17
1.9 Operational Definitions 18
1.9.1 Dependent Variables (DV)s: 18
1.9.2 Independent Variables (IV)s: 19
1.10 Outline of The Thesis 21
2 LITERATURE REVIEW

2.1 Introduction 22

2.2 Enterprise Resource Planning 24
  2.2.1 Evolution of ERP System 25
  2.2.2 Definitions of ERP 28

2.3 ERP Life Cycle 29

2.4 ERP Benefits 32
  2.4.1 ERP Post-Implementation Success (PIS) 34
  2.4.2 ERP Benefits in Post-Implementation Phase 37
    2.4.2.1 Operational Benefits (OP) 37
    2.4.2.2 Managerial Benefits (MB) 38
    2.4.2.3 Strategic Benefits (SB) 38
    2.4.2.4 IT Infrastructure Benefits (IT) 39
    2.4.2.5 Organizational Benefits (OR) 39
  2.4.3 ERP Benefits in This Study 40

2.5 ERP Critical Success Factors (CSFs) 42

2.6 CSFs Across the ERP Life Cycle 43
  2.6.1 CSFs in Pre Implementation and Implementation Phase 45
  2.6.2 Previous Studies on ERP Post-Implementation 46
  2.6.3 CSFs in Post-Implementation Phase 54
    2.6.3.1 ERP Top Management Support 56
    2.6.3.2 ERP External Consultants Support 57
    2.6.3.3 ERP User Support 58
    2.6.3.4 ERP Alignment with Organization Operation 58
    2.6.3.5 ERP Training 58
    2.6.3.6 ERP Implementation Team 59
    2.6.3.7 ERP Communication 59
    2.6.3.8 ERP External Pressure 60
    2.6.3.9 ERP Project Management 60
    2.6.3.10 Organizational Culture 60
    2.6.3.11 ERP Planning 61
    2.6.3.12 ERP Learning 61
    2.6.3.13 ERP External Trust 62
    2.6.3.14 ERP Data Accuracy 62
2.6.3.15 ERP Configuration 62
2.6.3.16 ERP Attributes 63
2.6.3.17 ERP Internal Expertise 63

2.7 Justification in Relation to Ignoring Control Variables and Moderator 64

2.8 Need to Categorize ERP CSFs 65

2.9 Theoretical Foundations 67
   2.9.1 The Technological, Organizational and Environmental (TOE) Theory 67
   2.9.2 Theoretical Foundation of Life Cycle Theory and TOE Theory 69

2.10 The Contribution of the Framework to the Knowledge 69

2.11 Justification for Categorizing CSFs by TOE Factors 71

2.12 Conceptual Framework and Development of The Hypotheses 73
   2.12.1 ERP Technological Factors Influence Post-Implementation Success (PIS) of ERP 78
      2.12.1.1 ERP Attributes Influence PIS of ERP 79
      2.12.1.2 ERP Internal Expertise Influence PIS of ERP 80
      2.12.1.3 ERP Data Accuracy Influence PIS of ERP 82
      2.12.1.4 Project Management and PIS of ERP 83
      2.12.1.5 ERP Configuration Influence PIS of ERP 84
      2.12.1.6 Implementation Team Influence PIS of ERP 85
      2.12.1.7 ERP Communication Influence PIS of ERP 85
   2.12.2 ERP Organizational factors Influence Post-Implementation Success (PIS) of ERP 87
      2.12.2.1 ERP Top Management Support Influence PIS of ERP 89
      2.12.2.2 ERP Alignment with Organization Operation Influence PIS of ERP 90
      2.12.2.3 Planning Influence PIS of ERP 91
      2.12.2.4 Organizational Culture Influence PIS of ERP 92
      2.12.2.5 ERP Training Influence PIS of ERP 93
      2.12.2.6 ERP Learning Influence PIS of ERP 94
      2.12.2.7 ERP User Support Influence PIS of ERP 94
2.12.3 Environmental factors Influence Post-
Implementation Success (PIS) of ERP 95

2.12.3.1 ERP External Pressure Influence PIS of ERP 96

2.12.3.2 ERP External Consultant Support Influence PIS of ERP 97

2.12.3.3 ERP External Trust Influence PIS of ERP 98

2.13 Summary of the Chapter 100

3 RESEARCH METHODOLOGY 101

3.1 Introduction 101

3.2 Research Design and Operational Framework 103

3.2.1 Research Method and Design Appropriateness 105

3.3 Target Population of This Study 107

3.4 Selection of the Best Respondents to Represent the Company in Relation to ERP Post-Implementation Success 108

3.4.1 IT Managers, CEOs and CIOs Best Representatives of ERP PIS 109

3.5 Sampling Process 111

3.5.1 Sampling Size of the Study 111

3.5.2 Sampling Method 113

3.6 Data Collection Procedures 116

3.6.1 The Measurement Instruments 116

3.7 Validity and Reliability of the Instrument 118

3.7.1 Content Validity 118

3.7.1.1 Pre-test 119

3.7.1.2 Face validity 120

3.7.1.3 Pilot Study 121

3.7.1.4 Reliability 121

3.7.2 Construct Validity 122

3.8 Descriptive Statistics 125

3.9 Inferential Statistics 126

3.9.1 Structural Equation Modelling (SEM) 126

3.9.1.1 Justification to Choose the Partial Least Square (PLS) 127

3.9.1.2 Assessing the Measurement Models 129
4.9.2.1 Internal Consistency Reliability and Indicator Reliability 166
4.9.2.2 Convergent Validity 167
4.9.2.3 Discriminant Validity 174
4.9.3 Assessment of Structural Model 179
4.9.3.1 Determination of Coefficient (R2) 180
4.9.3.2 Effect Sizes (f2) and (q2) 181
4.9.3.3 Path Coefficient Estimates (β) 182
4.9.3.4 Goodness-of-Fit Index 183
4.10 Results of Hypothesis Testing 184
4.10.1 The Relationship between ERP Attributes and ERP Post-Implementation Success 184
4.10.2 The Relationship between ERP Internal Expertise and EPIS 185
4.10.3 The Relationship between the ERP Data Accuracy and ERP Post-Implementation Success 185
4.10.4 The Relationship between ERP Project Management and ERP Post-Implementation Success 186
4.10.5 The Relationship between ERP Configuration and ERP Post-Implementation Success 187
4.10.6 The Relationship between ERP Implementation Team and ERP Post-Implementation Success 188
4.10.7 The Relationship between ERP Communications and ERP Post-Implementation Success 189
4.10.8 The Relationship between ERP Top Management Support and ERP Post-Implementation Success 190
4.10.9 The Relationship between ERP Alignment with Organization Operation and ERP Post-Implementation Success 191
4.10.10 The Relationship between ERP Planning and ERP Post-Implementation Success 192
4.10.11 The Relationship between Organizational Culture and ERP Post-Implementation Success 193
4.10.12 The Relationship between Training and ERP Post-Implementation Success 194
4.10.13 The Relationship between ERP Learning and ERP Post-Implementation Success 195
4.10.14 The Relationship between ERP User Support and ERP Post-Implementation Success 195
4.10.15 The Relationship between ERP External Pressure and ERP Post-Implementation Success 196
4.10.16 The Relationship between ERP External Consultants Support with ERP Post-Implementation Success 197
4.10.17 The Relationship between ERP External Trust and ERP Post-Implementation Success 198
4.11 Revised Conceptual Framework 200
4.12 Summary of The Chapter 202

5 DISCUSSION OF RESULTS AND CONCLUSION 204
5.1 Introduction 204
5.2 Discussion on the Research Question and Hypotheses 206
5.2.1 The Relationship between Technological Factors of ERP Critical Success Factors and ERP Post-Implementation Success 207
5.2.1.1 ERP Attributes Has Positive Effect on ERP Post-Implementation Success 207
5.2.1.2 ERP Internal Expertise Has Positive Effect on ERP Post-Implementation Success 209
5.2.1.3 ERP Data Accuracy Has Positive Effect on ERP Post-Implementation Success 210
5.2.1.4 ERP Project Management Has Positive Effect on ERP Post-Implementation Success 212
5.2.1.5 ERP Configuration Has Positive Effect on ERP Post-Implementation Success 213
5.2.1.6 ERP Implementation Team Has Positive Effect on ERP Post-Implementation Success 214
5.2.1.7  ERP Communication Has Positive Effect on ERP Post-Implementation Success 216

5.2.2  The Relationship between Organizational Factors of ERP Critical Success Factors and ERP Post-Implementation Success 218

5.2.2.1  ERP Top Management Support Has Positive Effect on ERP Post-Implementation Success 218

5.2.2.2  ERP Alignment with Organization Process Has Positive Effect on ERP Post-Implementation Success 220

5.2.2.3  ERP Planning Has Positive Effect on ERP Post-Implementation Success 222

5.2.2.4  ERP Organizational Culture Has Positive Effect on ERP Post-Implementation Success 224

5.2.2.5  ERP Training Has Positive Effect on ERP Post-Implementation Success 225

5.2.2.6  ERP Learning Has Positive Effect on ERP Post-Implementation Success 226

5.2.2.7  ERP User Support Has Positive Effect on ERP Post-Implementation Success 228

5.2.3  Relationship between Environmental Factors of ERP Critical Success Factors and ERP Post-Implementation Success 230

5.2.3.1  ERP External Pressure Has Positive Effect on ERP Post-Implementation Success 230

5.2.3.2  ERP External Consultant Support Has Positive Effect on ERP Post-Implementation Success 231

5.2.3.3  ERP External Trust Has Positive Effect on ERP Post-Implementation Success 233

5.2.4  The Relationship Between the Extended TOE Model of ERP Critical Success Factors and Post-Implementation Success 234

5.3 Research Contributions 237

5.3.1  Theoretical Contributions 238

5.3.2  Practical Contributions and Managerial Implications 241

5.4 Suggestions for Future Research 243
5.5 Limitation of the Study 244
5.6 Conclusion 244

REFERENCES 246

Appendices A – D 277–304
# LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE NO.</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Evolution of ERP</td>
<td>26</td>
</tr>
<tr>
<td>2.2</td>
<td>Definition of ERP</td>
<td>28</td>
</tr>
<tr>
<td>2.3</td>
<td>Comparison of ERP Implementation Life Cycle</td>
<td>32</td>
</tr>
<tr>
<td>2.4</td>
<td>ERP Post-Implementation Issue</td>
<td>36</td>
</tr>
<tr>
<td>2.5</td>
<td>ERP Benefits in Post-Implementation Phase</td>
<td>41</td>
</tr>
<tr>
<td>2.6</td>
<td>Previous Studies on ERP CSFs Based on Different Phases</td>
<td>44</td>
</tr>
<tr>
<td>2.7</td>
<td>CSFs in Pre-Implementation Phase</td>
<td>45</td>
</tr>
<tr>
<td>2.8</td>
<td>CSFs in Implementation Phase</td>
<td>46</td>
</tr>
<tr>
<td>2.9</td>
<td>CSFs in Post-Implementation Phase</td>
<td>54</td>
</tr>
<tr>
<td>2.10</td>
<td>Discussion about Limitation of Previous Research Models and Present New Gap</td>
<td>70</td>
</tr>
<tr>
<td>2.11</td>
<td>Categorizing CSFs by TOE Factors</td>
<td>72</td>
</tr>
<tr>
<td>3.1</td>
<td>Research Design</td>
<td>103</td>
</tr>
<tr>
<td>3.2</td>
<td>Research Operational Framework</td>
<td>104</td>
</tr>
<tr>
<td>3.3</td>
<td>Respondent Previous Studies</td>
<td>110</td>
</tr>
<tr>
<td>3.4</td>
<td>Sample Frame Based on the Industry Type and Company Size</td>
<td>113</td>
</tr>
<tr>
<td>3.5</td>
<td>The Numbers of Response Rates based on Sectors</td>
<td>115</td>
</tr>
<tr>
<td>3.6</td>
<td>Components of Research Instrument</td>
<td>117</td>
</tr>
<tr>
<td>3.7</td>
<td>Profile of Experts in Content Validity</td>
<td>120</td>
</tr>
<tr>
<td>3.8</td>
<td>Pilot Sample Size</td>
<td>121</td>
</tr>
<tr>
<td>3.9</td>
<td>Comparing PLS-SEM to Covariance Approaches of SEM</td>
<td>129</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>3.10</td>
<td>Criterion of Assessment of the Measurement Model</td>
<td>132</td>
</tr>
<tr>
<td>3.11</td>
<td>Criterion of Assessment of the Structural Model</td>
<td>134</td>
</tr>
<tr>
<td>4.1</td>
<td>Data Analysis Techniques and Purposes</td>
<td>138</td>
</tr>
<tr>
<td>4.2</td>
<td>Reliability of Constructs in Pilot Test</td>
<td>141</td>
</tr>
<tr>
<td>4.3</td>
<td>Measurement of Sampling Adequacy and Total Variance</td>
<td>143</td>
</tr>
<tr>
<td>4.4</td>
<td>Initial Assumptions of EFA</td>
<td>145</td>
</tr>
<tr>
<td>4.5</td>
<td>Eigenvalues and Variance Extracted by Each Component</td>
<td>146</td>
</tr>
<tr>
<td>4.6</td>
<td>Factor Structure Matrix of Loading Variable</td>
<td>146</td>
</tr>
<tr>
<td>4.7</td>
<td>Questionnaire Response Rate</td>
<td>149</td>
</tr>
<tr>
<td>4.8</td>
<td>Normality Test for Main Research Constructs</td>
<td>153</td>
</tr>
<tr>
<td>4.9</td>
<td>Leven’s Test of Homogeneity of Variances</td>
<td>154</td>
</tr>
<tr>
<td>4.10</td>
<td>Regression for Observing VIF and Tolerance Effect</td>
<td>155</td>
</tr>
<tr>
<td>4.11</td>
<td>Mann-Whitney-U-Test Observing Non-Response Biasness</td>
<td>157</td>
</tr>
<tr>
<td>4.12</td>
<td>Common Method Bias (Total Variance Explained)</td>
<td>158</td>
</tr>
<tr>
<td>4.13</td>
<td>Profile of Respondents</td>
<td>159</td>
</tr>
<tr>
<td>4.14</td>
<td>Profile of Companies</td>
<td>160</td>
</tr>
<tr>
<td>4.15</td>
<td>Descriptive Statistics on Underling Main Research Variables (N=290)</td>
<td>161</td>
</tr>
<tr>
<td>4.16</td>
<td>Descriptive Statistics for Research Items (N=290)</td>
<td>162</td>
</tr>
<tr>
<td>4.17</td>
<td>Reliability and Validity of the Survey Questionnaire</td>
<td>167</td>
</tr>
<tr>
<td>4.18</td>
<td>Results of Measurement Model (Loading Factors)</td>
<td>168</td>
</tr>
<tr>
<td>4.19</td>
<td>The Result of Reliability and Convergent Validity by AVE and Coefficient CR</td>
<td>173</td>
</tr>
<tr>
<td>4.20</td>
<td>Cross-Loadings (Main Constructs)</td>
<td>175</td>
</tr>
<tr>
<td>4.21</td>
<td>Square Root AVE and Correlations of Latent Variables</td>
<td>178</td>
</tr>
<tr>
<td>4.22</td>
<td>Result of the Coefficient Determination $R^2$ and $Q^2$ Value</td>
<td>180</td>
</tr>
<tr>
<td>4.23</td>
<td>Result of the $f^2$ and $q^2$ value</td>
<td>181</td>
</tr>
<tr>
<td>4.24</td>
<td>Path Coefficient, T-Value and Significance</td>
<td>182</td>
</tr>
</tbody>
</table>
4.25  The Results of Relationship between EA and EPIS  184
4.26  The Results of Relationship between EX and EPIS  185
4.27  The Results of Relationship between EDA and EPIS  186
4.28  The Results of Relationship between EPM and EPIS  187
4.29  The Results of Relationship between ECON and EPIS  188
4.30  The Results of Relationship between EIT and EPIS  189
4.31  The Results of Relationship between ECOM and EPIS  190
4.32  The Results of Relationship between ETMS and EPIS  191
4.33  The Results of Relationship between EAL and EPIS  192
4.34  The Results of Relationship between EPL and EPIS  192
4.35  The Results of Relationship between OCR and EPIS  193
4.36  The Results of Relationship between ETR and EPIS  194
4.37  The Results of Relationship between ELR and EPIS  195
4.38  The Results of Relationship between EUS and EPIS  196
4.39  The Results of Relationship between EEP and EPIS  197
4.40  The Results of Relationship between EECS and EPIS  198
4.41  The Results of Relationship between EET and EPIS  199
4.42  Results of Main Hypotheses Testing  200
5.1  Summary of Research Hypotheses and Findings  205
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE NO.</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Map of Literature Review</td>
<td>23</td>
</tr>
<tr>
<td>2.2</td>
<td>ERP Phases Adopted From (Cooper and Zmud, 1990)</td>
<td>30</td>
</tr>
<tr>
<td>2.3</td>
<td>Model Developed by Kouki et al. (2007, 2010)</td>
<td>50</td>
</tr>
<tr>
<td>2.4</td>
<td>The Model Presented by Madapusi (2008)</td>
<td>51</td>
</tr>
<tr>
<td>2.5</td>
<td>Zhu et al. (2010) Research Model</td>
<td>52</td>
</tr>
<tr>
<td>2.6</td>
<td>Nejib (2013) Proposed Research Model</td>
<td>53</td>
</tr>
<tr>
<td>2.7</td>
<td>List of CSFs on Post-Implementation Phase</td>
<td>56</td>
</tr>
<tr>
<td>2.8</td>
<td>The Comparison of Proposed Conceptual Framework with Previous Framework</td>
<td>75</td>
</tr>
<tr>
<td>2.9</td>
<td>Proposed Conceptual Framework</td>
<td>77</td>
</tr>
<tr>
<td>3.1</td>
<td>Overview of Research Methodology</td>
<td>102</td>
</tr>
<tr>
<td>3.3</td>
<td>The Flowchart of the Research Process Adopted from Offermann et al. (2008)</td>
<td>135</td>
</tr>
<tr>
<td>4.1</td>
<td>Preliminary Conceptual Framework</td>
<td>140</td>
</tr>
<tr>
<td>4.2</td>
<td>PLS Model with Items Loadings for Each Construct Before Deleting Low Factor Loading</td>
<td>171</td>
</tr>
<tr>
<td>4.3</td>
<td>PLS Model with Items Loadings for Each Construct After Deleting Low Factor Loading</td>
<td>172</td>
</tr>
<tr>
<td>4.4</td>
<td>Paths Coefficient and t-value of Relationship between EA and EPIS</td>
<td>184</td>
</tr>
<tr>
<td>4.5</td>
<td>Paths Coefficient and t-value of Relationship between EX and EPIS</td>
<td>185</td>
</tr>
<tr>
<td>4.6</td>
<td>Paths Coefficient and t-value of Relationship between EDA and EPIS</td>
<td>186</td>
</tr>
<tr>
<td>4.7</td>
<td>Paths Coefficient and t-value of Relationship between EPM and EPIS</td>
<td>187</td>
</tr>
<tr>
<td>4.8</td>
<td>Paths Coefficient and t-value of Relationship between ECON and EPIS</td>
<td>188</td>
</tr>
<tr>
<td>4.9</td>
<td>Paths Coefficient and t-value of Relationship between EIT and EPIS</td>
<td>189</td>
</tr>
<tr>
<td>4.10</td>
<td>Paths Coefficient and t-value of Relationship between ECOM and EPIS</td>
<td>190</td>
</tr>
<tr>
<td>4.11</td>
<td>Paths Coefficient and t-value of Relationship between ETMS and EPIS</td>
<td>191</td>
</tr>
<tr>
<td>4.12</td>
<td>Paths Coefficient and t-value of Relationship between EAL and EPIS</td>
<td>192</td>
</tr>
<tr>
<td>4.13</td>
<td>Paths Coefficient and t-value of Relationship between EPL and EPIS</td>
<td>193</td>
</tr>
<tr>
<td>4.14</td>
<td>Paths Coefficient and t-value of Relationship between OCR and EPIS</td>
<td>194</td>
</tr>
<tr>
<td>4.15</td>
<td>Paths Coefficient and t-value of Relationship between ETR and EPIS</td>
<td>194</td>
</tr>
<tr>
<td>4.16</td>
<td>Paths Coefficient and t-value of Relationship between ELR and EPIS</td>
<td>195</td>
</tr>
<tr>
<td>4.17</td>
<td>Paths Coefficient and t-value of Relationship between EUS and EPIS</td>
<td>196</td>
</tr>
<tr>
<td>4.18</td>
<td>Paths Coefficient and t-value of Relationship between EEP and EPIS</td>
<td>197</td>
</tr>
<tr>
<td>4.19</td>
<td>Paths Coefficient and t-value of Relationship between EECS and EPIS</td>
<td>198</td>
</tr>
<tr>
<td>4.20</td>
<td>Paths Coefficient and t-value of Relationship between EET and EPIS</td>
<td>199</td>
</tr>
<tr>
<td>4.21</td>
<td>Revised Conceptual Framework</td>
<td>201</td>
</tr>
</tbody>
</table>
**LIST OF ABBREVIATIONS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCM</td>
<td>Supply Chain Management</td>
</tr>
<tr>
<td>ERP</td>
<td>Enterprise Resource Planning</td>
</tr>
<tr>
<td>TQM</td>
<td>Total Quality Management</td>
</tr>
<tr>
<td>CRM</td>
<td>Customer Relationship Management</td>
</tr>
<tr>
<td>IMC</td>
<td>Inventory Management and Control</td>
</tr>
<tr>
<td>MRP</td>
<td>Materials Requirements Planning</td>
</tr>
<tr>
<td>MRPII</td>
<td>Manufacturing Requirement Planning</td>
</tr>
<tr>
<td>TOE</td>
<td>Technological- Organizational- Environmental Theory</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>CSF</td>
<td>Critical Success Factor</td>
</tr>
<tr>
<td>BPR</td>
<td>Business Process Reengineering</td>
</tr>
<tr>
<td>SEM</td>
<td>Structural Equation Modeling</td>
</tr>
<tr>
<td>PLS</td>
<td>Partial Least Squares</td>
</tr>
<tr>
<td>PIS</td>
<td>Post-Implementation Success</td>
</tr>
<tr>
<td>RBV</td>
<td>Resource Based View</td>
</tr>
<tr>
<td>RDT</td>
<td>Resource Dependency Theory</td>
</tr>
<tr>
<td>MNAR</td>
<td>Missing Not at Random or not-ignorable</td>
</tr>
<tr>
<td>VIF</td>
<td>Variance Inflation Factors</td>
</tr>
<tr>
<td>EM</td>
<td>Expectation Maximization</td>
</tr>
<tr>
<td>MAR</td>
<td>Missing At Random</td>
</tr>
<tr>
<td>AVE</td>
<td>Average Variance Extracted</td>
</tr>
<tr>
<td>CR</td>
<td>Construct Reliability</td>
</tr>
<tr>
<td>MVA</td>
<td>Missing Value Analysis</td>
</tr>
<tr>
<td>MCAR</td>
<td>Missing Completely at Random</td>
</tr>
<tr>
<td>CFA</td>
<td>Confirmatory Factor Analysis</td>
</tr>
</tbody>
</table>
**LIST OF APPENDICES**

<table>
<thead>
<tr>
<th>APPENDIX</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Research Questionnaire (English Version)</td>
<td>277</td>
</tr>
<tr>
<td>B</td>
<td>Research Questionnaire (Persian Version)</td>
<td>284</td>
</tr>
<tr>
<td>C</td>
<td>Statistical Analysis (SPSS)</td>
<td>291</td>
</tr>
<tr>
<td>D</td>
<td>Statistical Analysis (PLS)</td>
<td>304</td>
</tr>
</tbody>
</table>
CHAPTER 1

INTRODUCTION

1.1 Introduction

In this chapter, the topic of research is presented. After introduction, chapter starts with background of the study and enterprise resource planning (ERP) in automotive industry of Iran. Then, the chapter is followed by the statement of problems through which observation of the gaps in knowledge is discussed based on the previous studies conducted in this area. Next, research questions, research objectives, significance of the study and scope of the study are presented. The chapter ends with operational definitions of the research terms. The theoretical framework and the review of relevant literatures along with justifications for different hypothesis is discussed in the following chapter.

1.2 Background of The Study

Enterprise resource planning (ERP) is considered as a commercial software enabling the firms to unify their business processes (Van-Hau and Kuzic, 2010; Grabski et al., 2011). However, implementation of ERP is complicated because it is dependent on several factors. It needs a large amount of money to invest (Livermore and Rippa, 2011); high-level expertise to enhance output (Wenrich and Ahmad, 2009); allocated to promoting output of the organization (Beatty and Williams, 2006); and a 6 to 12 month period to implement (Aloini et al., 2007). In fact, in order to implement ERP effectively, millions of dollars should be allocated to develop this system, and it takes several years to assimilate it into a firm by providing its necessary infrastructures and capabilities (Tarhini et al., 2015; Orozco et al., 2015;
Abbasi et al., 2015). Therefore, ERP is considered as a multifaceted concept that is implemented in different phases, and each phase has its own challenges (Kronbichler et al., 2009). A research by Zhang et al. (2005) advocated that ERP projects were on average, 178 percent over budget, took 2.5 times as long as projected time, and delivered only 30 percent of promised benefits. Wang and Chen (2006) demonstrated in their study, whereby more than 90 percent of ERP implementations delayed, and required additional budget amounts. In the study by Panorama (ERP Consultation Company) in (2015), during the 5 years of evaluation, it cost 6.1 million dollars and 15.7 months in average. Across this step, approximately 42 percent of projects have implemented ERP by the planned budgets, near 35 percent of projects have implemented ERP on their planned time and finally in post-implementation stage, 47 percent of organizations just cached more than 50 percent of predetermined benefits of their ERP.

Although there are reports referring to the firms’ success in implementing their ERP systems, it is generally accepted that between 50 to 70 percent of ERP implementations have not been capable of obtaining their predicted objectives (Umble et al., 2003; Shao et al., 2012; Panorama ERP reports, 2015). Yet, it has been observed that providing the technical infrastructures has not led the ERP implementation programs to optimally take advantage of ERP deployments, which is stated also to originate from organizational and environmental factors. Two key factors are found to be attributed to unsuccessful ERP implementation leading to not achieving the expected objectives. First key factor refer firms incapability to manage the required organizational changes based on critical success factors (CSFs), and second refer to lack of technical capabilities required for ERP implementation (Satyan, 2003; Nah et al., 2003; Al-Mashari et al., 2003; Umble et al., 2003; Somers and Nelson, 2004; Kouki et al., 2010; Zhu et al., 2010).

Referring to life cycle theory (LCT), ERP implementation is usually categorized into three phases: pre-implementation, implementation and post-implementation (Somers and nelson, 2001; Swanson and Ramiller, 2004; Kronbichler et al., 2009; Wu and Chuang, 2010). Promoting the ERP success has been an interesting research issue, which has led to identifying the importance of CSFs for ERP implementation and pre-implementation phase in the past decades
(Nah et al., 2001; Nah et al., 2003; Al-Mashari et al., 2003; Umble et al., 2003; Somers and Nelson, 2004). There are many challenges for organizations during the ERP projects implementation. This highlights considering the CSFs in each phase for successful implementation of ERP (Panorama ERP reports, 2015). In the ERP literature, a success factor is defined as a factor that presence increases the probability of a successful implementation (Sherer and Alter, 2004). Often ERP project managers focus on technical issues, while the non-technical issues are ignored. The ERP project managers only supervise if the project is accomplished according to the scheduled time and budget. In fact, the majorities of researches evaluate ERP success by identifying whether the ERP is implemented on scheduled time/budget, while undermining the fact that the final aim of applying ERP is to make business value and improve business performance. Thus, a new venue of research on ERP has emerged addressing the ERP post-implementation. It is believed that this new stream of research on ERP is in its infinity and needs for more research and exploration to be conducted in this area (Zhang et al., 2005; Tsai et al., 2005; Liang et al., 2007; Kouki et al., 2010; Liu et al., 2010; Zhu et al., 2010; Panorama ERP reports, 2015).

Implementation of ERP cost between 1.3 to 70 million dollars for companies (Vilpola, 2008), and the average implementation time is 6 months to 2 years (Aloini et al., 2007). Therefore, it is important for managers to focus on the post-implementation phase, because when ERP implemented, these systems usually are not effortlessly replaced. Indeed, in the post-implementation phase, ERP systems are updated, maintained and assimilated in new business processes that leading to efficiencies (McGinnis and Huang, 2007). The common problem is that organizations that only complete the implementation phase will not gain the full benefits from the ERP (Willis and Willis-Brown, 2002). Hence, the post-implementation phase is critical to the lifelong success of the ERP (Law et al., 2010; Charmain, 2012; Panorama ERP reports, 2015). Technical, organizational elements along with the environmental factors affect the performance of ERP implementation. Therefore, not taking into consideration the technical as well as the organizational elements can result in weak implementation performance (Capaldo and Rippa, 2009). In other words, if the technical and organizational issues are not considered and discovered before the implementation, they could generate problems during the
implementation, thereby increasing the probability for failure in the post-implementation phase (Charmain, 2012). In other study, Madapusi (2008), report that a single and special attention on technical factors would only lead to technical successful implementations of ERP, which lonely would not create business advantage. In other words, organizational factors i.e., top management, planning and organizational culture, are concerned to organizational issues and environmental issues have approximately nothing to do with technical and organizational outcome. Aforementioned discussion emphasizes that successful ERP deployments is not likely to happen without simultaneous consideration of organizational, environmental, and technological issues together.

Tornatzky and Fleisher (1990) presented that the successful deployment of ERP is related to the external, organizational, and technological factors. ERP literature (e.g. Musaji, 2005; Kamhawi, 2008; Kouki et al., 2010) has also emphasized the significance of contingency factors in ERP post-implementation and benefit realization. Tornatzky and Feleischer’s (1990) recommend three aspects of the firm’s context those have enterprise wide influence on implementation and post-implementation process. The three groups of contextual factors named technological, organizational and environmental, are also marked as (TOE). The TOE has been used in several studies to examine the pre-implementation and implementation of several enterprise wide applications (Zhu et al., 2004) such as total quality management (TQM), supply chain management (SCM) and ERP (Bradford and Florin, 2003). The relevance of contingency factors including organizational, technological, and external factors for ERP implementation and post-implementation and benefits realization have been stressed by some researchers (Kouki et al., 2010; Zhu et al., 2010; Schniederjans and Yadav, 2013). This study, therefore, focus on a comprehensive set of technological, organizational and environmental determinant factors that have critical importance for ERP post-implementation success. In addition, this research tries to clarify the concepts around the critical success factors that are affecting the ERP projects on ERP post-implementation phase, and theoretically and practically developed based on TOE framework. Finally, current study tries to demonstrate the relationship between new critical success factors of this study and ERP benefits. Therefore, it contributes to an improved process of ERP benefits, where critical factors bridge the link between ERP post-implementation and
improvement in ERP benefits. The next section explain about automotive industry and ERP in Iran, and link between both related to the scope of the study.

1.3 ERP in Automotive Industry of Iran

Iranian companies look like other companies in the world, where they are acquainted with ERP and implementing it. Some Iranian software companies have started to produce ERP over the last 10 years and some others have started to join with foreign vendors as a partnership or licensing agreements. There are many international ERP vendors active in Iranian markets such as SAP, Oracle, SAGE, IFS and Epicor-Escala and many more (Nikookar et al., 2010). Due to sanction against Iran, Iranian companies are not allowed to directly buy the license from some original producers. However, some of international vendors have their exclusive distributor in Iran (Nikookar et al., 2010). There are also many Iranian ERP producers in Iran with many customers all over the nation. Namely, like Sabz Dadeh Afzar (Green dataware), Madaar Gostaresh, Raay Dana, Douran and Pars Royal System (Members of Iran ERP Association, 2010). ERP vendors are getting more experienced in implementation during recent years through exploiting best practices through frequent implementation in industries. Although Iranian ERP producers are not as experienced as foreign producers, most of Iranian organizations buy ERP from foreign producers, as local ERP vendors were not very successful in recent years (Moohebat et al., 2011). Furthermore, the cost of Iranian ERP systems is much lower than others imported ERP adopted from other countries, but failure percentage is almost the same and it is considered a crucial issue.

There are several factors highlighting the necessity of doing research on ERP in Iranian context. Iran is recognized by the United Nations as one of the powerful nations in Asia region (Yeganeh and Su, 2008). It is generally believed that effect of context may vary from country to country (Chien et al., 2007; Dezhdar and Ainin, 2011). In addition, due to increasing sanction against Iran, there is a fear among Iranian organizations that if they buy ERP from foreign companies, there is a high probability that they might leave the project uncompleted as it happened in some cases. In addition, most of Iranian firms are small, medium sized, and they are not
strong enough to afford huge costs of foreign ERPs. According to Moohebat et al. (2011), technology is not sufficient to solve the problems of the companies if the company does not acquire the knowledge, which is required to implement the technology. He mentioned this issue as what is happening in Iran in recent years where they misuse the technology without acquiring knowledge needed to use the technology. ERP is a new concept in Iran, although as a managerial tool, it is essential for Iranian firms to implement this to avoid from low performance and productivity.

Automotive industry is considered the second most active industry in Iran after the oil and gas industry, accounting for 10% of country’s gross domestic product (GDP) and 4% of the workforce (700,000 persons) (Washington Post, 2013). According to statistical centre of Iran (SCI) (www.sci.org.ir), Iran has turned into the biggest car manufacturer in the region with a contribution of 46% to the total numbers of cars produced in the region. Likewise, according to international organization of motor vehicle manufactures (OICA), which is “the voice speaking on automotive issues in world forums”. Iran is the 18th largest automaker in the world and one of the largest in Asia with annual production of more than 1.6 million units (OICA, 2013). In 2009, Iran’s automotive industry has grown increasingly with an increase of 44.5% in output since 1998 (Fars News Agency, 2010). However, referring to OICA statistics, production declined significantly to 750,000 automobiles in 2013 due to heavy economical sanction by US and other Western countries on automobile industry of Iran (OICA, 2013).

Numerous novel automotive industrial corporations have been built, and there have been several facilitative regulations regarding the Iranian administration’s protective strategies. In 2001-2002, Iranian automakers employed 16.8 workers per car produced. In 2007-2008, this rare dropped by 7.17 workers for each car produced. Iran’s fleet reached 11.5 million cars by 2010 and 14 million cars by 2014 (Iran Ranks, 2010; Iran Daily, 2014). Due to sanctions imposed on spare parts by France’s Peugeot and Renault, car manufacturing in Iran declined by 40 percent in 2012. However, it started to recover in 2014 by Geneva provisional agreement (Washington Post, 2014). Iranian car manufacturers produced 1,090,846 cars and commercial vehicles in 2014 with cars making up 925,975 of produced products and
other vehicles making 164,871 of the total number of products. According to OICA, an auto production rising of 3 percent is predicted causing the total production reach to just about 91 million vehicles in 2015 (Press TV, 2015). The development of car manufacturing can be explained by increase in demand in the marketplace, which derives from increase in population and specifically emergence of the youth population and the growth in attendance of female participation in the market etc. (Atiehbahar, 2008).

There are currently 13 public and privately owned automakers in Iran, which many have subsidiary companies producing various types of vehicles; there are 28 automotive manufacturing units throughout Iran. Iran Khodro and Saipa are the largest domestic vehicle manufacturing companies. The Iranian manufacturers currently produce six different types of vehicle, including passenger cars, 4WD, trucks, buses, minibuses, and pickup trucks. According to the latest statistics in 2014 provided by the ministry of industries and mines, there are exactly 9,965,734 vehicles in the country (SAPCO, 2008; Iran Daily, 2014). Iran Khodro and Saipa have the biggest market share governing 96% of the total marketplace in Iran. The other car manufacturers are not specified as belonging to a particular manufacturing group such as the Bahman Group, Kerman Motors, Kish Khodro, Runiran, Traktorsazi, Shahab Khodro, etc. together produce only 4% (SAPCO, 2008; Iran Daily, 2014). Iran is also a large producer of automotive spare parts. The Iranian automotive parts industry consists of approximately 1200 companies, which include those affiliated to vehicle manufacturers as well as independent firms. The industry consists of two primary sectors, original equipment manufacturing (OEM) suppliers, which produce parts for automakers, and after-market parts manufacturers (AMPM), which produce replacement parts for vehicles (Atiehbahar, 2011). Therefore, based on international organization for standardization (ISO), suppliers for Iranian automotive industry consist of 850 small, medium and large that have certified by ISO/TS16949 quality management system (http://www.iso.org/iso/home.html).

The automotive industry sector has warmly embraced the use of the new information and communication technologies i.e., ERP for their back-office relationships with their suppliers and front-office activities with their customers. These new technologies are now developing rapidly and contribute to reducing costs,
cycle time and improving data quality, productivity resource allocation and performance. The SAP Company, one of the biggest integrated systems providers, is in cooperation with Iran Khodro to deploy ERP since 2005 (Hatamirad and Mehrjerdi, 2010) as far as Saipa using Indian version of ERP since 2008. The goal of deploying ERP programs is to reengineering of production and supply chain processes, standardize and integrity of database and application in order to improve competitive advantage.

1.4 Problems Statement

Reviewing the literature found that although many firms have attempted to implement ERP, they have not been capable of achieving the expected outcome from ERP deployment (Panorama ERP reports, 2015). This gap is related to the fact that both practical and empirical studies have only addressed the pre-implementation and implementation phases while undermining the importance of the post-implementation phase in ERP deployment (Grabski et al., 2011). In fact, there are only a few studies paying attention to post-implementation phase and its influence within the firms (Law et al., 2010; Charmaine, 2012). As found from comprehensive review of the literature, although studies on ERP are many, but the post-implementation issues to examine CSFs impacts across various ERP benefits have not received sufficient attention. More specifically, what is lacking is a solid and exhaustive theoretical framework for identifying CSFs, with which the post-implementation success of ERP can be enhanced.

Previous studies presented that once an ERP system is implemented, it is not implied as successful deployment of ERP system. This is due to the fact that the post-implementation phase has its own attributes and challenges, which have to be taken into account for an ERP system integration to be considered successful (Al-Mashari et al., 2003). For instance, success of implementation phase is computed based on the fact that whether ERP is implemented on the planned period and budget (Yusuf et al., 2004), while the success of post-implementation is measured based on factors such as rate of return to investment and achieving higher performance in firm (Sedera and Gable, 2004; Ifinedo, 2007). In fact, in the post-implementation phase,
firms primarily emphasize on benefit realization derived from the deployment of ERP (Al-Mashari et al., 2003; Zhu et al., 2010).

TAM (technology acceptance model), LCT (life cycle theory) and TOE (technological, organizational and environmental) models and other models are used by researchers to measure the technology acceptance in post-implementation phase of ERP in order to improve performance. ERP benefits are dependent on the perceived usefulness and ease of use to measure the intention to use the technology. In addition, ERPs’ popularities in Iran, especially in recent years, and lack of literature about it, triggered the researcher to conduct this study among Iranian automotive industry. ERP is a new concept in Iran, although as a managerial tool, it is essential for Iranian firms to implement this to avoid from low performance and productivity. The cost of Iranian ERP systems is much lower than other countries’, but failure percentage is almost the same and it is considered a crucial issue.

Thus, the contribution of post-implementation phase of the ERP deployment is investigated in this study. In order to achieve this purpose, this study also addresses the interrelationship among the organization and its attributed parts as it is believed that developing dynamic reactions with the environment, customers and suppliers as the contingency factors related to implementation of ERP is necessary when examining the efficiencies and effectiveness of ERP systems (Paradice, 2010; Charmain, 2012). Thus, this study investigates the technological, organizational and environmental elements contributing to success of ERP in post-implementation phase, which are likely to ensure achieving the predicted benefits from ERP deployment.

In order to achieve this purpose, the technological, organizational, and environmental (TOE) theory is adopted as the theoretical base of this study, which has been applied in previous studies on investigating the pre-implementation and implementation of ERP systems (e.g. Zhu et al., 2004; Schniederjans and Yadav, 2013). In fact, researchers (Kouki et al., 2007, 2010; Schniederjans and Yadav, 2013) have emphasized the appropriateness of considering contingency factors for ERP implementation and post-implementation to benefit realization. The width and depth of the integration indicates that the post-implementation success of the ERP will be affected by multiple factors related to the organization. Regarding the
importance of width and depth of integration in accomplishment of the post-
implementation phase, the TOE theory can prepare the theoretical base to determine
the potential factors, which are likely to influence the post-implementation success.
Therefore, through a comprehensive review of literature, the CSFs in the post-
implementation phase are identified and classified into the three main groups called:
technological factors, organizational factors, and environmental factors. Thus, this
study attempts to fill the gap in theory with regard to post-implementation phase, as
the effect from most of the contingency relationships have not been empirically
investigated so far.

ERP technological factors refer as the attributes, capabilities, forces and
resources that contribute to the ERP success on post-implementation phase, which
based on previous literature is documented to four distinct dimensions: ERP
attributes, ERP internal expertise, project management and system configuration.
The importance of technological factors theoretically validated by researchers (e.g.
Kouki et al., 2007, 2010; Zhu et al., 2010). However, shortage of accurate data
(Madapusi, 2008; Shaul and Tauber, 2013); intensive implementation team
(Madapusi, 2008; Schniederjans and Yadav; 2013; Shaul and Tauber, 2013); and
open and honest communication (Madapusi, 2008; Dezdar and Ainin, 2011b) still not
well documented.

ERP data accuracy is implied as the proper integration of the inbound
information to the ERP system and outbound information coming from ERP (White,
2008; Madapusi and Ortiz, 2014). Because of existence of such integration in an ERP
life cycle, an inappropriate information in one phase ruins the effectiveness of other
phases leading to reduced operator motivation or unwillingness to apply the ERP on
a daily basis. Therefore, accurate data integration could have positive effect on
success of ERP especially on the operational (customer service improvement,
productivity and data quality improvement, cost and cycle time reduction) and
managerial (better decision making, and resource management and improve
performance) benefits.

Implementation team refers to authorized individuals who present sufficient
business and technical skills in ERP post-implementation success (Zhu et al., 2010;
Madapusi and Ortiz, 2014). The features of implementation team makes a significant
contribution to guaranteeing the success of applying an ERP system in the phase of post-implementation. Implementation team members’ mostly concentration on confirming accuracy of data entering to the ERP process results in improving the data quality. Automotive companies might have deployed their best functional implementation team and IT resources to emphasize on production developments and cost buildings, which has led to reduction in inventories and decline in cost and cycle time and ultimate result of increase in productivity and data quality.

ERP communication is referred as continuous and two-way communications across the firm. Communication through the firm among all levels of the organization throughout all phases of the ERP life cycle is vital to assuring implementation success of ERP (White, 2008). The lack or poor of an open communication information policy however, could potentially lead to problematic implementations as they may result in delayed to achieve benefits of implementing ERP especially managerial and operational benefits.

Moreover, the implementation of an ERP system is usually a large project, consuming a huge amount of resources during the ERP initiative. These resources, however, are usually distributed in multiple departments and viewed by each department as its own properties. The importance of technological factors have been theoretically validated by researchers (e.g. Kouki et al., 2007, 2010; Zhu et al., 2010). Therefore, this study intend to develop comprehensive technological determinant factors with detailed aspects for ERP post-implementation success. Thus, the first research question in this study is: What are the technological determinant of critical success factors for ERP post-implementation success?

ERP organizational factors deal with identifying if a firm has taken the required measures to exploit effectively from an ERP deployment. This arrangement is carried out by creating an appropriate condition for ERP application, in which necessary resources for the system’s operation are provided. Proper arrangement enables the efficient functioning of ERP through maximizing the benefits coming from ERP deployment. According to previous organizational factors documented on post-implementation CSFs, four dimensions include top management support, learning, ERP alignment and ERP user support reviewed and collected. High organizational readiness helps achieve synergy between the organization and the
ERP (Amrani et al., 2006). Thus, the capabilities of the ERP can fully be realized at the post-implementation phase to generate benefits. However, what is done in arena of organizational factors is still weak and developing a comprehensive organizational factors with approach to cultural issue (Shao et al., 2012; Tarhini et al., 2015), ERP planning (Madapusi, 2008, Shaul and Tauber, 2013) and enough training (Madapusi, 2008; Dezdar and Ainin, 2011b) is still needed.

Organizational culture refer to the cultural and organizational readiness to adopt ERP solutions (Hofstede et al., 1990). Sarkis and Sundarraj (2003), introduce the key CSFs including organizational culture changes to give early benefits like inventory reductions followed by managerial benefits over the long-term. The organizational culture interacts with the human and organization, and might be expected to improve operational and managerial benefits. ERP planning deals with considering solutions for firm’s changing cross-functional requirements, which is likely to result in success of ERP (Stratman and Roth, 2002). Planning can prepare real-time information quality, standardization of processes in order to reduce cycle time, rationalization of work force to better allocation of resources, integration to improve productivity, clear working to reduce cost, and faster decision making. ERP training refers to the documented and up-to-date program to train employee of the firm to use the ERP effectively (Stratman and Roth, 2002). ERP post-implementation fail due to lack of sufficient and proper training of end users. Hence, training for all activities through ERP programs and complex tasks results in accurate information output, and cycle impact profitability. Consequently might result in to realization of the ERP’s full potential operational and managerial benefits such as data quality improvement, cost and cycle time reduction and improve productivity (Mabert et al., 2003; Kouki et al., 2010). Therefore, the second research question of this study is: What are the determinant of organizational critical success factors for ERP post-implementation success?

ERP environmental factors refer to all factors that affected the ERP successful implementation externally. These external organizations can improve the implemented ERP and the main organization’s knowledge about it (Kouki et al., 2007; 2010). Thus, they contribute to the focal organization’s effective usage of the system, which in turn generates benefits. Using this framework in conjunction with
the life cycle theory could help to the body of knowledge to find the combination of variables that would be excellent predictors of ERP post-implementation. Its supplier and its connecting customers present ERP as an integrated system that integrates with focal organization. The interrelationship among the organization and its environment, customers, suppliers parts is necessary for businesses to develop competitive advantages (Charmaine, 2012) that without the interrelationship, companies may experience large cost overruns (Baraldi, 2009, Charmaine, 2012) and delays in which could affect the coordination, control, and further enhancements of the ERP (Charmaine, 2012). Identify CSF measures that take into account those factors that are critical to suppliers and customers as the firm’s ERP environment is extended across the supply chain (Madapusi, 2008; Baxter and Sommerville 2011). Therefore, factors consist of ERP external consultants support and external pressures (competitors and governance rules etc.) extracted from literature of ERP and new factor of external trust (Abdullah 2009; Schniederjans and Yadav; 2013) (customer’s and supplier’s trust) added as new environmental determinant from supply chain management (SCM). Therefore, evaluating and testing the relationship of aforementioned environmental CSFs on ERP post-implementation benefits should be more highlighted. Thus, the third research question is: What are the determinant of environmental critical success factors for ERP post-implementation success?

The complex interactions among the technology, environment, and organization are integral to extending the life and business benefits of the system. The main challenge is that regardless of the large financial and time commitment, few businesses are using ERP efficiently (Dawson and Owens, 2008; Panorama ERP reports, 2015), even though evidence indicates that successful deployment of ERP is beneficial to organizations (Kwahk and Ahn, 2010). However, “sustaining those benefits is challenging for most organizations” (Jain, 2008, p. 55) in the post-implementation phase (Charmain, 2012). Therefore, a holistic view of the interrelationships existing between organization, the technology, and the environment is necessary when considering the efficiencies and effectiveness of these systems (Bertalanffy, 1972; Paradice, 2010; Charmain, 2012). Past literature has criticized a long list of critical success factors (CSFs) on ERP post-implementation phase but their relationships with post-implementation success in order to gain benefits is not well documented in the literature. In other words, very
limited empirical attention is done to make specifically dimensional relationships between determinant critical factors CSFs and ERP in post-implementation success. More specifically, the issue to determine dimensional critical factors for ERP post-implementation phase by exploring technological advantage, organizational support, and environmental intensity has not received sufficient attention. Therefore, this study finally propose the comprehensive technological, organizational and environmental (TOE) model by various ERP critical success factors (CSFs) for the ERP post-implementation success.

1.5 Research Questions

This study addresses the following main research questions:

1- What are the determinant factors of ERP technological factors for ERP post-implementation success?
2- What are the determinant factors of organizational factors for ERP post-implementation success?
3- What are the determinant environmental factors for ERP post-implementation success?
4- What are the extended TOE model by various ERP determinant critical success factors (CSFs) for the ERP post-implementation success?

1.6 Research Objectives

A primary objective of this research is to investigate the determinant critical success factor (CSFs) that could assure success in post-implementation phase of the ERP in term of gain expected benefits. Secondly, this study aim to develop and empirically test a model explaining the impact of ERP critical success factor (CSFs) on the ERP post-implementation success based on TOE model. This study has four main objectives:
1- To determine the determinant factors of ERP technological factors for ERP post-implementation success.

2- To examine the determinant factors of organizational factors for ERP post-implementation success.

3- To find out the determinant environmental factors for ERP post-implementation success.

4- To examine the determinant factors of extended TOE model by various ERP critical success factors (CSFs) for the ERP post-implementation success.

1.7 Significance of The Study

This study holds significant contribution for ERP research. Although previous studies on ERP have proposed several critical factors that affect the post-implementation success of ERP, but these studies were conducted in a disconnected mode. Only a small number of studies have addressed the identification of CSFs and their relevance along the ERP life cycle, and few studies have systematically and quantitatively investigated the post-implementation issues (King and Burgess, 2006; Federici, 2009; Kouki et al., 2010). For this purpose, current study in line with TOE theory and by considering comprehensive antecedents of post-implementation success of ERP attempted to provide a new scholarly way on effective implementation and maintaining of ERP in automotive industry of Iran.

Previous research primarily applied the TOE theory to explain the pre-implementation and implementation phases of the ERP, while the post-implementation phase of ERP has been neglected (Grabski et al., 2011). This study goes further along the post-implementation process of the ERP by defining ERP technological factors, organizational factors, and environmental factors for post-implementation success of ERP in the context of Iran and automotive suppliers. ERP technological factors are referred to the capabilities, forces, attributes and resources that contribute to the ERP success on post-implementation phase, ERP organizational factors relay on the issues that whether an organization has made the necessary arrangements for the continuous and effective deployment of ERP and ERP
environmental factors refer to all factors that affected the ERP successful implementation externally.

More importantly, this study highlights the important roles of technological antecedents of ERP post-implementation success. Therefore, this study introduced some new technological variables (e.g. ERP data accuracy, qualification of implementation team, and ERP communication) to shed new light to the body of knowledge about the role of technological factors in the effective implementation and maintaining of ERP in automotive industry. Moreover, in the study, some new organizational factors i.e., ERP planning, ERP organizational culture, and ERP training were introduced as the (CSFs) of post-implementation success. Therefore, along with TOE theory, these contributions have provided some academic evidence toward the role of organizational factors on ERP post-implementation success.

Scholars have not sufficiently addressed the role of environmental factors on ERP post-implementation success. This current study also adds new elements i.e. external trust (customers and suppliers’ trust) to the existing ERP post-implementation (CSFs) namely external pressure and ERP external consultant support. This contribution has provided more detailed information on benefits of the environment factors for ERP in Iran’s automotive industry. In addition, too few existing studies theoretically, comprehensively and concurrently examined the effect of different antecedents of ERP post-implementation such as (CSFs) on ERP post-implementation success. To have a better understanding on the success of ERP alternative after implementing, it is rational to consider all the antecedent factors for the success of the ERP solutions concurrently. The contribution of this study shed a new light to the body of knowledge about reasons of the success and the failure of the ERP solutions.

Hence, this study claims that ERP data accuracy, ERP implementation team, communication, ERP planning, ERP organizational culture, training, and external trust (customer and supplier trust) in line with life cycle theory and TOE theory influence the post-implementation phase of the ERP. This study also empirically tests this research model in the automotive industry of Iran.
1.8 Scope of The Study

The study examines the relationship between critical success factors (CSFs) contributing to success of ERP in post-implementation phase. This quantitative empirical study discovers the condition of ERP implementation in the Iranian automotive industry. Based on International Organization for Standardization (ISO), suppliers for Iranian automotive consist of 850 small, medium and large companies that have certified by ISO/TS16949 quality management system (http://www.iso.org/iso/home.html). Therefore, the target populations selected for this research are suppliers of auto parts manufacturers in the three main groups of namely, metal, electronic and polymer over Iran. The segmentation done based on criteria of two leading car manufacturers in Iran. According to statistics, 850 suppliers are available in automotive industry, which directly involved with ERP. Based on the requirements of automotive industries, all the suppliers that have at least minimum modules of ERP certified to the standard.

This population is selected for the following reasons: Firstly, the auto industry is one of the leading industries in the world. The economic and social importance of the industry explains the need for conducting research on improved ways of organizing and managing the diverse processes involved in the production of motor vehicles. Besides, successful implementation of ERP establishes a connection between processes in a firm including inbound and outbound logistics, manufacturing, human resources, financial systems, and distribution with external suppliers and customers, which leads to emergence of an integrated system.

Today, most of original equipment manufacturers have widely inaugurated the ERP in their companies. Thus, due to the widespread and prolonged use of these systems in this industry, it could be an appropriate population for the study. In addition, the companies have extensively implemented this system in their supply network as they have necessitated using these systems for their suppliers as well. Secondly, Iran is the 18th largest automaker in the world and one of the largest in Asia, with annual production of more than 1.6 million and in 2009 Iran ranked fifth in car production growth standing next to China, Taiwan, Romania and India. Thirdly, 96% of the total domestic production is covered by Iran Khodro and Saipa (Sheikholeslami, 2010), and can be a good representative of Iran
automotive industry by producing more than a million cars in a year. According to the above reasoning, conducting study on the post-implementation success of ERP in the Iranian automotive industry can make significant contribution to finding a deep understanding about ERP deployment. The data for the study were obtained from three types of companies in the aforementioned automotive industries namely metal, electronic and polymer. The data were gathered during the period of 15 February to 30 April 2015.

1.9 Operational Definitions

1.9.1 Dependent Variables (DV):s:

**ERP Post-Implementation Success**: Ultimate goal of using ERP is to create business value and enhance business performance; therefore, acquiring optimize benefits from the deployed ERP in term of operational and managerial benefits, result in to success in the ERP post-implementation in the context of automotive suppliers.

**Operational benefits**: Operational benefits deal with day-to-day activities that involve obtaining and consuming resources that are usually repeated periodically i.e. daily, weekly and monthly in automotive suppliers in terms of cost reduction, cycle time reduction, productivity improvement, quality improvement and improved customer service.

**Managerial Benefits**: Managerial benefits address and support business management activities such as resource utilization and deployment, monitoring the operations and strategic decision making in automotive supplier companies in order to achieve better resource management, improved decision making and planning and improved performance in different operating divisions of the company.
1.9.2 Independent Variables (IVs):

**Technological Factors:** Technological factors refer to the capabilities, forces, attributes and resources that contribute to the ERP success on post-implementation phase in order to gain operational and managerial benefits in automotive suppliers.

**Organizational Factors:** Organizational factors related to the organizational issues that is established the necessary arrangements for the continuous and effective deployment of ERP in automotive industry.

**Environmental Factors:** Environmental factors refer to all effective external factors that could assure success of ERP in the post-implementation phase in term of catching the operational and managerial benefits in automotive context.

**ERP Attributes:** ERP attributes is defined as the attributes i.e., ease of use, relative advantage, and compatibility of ERP, which have effect on ERP post-implementation success especially on operational performance.

**ERP Internal Expertise:** ERP internal expertise is defined as internal capabilities to support operators and managers to trouble shooting the system, by providing the necessary maintenance, refinement, and adaptation.

**ERP Data Accuracy:** ERP data accuracy refers to the accurate integration of data that is input into the ERP as well as the output obtained from the ERP in order to improve operational and managerial performance concurrently.

**ERP Project Management:** ERP project management refers to the systematically manage and control activities to make sure that the ERP become success in post-implementation phase based on operational and managerial benefits through automotive supplier companies.

**ERP Configuration:** ERP configuration refers to well structure and configuration of ERP through the automotive supplier companies.
**ERP Implementation Team:** Refers to the authorized individuals who have sufficient skills in ERP post-implementation phase in case of improve effective deployment of ERP.

**ERP Communication:** ERP communication is defined as continuous and two-way communications across the automotive supplier companies.

**ERP Top Management Support:** ERP top management support refers to the supporting of top management relating to ERP implementation and post-implementation activities in automotive industry context.

**ERP Alignment with Organization Operation:** ERP alignment with organization operation refers to the coordination of operational activities with ERP in order to effective operation of ERP.

**ERP Planning:** ERP planning refers to the ongoing arrangements of ERP system on implementation and post-implementation phase through automotive supplier companies, which could reflected in better oparetional and managerial benefits.

**Organizational Culture:** Organizational culture related to the cultural and organizational readiness which to adopt and implement ERP.

**ERP Training:** ERP training refers to the documented and up-to-dated program to train employee of the firm to use the ERP effectively in terms of gain more operational and managerial benefits in the context of automotive industry.

**ERP Learning:** ERP learning refers to the processes designed by the automotive companies to identify effective as well as improved uses of the ERP, in line with current developments in the ERP.

**ERP User Support:** ERP user support refers to the acceptance and support of the ERP by all the employees of the automotive suppliers.

**ERP External Pressures:** An external pressure is a competitive/regulatory pressure to accept and support a specific information technology program i.e., ERP in the automotive industry.
**ERP External Consultants Support:** ERP external support related to the expertise and capability of the consultants in preparing various types of support to the automotive supplier companies i.e., knowledge, training, maintenance, and technical support externally.

**ERP External Trust:** Is defined as triadic group trust, composed of an implementing organization, the supplier who supplies all manufacturing resources (i.e., row material, service etc.) and the customers, which interact with the focal organization and ERP.

### 1.10 Outline of The Thesis

Key concepts and objectives of the research were introduced in this chapter. Next, in chapter two the related literature were reviewed and discussed. The literature review also discusses the research conceptual framework, the related theories, perspectives and theoretical framework of the study. The chapter ends with hypothesis development and a summary of the chapter. Chapter three, then, was designated to research methodology in terms of sample frame, research method, research instrument, data collection procedures, and determining data analysis method. In chapter four, an analysis of collected data and evidences with the initial model is presented. Finally, chapter five contains discussion and conclusion of research findings.
REFERENCES


Zhu K, Kraemer KL, Xu Sand Dedrick J (2004). Information Technology Payoff in E-Business Environments: An International Perspective on Value Creation of E-


