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AERONAUTICAL AND MECHANICAL ENGINEERING**CRITICAL SUCCESS FACTORS FOR STEEL CASTING INDUSTRIES
IN VIDARBHA REGION-INDIA****Ketki Kaskhedikar¹, Hansini Rahate², Seema Rewatkar³**¹*Dr. Babasaheb Ambedkar College of Engineering and Research Nagpur, ketkikaskhedikar@yahoo.co.in*²*Dr. Babasaheb Ambedkar College of Engineering and Research Nagpur, rahatehansini@gmail.com*³*Dr. Babasaheb Ambedkar College of Engineering and Research Nagpur, seema_rewatkar@rediffmail.com
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Abstract

The study aims to investigate the Critical Success Factors (CSFs) for Steel Casting Industry in Vidarbha Region-India. The term 'CSF' is defined as an explicit representation of the key performance areas of an organization. The research was undertaken to identify & interpret the critical success factors that affect the performance of steel casting industry. The literature review was carried out for the identification of CSFs for steel casting industry. Through a survey method using an instrument the data analysis technique had been used for one of the popular analysis methods for qualitative research works. The results of the CSFs for Steel Casting Industries were grouped into 7 factors: 1) Training & Education, 2) Conducive Work Environment, 3) Continuous Improvement, 4) Process Management, 5) Quality Promotion, 6) Support to Employees, 7) Organization Culture. Each factor includes several key attributes that may aid to enhance the efficiency of Steel Casting Industries. It is an attempt to lead functions of a Steel Casting Industry in all levels to the same directions for achieving the success and to make Managers and executives know what they have to do for the success of Steel Casting Industry.

Keywords: Critical Success Factor; Steel Casting Industry.

1. INTRODUCTION

The cut throat competition of these days has forced the organizations to add an extra effort to maintain their spot in the technological race. Quality and productivity are the two basic fundamentals for the success of any industry. The most successful organizations are those that are able to meet the customer expectations and as such managers are increasingly in search of dissimilar ways for accomplishing the organizational performance and competitive advantage. Gunasekaran et. al. (1994) elaborated that today most of the firms are interested in a strategic approach for improving productivity and quality in their organizations. Jha and Sunanad Kumar (2010) had found the CSFs as an internal or external factor that can seriously affect the firm for better or worse. It is widely recognized that Small and Medium Sized Enterprises (SMEs) forms the backbone of the private sector at all levels of developing countries. To achieve this state of competitiveness it is essential to develop the Quality Management for any business organization. Quality management has achieved greater advantage for competitiveness in manufacturing and service industries. Some Industrial

sectors like casting industry which is established before few decades has not yet given the attention by quality management researchers.

A variety of organizational traits had been discussed earlier by any researchers such as top management commitment, organizational culture, leadership qualities as the effort factors leading to the success of the industries. As a result, if these firms implement quality management the chances of their products being accepted in the international markets to compete with other similar products worldwide. Additionally it has been noticed that there has been very less researchers examining the role of quality management practices in different industries. Although few studies have reported about the quality management aspects practiced in different industries, the study of quality management practices and their impact on organizational performance is scanty. In context of this, the present study was carried out to elaborate the CSFs that influence the organizational performance. The study done by other researchers which were justified in the published literature, were systematically assessed.

2. Literature Review

Total Quality Management (TQM) aimed at continuously improving the quality of products and processes to achieve customer satisfaction. It promotes consistency to quality in all areas of an organization and aims to promote an organizational culture that meets consumers (Talib et al., 2010) plays a vital role in TQM implementation and management. Moreover, Rohani et al., (2010) mentioned some of the benefits of using advanced statistical measures, like measurement system analysis and control charts to manage the TQM related processes. Some authors have identified quality management influencing parameters or variables as leadership, customer focus, employee involvement, use of statistical methods and flexibility. However, the output or the indicator variables were recognized as financial and non-financial results. An approach of case study was also used by some authors. Dilber et al., (2005) developed a model for healthcare industry; Cheng & Choy (2007) have developed a model for quality management for the shipping industry.

As per Lepmets et. al., (2012) Continuous improvement of service quality results in enhanced customer satisfaction, increased efficiency and maximization of business value of the service within the company. Amuthakkannan (2012) mentioned that the increasing demand on quality and productivity of products and services. In context of this the present study is discussed & elaborated.

3. Critical Success Factors and its Need

CSFs can be described as best practices or ways in which firms and their employees undertake business activities in all key processes such as leadership, planning, customers, suppliers, community relations, production, supply of products and services, use of benchmarking etc. Identifying and applying CSFs is not a new field of work. The original concept of success factors put forth in management literature by D. Ronald Daniel in the 1960 who is regarded as the creator of the concept (Caralli et al.; 2004). CSFs are powerful because they make explicit those things that a manager intuitively, repeatedly, and even perhaps accidentally knows and does to stay competitive. Saraph et al. (1989) defined the CSFs as “the critical areas of managerial planning and action that must be practiced in order to achieve the effectiveness”. Rockart (1979) defined the CSFs as “the areas in which, if they are satisfactory, will ensure successful competitive performance for the organization” According to Caralli et al. (2004), the Critical Success Factor method is a means for identifying important elements of success. According to Boynton and Zmud (1984), CSFs are those vital constructs that must go well to ensure success for manager or organization. Ahire et al. (1996), mentioned in his work that “CSFs of TQM are latent variables, which means they cannot be measured directly”.

Some theories were made to analyze these factors through Pareto analysis (Karuppusami, G. and Gandhinathan, R., 2006). Hence it is found that the concept of CSFs is given a special attention for the research work. The problems which were found in quality area in general manufacturing industries had been checked and tried to correct by using CSFs. During the past years, CSFs have been used successfully to improve the effectiveness of quality management in different Industries. However, the changing technological environment and business practices demand that the CSFs be determined intermittently. From the above study

it has been observed that no study is carried out for the selected domain i.e. steel casting industry. Hence the authors elected the present domain for enhancing the efficiency of steel casting industries.

4. CSFs Identified through Literature Review

Table 1: Judgemental Grouping of CSFs with References

Judgmental Grouping of The CSFS	References
Top Management Commitment Ability of Management to take Responsibility for Continuous Quality Improvement. Establishment of Management Information System. Clear understanding of strategic goals on the basis of SWOT (Strength, Weakness, Opportunities & Threats) analysis. Commitment of Job Security to employees. Effective People Management. Good Leadership quality of Manager.	Boynton & Zmud, (1984), Saraph et. al. (1989), Ahire et. al.(1996), Holland & Light, (1999),Sila & Ebrahmpour,(2003).
Training and Education Continuous Learning from tools, techniques & Processes. Educating Employees for providing Benefits Available to them. Leadership Development Training programs.	Holland & Light, (1999), Cheng & Choy, (2007), Putri &Yusof (2008), Rohani et.al.(2010), Talib et. al.(2010).
Employee Involvement Better Co-ordination & Good Relations of Employees with Supervisors & in between them. Collective Responsibility by all Employees. Encouraging Teamwork.	Talib et. al. (2010), Vinayn et. al. (2012), Dubey & Bansal, (2013).
Organizational Culture Encouraging innovation. Focus on Social skills improvement. Good Economic, cultural & technological Environment. Increase Employees Adaption for Changes.	Sternad and Bobek (2006), Chetcuti (2008), Vinayn et. al. (2012).
Continuous Improvement Emphasis on Benchmarking Competitors Products and Processes. Faster Response for Adaption of New Technologies for Continuous Improvement. Problem solving and continuous improvement processes based on facts and systematic analysis.	Ahire et al.(1996),Joseph et.al.(1999), Chong (2012), Raghunath & Jayathirtha, (2013).
Work Environment Regular & Efficient Supply of Raw Materials. Favorable Government laws & Regulations. Presence of Adequate Competent Personnel. Proper location of the firm.	Vokurka, et. al., (2001), Calingo, (2002), Sila & Ebrahmpour, (2003), Milkavoch, et. al., (2004), Chang, (2005), Dilber, (2005), Singh, et. al., (2006),
Technical Adequacy Efficient Tools and techniques. Emphasis on Shop Floor Experience and Marketing Experience for Design Team. Innovation & Improvement techniques. Promoting Automation in Production.	Ahire et. al.(1996), Yusof and Aspinwali (1999), Putri&Yusof (2008).
Customer focus Availability of Customer Complaint Information to Managers. Establishing Customer Relationship Management. Good after sale Service.	Saraph et. al. (1989), Ahire et. al. (1996), Dilber et. al.(2005),Chong(2012)

Judgmental Grouping of The CSFS	References
Good Knowledge of customer requirements (Voice of Customers). Honest & Two way Communication Methods with customers used by companies.	
Quality Assurance Allocation of Adequate resources to quality improvement Efforts. Availability of Cost of Quality and Rework data to Managers. Communication of ISO 14001 (Environmental Management System). Customer involvement in viewing product quality & Development. Performance evaluation of Managers based on Quality.	Boynton & Zmud, (1984), Saraph et. al. (1989), Sila & Ebrahmpour, (2003), Dilber et. al. (2005), Putri & Yusof (2008).
Process Management Availability of Sufficient Resources, time & Energy to meet the process Effort. Clarity of process instructions given to employees. Continuous Inspection of Processes. Continuous Process analysis, monitoring and improvement strategies. Good Knowledge of Process tools & Methods. Targeting of correct Processes to be Re-Engineered. Use of Statistical Process Control for Process Management.	Boynton & Zmud, (1984), Ahire et. al.(1996), Holland & Light, (1999), Yusof and Aspinwali (1999), Umble(2003),Dilber et. al. (2005), Putri & Yusof (2008), Salaheldin (2009).

5. Research Methodology

The main purpose of this study was to identify the CSFs for Steel casting industry in the Vidarbha region of India. The literatures were reviewed to determine items relevant to CSFs for Large & medium scale steel casting industries. The topics of interest were mainly the items related to process management (steel casting industry is a process industry). A bunch of papers, published during 2000-2012, were used for sorting out the items relevant to steel casting industries. The research instrument was data analyzing form. The methodology for this research was analyzing and synthesizing data using one of the popular qualitative techniques with content analysis.

Table 2 Research Instrument Input Attributes

No.	ATTRIBUTES
IP-1	Top Managements Commitment for Continuous Quality Improvement.
IP-2	Clear understanding of strategic goals on the basis of SWOT (Strength, Weakness, Opportunities & Threats) analysis.
IP-3	Commitment of Job Security to employees.
IP-4	Effective People Management.
IP-5	Establishment of Management Information System.
IP-6#	Good Leadership quality of Manager.
IP-7	Continuous Learning from tools, techniques & Processes.
IP-8#	Educating Employees on the Benefits Available to them.
IP-9#	Leadership Development Training programs.
IP-10	Provision of videos and manuals of Desired Practice to Employees.
IP-11#	Training programs on Total Quality Management.
IP-12	Training to Employees with Respect to Risk Assessments.
IP-13#	Better Co-ordination & Good Relations of Employees with Supervisors & in between them.
IP-14#	Collecting Responsibility by all Employees.
IP-15#	Encouraging Teamwork
IP-16	Fair compensation to all employees as well as Individual performance-related pay for employees.
IP-17*	Measurement of Employees Commitment Levels.

IP-18	Regular process auditing by all employees.
IP-19*	Effective & well Defined Rules Regulations & Operating Procedures.
IP-20*	Effective organization Structure.
IP-21	Encouraging innovation.
IP-22	Focus on Social skills improvement.
IP-23	Good Economic, cultural & technological Environment.
IP-24	Increase Employees Adaption for Changes.
IP-25	Regular Organizational Performance Measurement.
IP-26	Emphasis on Benchmarking Competitors Products and Processes.
IP-27*	Faster Response for Adaption of New Technologies for Continuous Improvement.
IP-28*	Problem solving and continuous improvement processes based on facts and systematic analysis.
IP-29	Favorable Government laws & Regulations.
IP-30	Favorable, Pleasant work environment and culture.
IP-31	Presence of Adequate Competent Personnel.
IP-32	Proper location of the firm.
IP-33	Regular & Efficient Supply of Raw Materials.
IP-34	Regular Consideration of Employees Feedback.
IP-35	Supporting Infrastructure for Problem Solving.
IP-36	Efficient Tools and techniques.
IP-37*	Emphasis on Shop Floor Experience and Marketing Experience for Design Team.
IP-38	Innovation & Improvement techniques.
IP-39	Promoting Automation in Production.
IP-40	Availability of Customer Complaint Information to Managers.
IP-41*	Establishing Customer Relationship Management.
IP-42	Good after sale Service.
IP-43	Good Knowledge of customer requirements (Voice of Customers).
IP-44#	Honest & Two way Communication Methods with customers used by companies.
IP-45	Allocation of Adequate resources to quality improvement Efforts.
IP-46	Availability of Cost of Quality and Rework data to Managers.
IP-47	Communication of ISO 14001 (Environmental Management System).
IP-48#	Customer involvement in viewing product quality & Development.
IP-49	Effective implementation of Predefined Quality Goals and Policies.
IP-50	Performance evaluation of Managers based on Quality.
IP-51	Regular monitoring of Quality feedback.
IP-52	Use of Quality Standards.
IP-53	Availability of Sufficient Resources, time & Energy to meet the process Effort.
IP-54	Clarity of process instructions given to employees.
IP-55	Continuous Inspection of Processes.
IP-56	Continuous Process analysis, monitoring and improvement strategies.
IP-57*	Good Knowledge of Process tools & Methods.
IP-58	Targeting of correct Processes to be Re-Engineered.
IP-59	Use of Statistical Process Control for Process Management.

* indicates the attributes (no.17,19,20,27,28,37,41 and 57) deleted after analysis of data and discussion with respondents during collecting the responses, and after collecting more information about the industry. Hence attributes (no.19 and 41) are deleted from Main Study. Certain attributes appeared to be suitable for deletion through data analysis, however, they found significant during discussion with casting employees & were retained (17, 20,27,28,37 and 57).

Table 3 Factor Rotation

Input Variables	Components								
	1	2	3	4	5	6	7	8	9
2-Clear understanding of strategic goals on the basis of SWOT (Strength, Weakness, Opportunities & Threats) analysis.	0.427								
4-Effective People Management.	0.673								
5-Establishment of Management Information System.	0.660								
6-Continuous Learning from tools, techniques & Processes.	0.619								
7-Leadership Development Training programs.	0.518								
8-Provision of videos and manuals of Desired Practice to Employees.	0.446								
9-Training programs on Total Quality Management.	0.497								
10-Training to Employees with Respect to Risk Assessments.	0.585								
11-Collecting Responsibility by all Employees.	0.565								
40-Availability of Cost of Quality and Rework data to Managers.	0.311								
41-Communication of ISO 14001 (Environmental Management System).	0.494								
42-Customer involvement in viewing product quality & Development.	0.310								
18-Focus on Social skills improvement.		0.476							
20-Increase Employees Adaption for Changes.		0.661							
21-Regular Organizational Performance Measurement.		0.545							
24-Problem solving and continuous improvement processes based on facts and systematic analysis.		0.455							
25-Favorable Government laws & Regulations.		0.541							
31-Supporting Infrastructure for Problem Solving		0.404							
53-Use of Statistical Process Control for Process Management.		0.320							

22-Emphasis on Benchmarking Competitors Products and Processes.			0.465						
32-Efficient Tools and techniques.			0.452						
33-Emphasis on Shop Floor Experience and Marketing Experience for Design Team.			0.397						
39-Allocation of Adequate resources to quality improvement Efforts.			0.704						
44-Performance evaluation of Managers based on Quality.			0.332						
49-Continuous Inspection of Processes.			0.495						
50-Continuous Process analysis, monitoring and improvement strategies.			0.416						
23-Faster Response for Adaption of New Technologies for Continuous Improvement.				0.399					
29-Regular & Efficient Supply of Raw Materials.				0.553					
36-Availability of Customer Complaint Information to Managers.				0.323					
51-Good Knowledge of Process tools & Methods.				0.687					
52-Targeting of correct Processes to be Re-Engineered.				0.738					
1-Top Managements Commitment for Continuous Quality Improvement.					0.378				
15-Regular process auditing by all employees.					0.471				
16-Effective organization Structure.					0.505				
35-Promoting Automation in Production.					0.555				
37-Good after sale Service.					0.405				
45-Regular monitoring of Quality feedback.					0.583				
46-Use of Quality Standards.					0.447				
12-Encouraging Teamwork						0.591			
13-Fair compensation to all employees as well as Individual performance-related pay for employees.						0.513			
14-Measurement of Employees Commitment Levels.						0.439			
19-Good Economic, cultural & technological Environment.						0.550			

38-Good Knowledge of customer requirements (Voice of Customers).						0.469			
43-Effective implementation of Predefined Quality Goals and Policies.						0.528			
17-Encouraging innovation							0.705		
26-Favorable, Pleasant work environment and culture.							0.416		
27-Presence of Adequate Competent Personnel.							0.517		
28-Proper location of the firm.							0.498		
30-Regular Consideration of Employees Feedback.								0.331	
47-Availability of Sufficient Resources, time & Energy to meet the process Effort								0.360	
48-Clarity of process instructions given to employees.								0.695	
3-Commitment of Job Security to employees.									0.688
34-Innovation & Improvement techniques.									0.703

Table 4 Factors after rotation

Factors after first rotation	No. of variables in particular factor	
IF1	2,4,5,6,7,8,9,10,11,40,41,42	Total = 12
IF2	18,20,21,24,25,31,53	Total= 7
IF3	22,32,33,39,44,49,50	Total=7
IF4	23,29,36,51,52	Total = 5
IF5	1,15,16,35,37,45,46	Total = 7
IF6	12,13,14,19,38,43	Total=6
IF7	17,26,27,28	Total=4
IF8	30,47,48	Total=3
IF9	3,34	Total=2

Table 5 Loading of Factors

Factor Name	Variables Loaded In Factor
IF1 – Training & Education	2-Clear understanding of strategic goals on the basis of SWOT (Strength, Weakness, Opportunities & Threats) analysis. 4-Effective People Management. 5-Establishment of Management Information System. 6-Continuous Learning from tools, techniques & Processes. 7-Leadership Development Training programs. 8-Provision of videos and manuals of Desired Practice to Employees. 9-Training programs on Total Quality Management. 10-Training to Employees with Respect to Risk Assessments. 11-Collecting Responsibility by all Employees.

	<p>40-Availability of Cost of Quality and Rework data to Managers.</p> <p>41-Communication of ISO 14001 (Environmental Management System).</p> <p>42-Customer involvement in viewing product quality & Development.</p>
IF2 –Conducive Work Environment	<p>18-Focus on Social skills improvement.</p> <p>20-Increase Employees Adaption for Changes.</p> <p>21-Regular Organizational Performance Measurement.</p> <p>24-Problem solving and continuous improvement processes based on facts and systematic analysis.</p> <p>25-Favorable Government laws & Regulations.</p> <p>31-Supporting Infrastructure for Problem Solving.</p> <p>53-Use of Statistical Process Control for Process Management.</p>
IF3 –Continuous Improvement	<p>22-Emphasis on Benchmarking Competitors Products and Processes.</p> <p>32-Efficient Tools and techniques.</p> <p>33-Emphasis on Shop Floor Experience and Marketing Experience for Design Team.</p> <p>34-Innovation & Improvement techniques</p> <p>39-Allocation of Adequate resources to quality improvement Efforts.</p> <p>44-Performance evaluation of Managers based on Quality.</p> <p>49-Continuous Inspection of Processes.</p> <p>50-Continuous Process analysis, monitoring and improvement strategies.</p>
IF4 – Process Management	<p>23-Faster Response for Adaption of New Technologies for Continuous Improvement.</p> <p>29-Regular & Efficient Supply of Raw Materials.</p> <p>36-Availability of Customer Complaint Information to Managers.</p> <p>47-Availability of Sufficient Resources, time & Energy to meet the process Effort</p> <p>51-Good Knowledge of Process tools & Methods.</p> <p>52-Targeting of correct Processes to be Re-Engineered.</p>
IF5 – Quality Promotion	<p>1-Top Managements Commitment for Continuous Quality Improvement.</p> <p>15-Regular process auditing by all employees.</p> <p>16-Effective organization Structure.</p> <p>35-Promoting Automation in Production.</p> <p>37-Good after sale Service.</p> <p>45-Regular monitoring of Quality feedback.</p> <p>46-Use of Quality Standards.</p>
IF6 – Support to Employee	<p>3-Commitment of Job Security to employees</p> <p>12-Encouraging Teamwork</p> <p>13-Fair compensation to all employees as well as Individual performance-related pay for employees.</p> <p>14-Measurement of Employees Commitment Levels.</p> <p>19-Good Economic, cultural & technological Environment.</p> <p>30-Regular Consideration of Employees Feedback.</p> <p>38-Good Knowledge of customer requirements (Voice of Customers).</p> <p>43-Effective implementation of Predefined Quality Goals and Policies.</p> <p>48-Clarity of process instructions given to employees.</p>
IF7- Organization culture	<p>17-Encouraging innovation</p> <p>26-Favorable, Pleasant work environment and culture.</p> <p>27-Presence of Adequate Competent Personnel.</p> <p>28-Proper location of the firm.</p>

This method considers the correlation of each variable with individual scale. Specifically the item score to scale score correlation is used to determine whether an item belongs to the assigned factor or not. If an item does not correlate highly with the assigned scale, then it is shifted to the scale to which it is highly correlated.

6. Discussion

Steel casting industries forms the backbone of Industrial sector for the developing countries like India, which will provide a competitive advantage over the other industries worldwide. Therefore, identifying CSFs is necessary to determine the direction of the steel casting industries towards success and these must be implemented properly for achieving a better success to the organizations. In conclusion, the “CSFs for steel casting industry” found are: 1) Training & Education,2)Conducive Work Environment,3)Continuous Improvement,4) Process Management,5)Quality Promotion,6)Support to Employees,7)Organization Culture. As the factors which are carried out are significant, it is suggested that these should be used for improving the overall performance of the steel casting industries in Vidarbha region. It is a concrete approach to lead steel casting industry in all levels to the same directions for achieving the success and to make employees and executives know what they have to do for the success of steel casting plants.

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8. References

1. Ahire, S.L., Golhar, D.Y. and Waller, M. A. (1996) ‘Development and validation of TQM implementation constructs’, *Decision Sciences*, Vol. 27, No.1, pp.23- 56.
2. Boynton A.C., Zmud R.W. (1984) ‘An Assessment of Critical Success Factors’, *Sloan Management Review*, Vol.25 No.4’, pp.17-27.
3. Calingo, L. R., (2002) ‘The Quest for Global Competitiveness through National Quality and Business Excellence Awards’. *Asian Productivity Organization*, Vol. 7, No.5, pp.05-176.
4. Chang, H., (2005) ‘The Influence of Continuous Improvement and Performance Factors in Total Quality Organization’, *Total Quality Management*, Vol. 16, No. 3, pp.413-437.
5. Caralli R.A., James F. Stevens, Bradford J. Willke, and William R. Wilson (2004), ‘The Critical Success Factor Method: Establishing a Foundation for Enterprise Security Management’, No. CMU/SEI, pp.1-135.
6. Chang, H., (2005) “The Influence of Continuous Improvement and Performance Factors in Total Quality Organization”, *Total Quality Management*, Vol. 16, No. 3, pp.413-437.
7. Cheng, T.C.E. and Choy, P.W.C. (2007) ‘Measuring success factors of quality management in the shipping industry’, *Maritime Economics & Logistics*, No.9, pp.234-253.
8. Chittithaworn, C., Islam A., Keawachana, T., & Yusuf, D., (2011) “Factors Affecting Business Success of Small & Medium Enterprises (SMEs) in Thailand”, *Asian Social Science*, Vol. 7, No. 5, pp.1-11.
9. Dilber, M., Bayyurt, N., Zaim, S., and Tarim, M. (2005) ‘Critical factors of total quality management and its effect on performance in health care industry: a Turkish experience’, *Problems & Perspectives in Management*, Vol.4, pp.220-234.
10. Final Report For RMC, 2003. Total quality management (TQM) advancement and critical success factors for implementation in manufacturing small & medium sized enterprise (SMEs), [online] <http://eprints.utm.my/2626/1/71663.pdf> (Accessed 10 November 2012).
11. Gunasekaran, A. (1999) ‘Agile manufacturing: A framework for research and development’, *International Journal of Production Economics*, No. 62(1), pp.87-105.
12. Kshirsagar, V. P., & Gorantiwar, V. S., (2011) “Computer Aided Quality and Productivity Improvement In Sponge Iron Manufacturing”. *International Conference on Sustainable Manufacturing*, Vol. 1, No.2, pp. 64-131.

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