

A Meta-Analytical Approach to Cognize the Pooled Effect of Customer Relationship Management on Firm Performance

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Abstract

Purpose : This study attempted to explore the pooled effect of customer relationship management (CRM) on firm performance with a meta-analytical approach. It aimed to provide a holistic view of how CRM practices influenced organizational performance.

Methodology : The meta-analysis aggregated data from 51 studies with a total sample size of 11,081. This paper utilized the random effects model by taking into account the differences across studies in order to draw on the Z-values representing overall effect size, confidence levels, and *p*-values. Additionally, heterogeneity across the studies was quantified with the *I*² statistic and publication bias was examined with the Trim-and-Fill method.

Findings : The results unveiled a positive and statistically significant effect between CRM and firm performance with a pooled or combined effect size of 0.524 under a confidence level of 95% and a confidence interval with a lower limit of 0.444 to an upper limit of 0.595, while the prediction interval of lower limit -0.239 to an upper limit of 0.887. The analysis showed high heterogeneity among the studies (*I*² = 97.25%) and indicated variability in terms of the effectiveness of CRM interventions across different contexts.

Practical Implications : As the results indicated, policymakers could adopt innovative CRM strategies for better firm performance without any hesitation. However, while formulating strategies, they should consider the level of publication bias and heterogeneity and pilot-test the strategy in their local environment.

Originality/Value : The findings of this meta-analysis could serve as a benchmark for future research, allowing the replacement of mean effect sizes in null hypothesis testing. Future research should also explore sector-specific nuances in CRM and customer behavior, considering that foundational principles may differ across industries.

Keywords : customer relationship management (CRM), firm performance, meta-analysis, random effects model, organizational success

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The origin of customer relationship management (CRM) can be traced back to the early 1970s when businesses began recognizing the need to nurture relationships with their customers to ensure long-term success (Buttle, 2008). During this period, CRM's foundational principles began emerging and emphasized customer data collection and relationship-building strategies. Over the subsequent decades, significant technological and methodological advancements like database marketing, contact management software, sales force automation, e-commerce, social media, and cloud-based technologies shaped CRM into an integrated and robust business tool (Guerola-Navarro et al., 2024). During the 1980s, database technology helped businesses organize and store customer information systematically, creating an opportunity for more personalized interaction with customers (Das et al., 2024). It also introduced contact management software during this period that made organizing customer data and communication effective (Agrawal et al., 2023). By the 1990s, the CRM system began to combine features of sales force automation. This feature allowed the sales team to handle leads, track opportunities, and improve workflow processes (Soltani et al., 2018).

The introduction of internet-integrated e-commerce applications and online customer support services into CRM drastically heightened the reach and influence of the tool for businesses, whereby customers can be accessed over the Internet (Dwivedi et al., 2021). Furthermore, social media sites transform CRM by reaching out to wider audiences, analyzing the client's sentiments, and creating closer relationships with them (Greenberg, 2009). Cloud-based technology improved the accessibility and scalability of CRM, which reduced the cost of infrastructure and helped smaller businesses implement CRM solutions in an effective manner (Vial, 2021). The primary objective of CRM was to improve relationships with customers through better services, retention of clients, and increased sales and post-sale interactions (Parvatiyar & Sheth, 2001). With the inclusion of technology in business processes, CRM increased customer satisfaction and significantly improved company performance (Stone et al., 2020). CRM was designed as a strategy, methodology, and technology-driven approach to managing customer relationships, focusing on customer-centric procedures and interactions (Srivastava, 2019). These systems allowed for the integration of digital commerce, customer care, marketing, and sales operations with the objectives of maximizing profitability, revenue, and satisfaction (Joshi & Dabas, 2022; Suar & Mishra, 2020). As an emerging discipline, CRM adopted sophisticated analytics and data mining methods that made it possible for companies to learn more about customer behavior, segment their customer bases, and customize interaction (Swift, 2001).

Reichheld and Sasser (1990) argued that effective CRM fosters customer loyalty and retention, which are the key determinants of business success. CRM's integration with information technology allowed firms to tailor marketing, sales, and support activities, ensuring consistent and rewarding customer experiences (Chen & Popovich, 2003). Further, the use of CRM tools helped businesses optimize operations, enhance customer engagement, and build lasting relationships (Kumar & Shah, 2004). By leveraging data analytics and technology, CRM has become an indispensable component of modern business growth and development strategies. It enables firms to track customer interactions, evaluate performance metrics, and identify opportunities for growth and improvement (Zablah et al., 2004). Moreover, CRM's ability to align organizational goals with customer-centric practices underscores its transformative impact on business processes and outcomes (Payne & Frow, 2005).

Scholars also emphasized CRM's strategic significance in improving customer satisfaction and firm performance. By utilizing CRM systems, businesses achieved higher customer satisfaction, loyalty, and retention rates, which directly influenced profitability and market competitiveness (Battor & Battor, 2010). CRM facilitates efficient resource allocation by enabling firms to focus on high-value customers and tailor strategies to meet their needs effectively (Soltani et al., 2018).

Technological advancements within CRM systems enhanced firms' ability to analyze customer data, predict buying patterns, and respond to market changes promptly. These capabilities not only improved operational efficiency but also bolstered firms' strategic decision-making processes (Mohamad et al., 2014). CRM's emphasis

on customer engagement and personalized experiences contributed to building trust and long-term relationships, the key drivers of firm performance (Valmohammadi, 2017). Furthermore, firms leveraging CRM technologies demonstrated improved coordination across marketing, sales, and customer support functions, resulting in cohesive and effective business operations (Akgün et al., 2014).

CRM's strategic alignment with firm objectives facilitated the achievement of performance metrics, including increased revenue, market share, and customer acquisition rates (Charles, 2013). It also enabled firms to identify and mitigate operational inefficiencies, thereby improving cost management and enhancing profitability (Reichheld & Sasser, 1990). In dynamic market environments, CRM's ability to adapt to changing customer preferences and market conditions ensures sustained competitive advantage and growth (Guerola-Navarro et al., 2024).

Firm performance has historically been measured through a combination of financial and non-financial indicators, reflecting a company's ability to achieve its strategic objectives and operational goals. Financial metrics, such as profitability, liquidity, and efficiency, have long been considered primary measures of performance (Taouab & Issor, 2019). These metrics provide insights into a firm's financial health and operational success, guiding managerial decision-making and strategic planning (van de Ven et al., 2023). Non-financial metrics, including customer satisfaction, employee productivity, innovation, and corporate social responsibility, also play a significant role in assessing firm performance (Uzir et al., 2021). High customer satisfaction levels indicate that a company is meeting or exceeding customer expectations, which often translates into increased loyalty and higher market share (Gluck et al., 1980). Similarly, motivated and productive employees contribute to enhanced organizational performance by driving innovation and ensuring operational efficiency (Patrick, 2012).

Innovation and research and development (R&D) activities are critical drivers of firm performance, enabling companies to maintain a competitive edge and adapt to evolving market trends (Gleißner et al., 2022). Companies investing in sustainable practices and corporate social responsibility initiatives further enhance their reputation and credibility, positively influencing their performance (Eccles et al., 2007). The adoption of comprehensive performance measurement frameworks, such as the Balanced Scorecard, has enabled firms to evaluate their performance holistically, considering both short-term financial outcomes and long-term strategic goals (Kaplan & Norton, 1993). Firm performance reflects a firm's ability to handle complex market environments and address emerging challenges. Companies that effectively leverage technological advancements, including CRM, are better equipped to optimize operations, enhance customer experiences, and achieve sustainable growth (Guerola-Navarro et al., 2024). As markets become increasingly competitive, firms must prioritize performance measurement and improvement strategies to ensure continued success and relevance.

Methodology

This study follows the PRISMA model, which provides a clear and structured approach to reporting systematic reviews and meta-analyses. It outlines four key stages: identification, screening, eligibility, and included studies; and further aided by meta-analysis to find the linkage between CRM and firm performance.

Identification

An in-depth examination of various databases, including the Web of Science, Scopus, and Google Scholar, was conducted. Inclusion criteria for relevant studies on the keywords “CRM” and “firm performance” were established a priori, focusing the research article selection to the years 2004–2023. This ensured the selection was focused, relevant, and comprehensive. The search was completed by December 31st, 2023, to fully incorporate any recent publications.

Screening

After the preliminary selection, all retrieved records were screened against titles and abstracts to eliminate irrelevant studies for this research work suitable for meta-analysis. Studies that were ambiguous or too brief to fully determine relevance were selected for full-text screening. To minimize the bias and increase the likelihood of consistency, two reviewers independently screened all the articles. In addition, in case of differences between the two reviewers on the matter, a third reviewer's feedback was taken to resolve the unresolved cases.

Eligibility

At the eligibility screening stage, the studies were evaluated against the pre-specified inclusion and exclusion criteria. These criteria considered factors such as study design (e.g., randomized controlled trials, observational studies), population characteristics (e.g., age group and clinical conditions), and outcome measures (e.g., intervention effectiveness, risk factors). Studies that met all the inclusion criteria and were methodologically sound were selected for data extraction. Conversely, studies that failed to satisfy the eligibility criteria were excluded, and the reasons for their exclusion were documented.

A standardized form was used to extract key information from the selected studies, including author details, year of publication, sample size, and outcome measures, particularly the correlation coefficient (r) or beta coefficient (β). For studies that did not report the correlation coefficient, the researchers contacted the authors to obtain this information. Additionally, studies that only provided the beta coefficient were converted to the correlation coefficient using the formula " $r = 0.98\beta + 0.5$." The extracted data were systematically organized and analyzed. A meta-analysis was conducted to quantitatively summarize the findings, using the "Meta Essentials" statistical software developed by Erasmus Universiteit Rotterdam. When heterogeneity was observed, a qualitative synthesis was undertaken to highlight patterns and trends in the literature.

Inclusion and Reporting

The final step was to compile and report the results of the systematic review, following the PRISMA guidelines. The review identified approximately 630 papers related to CRM and firm performance. However, the researchers focused on 81 papers that clearly measured the effect of CRM on firm performance. Unfortunately, some of these papers were qualitative and lacked quantifiable effects, while others did not provide the necessary parameters (r or β) for meta-analysis and did not respond to personal requests as well. Ultimately, the researchers were able to perform a meta-analysis on 51 of the eligible papers.

A Prisma-Based Systematic Approach of CRM's Impact on Firm Performance

Following the PRISMA model, this systematic review provides a clear, reproducible, and comprehensive procedure to synthesize the existing literature on this topic. The process, therefore, diminishes bias considerably, leading to enhanced reliability and valuable insights for future research practice. The key findings from the narrative synthesis of the 51 eligible papers are presented in Table 1 in chronological order.

Yim et al. (2004) outlined four strategic areas for achieving superior customer relationships: focusing on valued customers, unifying around CRM, handling knowledge, and leveraging CRM-based technology. They emphasized that these superior customer relationships can be best achieved through coordinated efforts across functional areas. The organization should offer customized services and products to valued customers and have adequate hardware, software, and technical personnel to service them. Luo et al. (2004) highlighted the

Table 1. Studies Considered for Meta-Analysis

Studies Considered for Meta-Analysis							
S. No.	Study (Year)	Correlation (r)	Number of Subjects (n)	S. No.	Study (Year)	Correlation (r)	Number of Subjects (n)
1	Yim et al. (2004)	0.22	215	27	Kebede & Tegegne (2018)	0.67	350
2	Luo et al. (2004)	0.79	351	28	Soltani et al. (2018)	0.73	185
3	Kim (2008)	0.54	199	29	Rizwan et al. (2019)	0.80	150
4	Krasnikov et al. (2009)	0.65	199	30	Bhatti et al. (2019)	0.313	250
5	Battor & Battor (2010)	0.25	125	31	Foltean et al. (2019)	0.232	570
6	Chang et al. (2010)	0.24	180	32	Rafiki et al. (2019)	0.391	149
7	Reimann et al. (2010)	0.46	434	33	Rastgar et al. (2019)	0.55	167
8	Akroush et al. (2011)	0.92	318	34	Santoso & Siagian (2019)	0.698	300
9	Ernst et al. (2011)	0.15	285	35	Chatterjee et al. (2021a)	0.242	52
10	Vorhies et al. (2011)	0.46	231	36	Liu et al. (2020)	0.72	397
11	Patrick (2012)	0.22	169	37	Guerola-Navarro et al. (2020)	0.42	135
12	Adiele & Gabriel (2013)	0.60	100	38	Rodriguez & Boyer (2020)	0.64	223
13	Charles (2013)	0.78	40	39	Chatterjee et al. (2021b)	0.22	366
14	Law et al. (2013)	0.66	113	40	Guerola-Navarro et al. (2021)	0.359	74
15	Shavazi et al. (2013)	0.59	215	41	Herman et al. (2021)	0.434	150
16	Akgün et al. (2014)	0.75	359	42	Medjani & Barnes (2021)	0.281	227
17	Mohamad et al. (2014)	0.34	103	43	Nupus & Ichwanudin (2021)	0.035	191
18	Mozaheb et al. (2015)	0.02	369	44	Rahmadi et al. (2021)	0.64	100
19	Chen & Wu (2016)	0.31	105	45	Quzwen et al. (2021)	0.936	400
20	Soltani & Navimipour (2016)	0.47	585	46	Alshourah et al. (2022)	0.122	50
21	Rahman et al. (2017)	0.80	150	47	Chaithanapat et al. (2022)	0.20	283
22	Madhovi & Dhliwayo (2017)	0.68	90	48	Dogan-Sudas et al. (2022)	0.58	152
23	Mohammed et al. (2017)	0.52	46	49	Letchumannan et al. (2022)	0.72	230
24	Valmohammadi (2017)	0.70	152	50	Mehralian & Khazaee (2022)	0.253	257
25	Wang & Kim (2017)	0.201	211	51	Rahman et al. (2023)	0.469	217
26	Pozza et al. (2018)	0.35	112	Total Sample Size			11,081

significance of relational resources, such as customer relationships and social capital, in global competitiveness. Their study examined the impact of these resources on firm performance and their influence on domestic or international ownership. Conducted in China, the study acknowledges its limitations and calls for further research to improve the findings. Kim (2008) highlighted the importance of processing customer information in the hospitality industry. It suggested that training employees and promptly processing customer data can enhance business performance. The study also indicated that future research should explore factors influencing CRM performance and organizational variables as CRM aims to build customer relationships to enhance marketing and organization value.

According to Krasnikov et al. (2009), CRM should not be treated as a means of increasing efficiency, even though it can increase the potential profit of a company. Businesses should set yardsticks for performance objectives based on reasonable timelines. CRM providers should be cautious when making promises of rapid returns. Furthermore, it considered the influence of CRM on operational efficiency and profit efficiency.

Battor and Battor (2010) explored the relationship between innovation capability and a firm's capability to manage customer relationships. Firms with CRM capabilities can have better insights into customer demands and would ultimately innovate for better goods and services. Chang et al. (2010) emphasized the “customer needs first” culture and motivated staff to put the needs of the customer first. It examined how market share, sales revenue, customer acquisition, and sales growth relate to profitability, return on investment, and effectively achieving financial objectives. Reimann et al. (2010) stressed that managers who see CRM as a marketing initiative are unlikely to adopt CRM activities. Furthermore, CRM's capacity to direct or improve cost leadership and differentiation initiatives is more constrained.

Akroush et al. (2011) assessed knowledge management, approach, and key customer emphasis, and CRM initiatives may be converted into tangible organizational activities that support its success. Ernst et al. (2011) explored multi-channel management, customer information management, customer value management, financial benefits, improved career opportunities, and recognition of total revenue and return on investment. Vorhies et al. (2011) focused on cross-functional collaboration, collection, and use of information about the marketplace. It discussed the importance of interdepartmental meetings, information sharing, analysis of new marketing ideas, and a shared understanding of marketing information on a firm's performance. Patrick (2012) focused on how businesses must focus on customers as well as on utilizing CRM practices. This can be done through CRM deployment in gradual phases, scalable structure, and acknowledgment of the differences with a variety of customers. Continued product development, as well as innovation, is important to business success.

Adiele and Gabriel (2013) investigated CRM and business performance of the retail banking sector in Nigeria. It revealed that CRM is crucial for the success of banks, with customer identification and retention being key factors. The research suggested that CRM strategies, customer attraction, and retention policies improve performance. Customer identification, in particular, was the most significant contributor to bank profitability. The conclusion of the study suggested that Nigerian retail banking sectors should strive to enhance their CRM strategy. Charles (2013) explored the effect of CRM on the perceived bank performance in Oyo Town, Nigeria. It identified attachment, belief, promise, communication, and satisfaction as predictors of bank performance. Law et al. (2013) argued that information utilization mediated the relationship between the adoption of CRM with customer satisfaction, retention, employee job satisfaction, organizational commitment, and business performance.

Shavazi et al. (2013) studied the Iranian banking industry by using a balanced scorecard approach and found a strong correlation between CRM processes and performance. Akgün et al. (2014) argued that CRM performance is linked to the organization's ability to learn, share knowledge, and effectively integrate that knowledge into CRM. Mohamad et al. (2014) underlined the need for firms to understand and meet customer needs through customer-centric management and adopt suitable CRM systems. Mozaheb et al. (2015) investigated the impact of CRM on the performance of small and medium-sized enterprises (SMEs) in Mashhad. About 105 managers were randomly selected from an industrial park. Data was collected using library methods, survey methods, and questionnaires. The results showed that CRM significantly impacted SMEs' performance, with technology playing a crucially enabling role in achieving superiority.

Chen and Wu (2016) examined the relationship between CRM implementation, internal marketing strategies, relationship management effectiveness, and operating performance in the lodging sector. It was found that both CRM and internal marketing directly affected CRM and had indirect effects on firm performance. Internal marketing strategies also directly enhanced financial and nonfinancial performance in all three sectors, with variations in strength among them. Soltani and Navimipour (2016) presented a framework and model to show the influential factors of CRM success and evaluated the impact of customer orientation, organizational capability, technology, and customer knowledge management on CRM success.

Rahman et al. (2017) pointed out that client knowledge, valued client focus, and relationship marketing upturned firm performance. Madhovi and Dhliwayo (2017) emphasized that knowledge management, along with

continuous assessments of service quality, was critical to the success of service provision. Mohammed et al. (2017) examined the relationship between CRM and hotel performance in Malaysia. Valmohammadi (2017) advocated long-term partnerships, information sharing, joint problem-solving, and technology-based CRM applicable to both B2C and B2B marketing models. Wang and Kim (2017) emphasized integrating social media into marketing strategies to develop customer engagement and firm performance. Pozza et al. (2018) discussed the influence of organizational alignment dimensions in fostering CRM practices.

Kebede and Tegegne (2018) determined the effect of key customer focus, CRM organization, technology-based CRM, and knowledge management on commercial bank performance. Soltani et al. (2018) examined the impact of CRM on organizational performance, focusing on factors such as customer orientation, organizational capability, technology, and customer knowledge management. Rizwan et al. (2019) identified four CRM capability dimensions: customer orientation, CRM technology, CRM processes, and CRM organization and established them as significant predictors of organizational performance. Bhatti et al. (2019) examined the relationship between social media usage, CRM capabilities, and firm performance in the textile industry in Pakistan. The study found that social media usage had a positive mediation effect between social CRM capabilities, customer engagement, and firm performance.

Foltean et al. (2019) found that social media usage indirectly affected firm performance through CRM capabilities, and it emphasized the use of social media for better CRM processes. Rafiki et al. (2019) focused on the technological dimensions of CRM that influenced CRM performance. It recommended data analysis, quality CRM initiatives, and top management support for successful CRM. Rastgar et al. (2019) found the effect of knowledge management and e-CRM on business performance in the banking industry.

Santoso and Siagian's (2019) study revealed that there was a significant improvement in productivity, lead time, and profit with the help of information technology. IT applications enabled companies to understand the requirements of customers, manage their relationships, and improve the management of warehouses. It emphasized the role of IT in the satisfaction of customer demands and competitiveness. Chatterjee et al. (2021a) discussed factors affecting Indian organizations' adoption of SCRM and its benefits. Implementing SCRM would be able to save costs, enable better analysis of customer behaviour, and generate huge business benefits. Liu et al. (2020) emphasized the significance of customer orientation in B2B e-commerce platforms, suggesting that resources should be allocated disproportionately between seller and buyer efforts based on demand uncertainty. It also discussed the limitations of the study and hypotheses related to CO strategies.

Guerola-Navarro et al. (2020) presented a research model and methodology using a questionnaire for data collection. The paper emphasized the importance of measuring CRM introduction and incorporating an independent variable for CRM practices but does not provide specific details about specific companies. Rodriguez and Boyer (2020) explored the role of mobile CRM on customer satisfaction and sales performance which was mediated by collaboration. Chatterjee et al. (2021b) advocated AI-CRM in a B2B context. It concluded that to keep the new system alive, organizations need to concentrate more on improving individual capabilities and overall competencies. Guerola-Navarro et al. (2021) studied the relationship among CRM, innovation, and firm performance in the wine production sector. Herman et al. (2021) discussed the use of e-CRM in small and medium enterprises to enhance marketing performance. Companies that use e-CRM properly will have better customer satisfaction and loyalty.

Medjani and Barnes (2021) emphasized the use of social CRM to gain a competitive advantage in customer service. Nupus and Ichwanudin (2021) emphasized business network accessibility, CRM and value co-creation, and firm capabilities for superior performance. Rahmadi et al. (2021) recommended that organizations should assist small and medium micro enterprises in understanding CRM and entrepreneurial orientation to improve their performance. Quzwen et al. (2021) highlighted the importance of CRM in improving corporate performance, highlighting organizational, strategic, and cultural factors. Effective leadership, sourcing, communication, and

evaluation are crucial. Alshourah et al. (2022) examined the requirements of firms to change the marketing strategies they have because of the considerable impact that social media is having on achieving business goals.

Chaithanapat et al. (2022) discussed the relationship between knowledge-oriented leadership, customer knowledge management, innovation quality, and firm performance in SMEs. Dogan-Sudas et al. (2022) indicated how social media can be used to enhance the effectiveness of traditional CRM. Letchumannan et al. (2022) found that people, processes, and technology had their effects on CRM in organizational performance. As such, it focused more on fulfilling customer needs with quality service and digital transformation. Mehralian and Khazaei (2022) examined the influence of digital marketing on the business performance of micro, small, and medium enterprises (MSMEs) during the COVID-19 pandemic, taking into account the mediating role of CRM. Rahman et al. (2023) recognized the mediating role of AI-driven CRM to optimize firms' dynamic capabilities, through relationship performance.

Results and Findings of the Meta-analysis

Forest Plot

The meta-analysis is based on 51 studies and conducted on a total of 11,081 sample sizes or subjects (Figure 1). The random effects model indicates a highly significant result with a Z-value of 11.15, $p < 0.001$. The random effects model presumes that the studies involved in the meta-analysis have both within-study and between-study

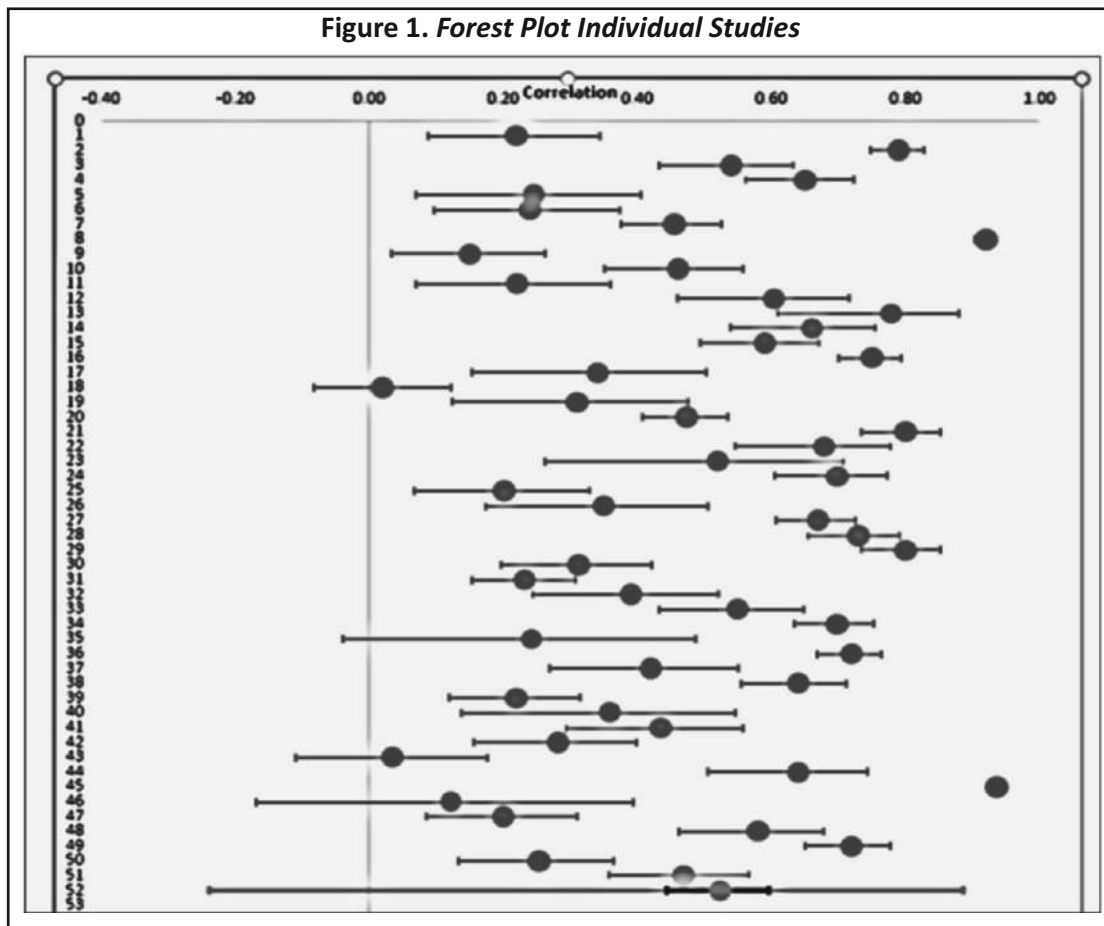


Table 2. Individual Study Weights (Forest Plot)

Individual Study Weights (Forest Plot)											
S. No.	Study Name	Correlation	CI	CI	Weight	S. No.	Study Name	Correlation	CI	CI	Weight
			Lower Limit	Upper Limit					Lower Limit	Upper Limit	
1	Yim et al. (2004)	0.22	0.09	0.34	1.98%	27	Kebede & Tegegne (2018)	0.67	0.61	0.72	2.01%
2	Luo et al. (2004)	0.79	0.75	0.83	2.01%	28	Soltani et al. (2018)	0.73	0.65	0.79	1.98%
3	Kim (2008)	0.54	0.43	0.63	1.98%	29	Rizwan et al. (2019)	0.80	0.73	0.85	1.96%
4	Krasnikov et al. (2009)	0.65	0.56	0.72	1.98%	30	Bhatti et al. (2019)	0.313	0.20	0.42	1.99%
5	Battor & Battor (2010)	0.25	0.07	0.40	1.95%	31	Foltean et al. (2019)	0.232	0.15	0.31	2.02%
6	Chang et al. (2010)	0.24	0.10	0.37	1.97%	32	Rafiki et al. (2019)	0.391	0.24	0.52	1.96%
7	Reimann et al. (2010)	0.46	0.38	0.53	2.01%	33	Rastgar et al. (2019)	0.55	0.43	0.65	1.97%
8	Akroush et al. (2011)	0.92	0.90	0.94	2.00%	34	Santoso & Siagian (2019)	0.698	0.63	0.75	2.00%
9	Ernst et al. (2011)	0.15	0.03	0.26	2.00%	35	Chatterjee et al. (2021a)	0.242	-0.04	0.49	1.82%
10	Vorhies et al. (2011)	0.46	0.35	0.56	1.99%	36	Liu et al. (2020)	0.72	0.67	0.76	2.01%
11	Patrick (2012)	0.22	0.07	0.36	1.97%	37	Guerola-Navarro et al. (2020)	0.42	0.27	0.55	1.95%
12	Adiele & Gabriel (2013)	0.60	0.46	0.72	1.92%	38	Rodriguez & Boyer (2020)	0.64	0.55	0.71	1.99%
13	Charles (2013)	0.78	0.61	0.88	1.76%	39	Chatterjee et al. (2021b)	0.22	0.12	0.32	2.01%
14	Law et al. (2013)	0.66	0.54	0.75	1.94%	40	Guerola-Navarro et al. (2021)	0.359	0.14	0.55	1.88%
15	Shavazi et al. (2013)	0.59	0.49	0.67	1.98%	41	Herman et al. (2021)	0.434	0.29	0.56	1.96%
16	Akgün et al. (2014)	0.75	0.70	0.79	2.01%	42	Medjani & Barnes (2021)	0.281	0.16	0.40	1.99%
17	Mohamad et al. (2014)	0.34	0.15	0.50	1.93%	43	Nupus & Ichwanudin (2021)	0.035	-0.11	0.18	1.98%
18	Mozaheb et al. (2015)	0.02	-0.08	0.12	2.01%	44	Rahmadi et al. (2021)	0.64	0.51	0.74	1.92%
19	Chen & Wu (2016)	0.31	0.12	0.48	1.93%	45	Quzwen et al. (2021)	0.936	0.92	0.95	2.01%
20	Soltani & Navimipour (2016)	0.47	0.41	0.53	2.02%	46	Alshourah et al. (2022)	0.122	-0.17	0.39	1.81%
21	Rahman et al. (2017)	0.80	0.73	0.85	1.96%	47	Chaithanapat et al. (2022)	0.20	0.08	0.31	2.00%
22	Madhovi & Dhliwayo (2017)	0.68	0.55	0.78	1.91%	48	Dogan-Sudas et al. (2022)	0.58	0.46	0.68	1.96%
23	Mohammed et al. (2017)	0.52	0.26	0.71	1.79%	49	Letchumannan et al. (2022)	0.72	0.65	0.78	1.99%
24	Valmohammadi (2017)	0.70	0.61	0.77	1.96%	50	Mehralian & Khazaei (2022)	0.253	0.13	0.36	1.99%
25	Wang & Kim (2017)	0.201	0.07	0.33	1.98%	51	Rahman et al. (2023)	0.469	0.36	0.57	1.99%
26	Pozza et al. (2018)	0.35	0.17	0.50	1.93%						

variability; and is used when the studies are expected to have different underlying true effects (Table 2). The Z -value = 11.15 is used to assess the overall effect size. A high Z -value means that the result is highly significant, suggesting that the combined effect is different from zero with very high certainty. Confidence level = 0.95 refers to the 95% confidence interval used in the analysis, which means the researchers can be 95% confident that the true effect size lies within the confidence interval. The one-tailed p -value is $0.000 < 0.05$. The “one-tailed” test is used in case the direction of the effect is specified. In addition, the two-tailed p -value = 0.000 is also found to be significant. This test determines whether the effect is significantly different from zero in either a positive or negative direction. The number of included subjects or the total sample size is 11,081, and a total of 51 studies were included in the meta-analysis. A high number of subjects boosted the power of the analysis, and hence, the results are considered to be more reliable.

The combined effect size is the point estimate for the overall effect of the intervention or variables being studied. The exact values are not shown in this snippet but would typically be shown in the output of the

Table 3. Meta-Analysis Model

Meta-Analysis Model			
Model	Random Effects Model	Z-value	11.1545
Confidence level	0.95	One-tailed <i>p</i> -value	0.000
Presentation		Two-tailed <i>p</i> -value	0.000
Sort By	Entry number	Number of incl. subjects	11,081
Order	Ascending	Number of incl. studies	51
	Combined Effect Size	Heterogeneity	
Correlation	0.524	<i>Q</i>	1818.79
Confidence interval LL	0.444	<i>pQ</i>	0.000
Confidence interval UL	0.595	<i>I</i> ²	0.9725
Prediction interval LL	-0.239	<i>T</i> ² (<i>Z</i>)	0.166
Prediction interval UL	0.887	<i>T</i> (<i>Z</i>)	0.408

meta-analysis. The correlation = 0.524 indicates a moderate positive correlation between the effect sizes across studies. The Cochran's *Q* statistic for heterogeneity is $Q = 1818.79$. It tests whether the variation in the effect sizes is more than the amount of sampling error. Finally, $pQ = 0.000$ is the *p*-value of the *Q* statistic. For the case of a *p*-value < 0.05, there is significant heterogeneity amongst the studies in the meta-analysis.

*I*² statistic is used to measure the percentage of total variation across studies due to heterogeneity instead of chance. *I*² of the study is 97.25%, which is highly significant, reflecting much variation between studies (Table 3). The prediction interval (PI), or LL = -0.239, is the lower bound of the PI. This interval provides an estimate of the effect size of new studies that could be conducted. The upper bound of the PI UL is 0.887. The PI is wider than the confidence interval, reflecting greater uncertainty about the effect size in future studies.

The $T^2(Z) = 0.166$ represents the estimate of between-study variance (τ^2) in the random effects model. It indicates the amount of variability in the true effect sizes across studies. And $T(Z) = 0.408$ tests whether the estimated pooled effect size has high precision. The higher the value reflected, the higher the precision in the majority of cases. The effect-size correlation average is 0.524, indicating that the effects in at least several of the studies are perhaps being somehow reliably replicated. The *Q* and *pQ* statistics both show significant heterogeneity between studies. The *I*² statistic (97.25%) indicates that there is highly heterogenic variation among the studies with very large differences in effect sizes. The PI is broad, which indicates uncertainty regarding the effect in future studies, possibly showing both negative and positive effects. This analysis supports a significant overall effect, but the high heterogeneity and wide PI suggest caution in applying the results to new settings or populations.

Publication Bias Analysis

The unadjusted pooled effect size ($Z = 0.60$) is strong and significant with a narrow CI [0.58, 0.62]. However, such an observed effect might be an artifact of smaller studies with non-significant results missing from the analysis (Figure 2). The PI of [-0.22, 1.42] accounts for between-study variability and it is found that zero is a part of it. This means that some of the individual studies may be non-significant or even negative, thus indicating that there is a need to assess for publication bias in the studies included. The “Trim-and-Fill method” is used to assess the publication bias. This method identifies and controls publication bias through the following process:

✎ **Trimming Asymmetric Studies** : This approach evaluates the asymmetry of a funnel plot, where the effect sizes are plotted against standard errors. Asymmetry is an indication of missing studies due to bias.

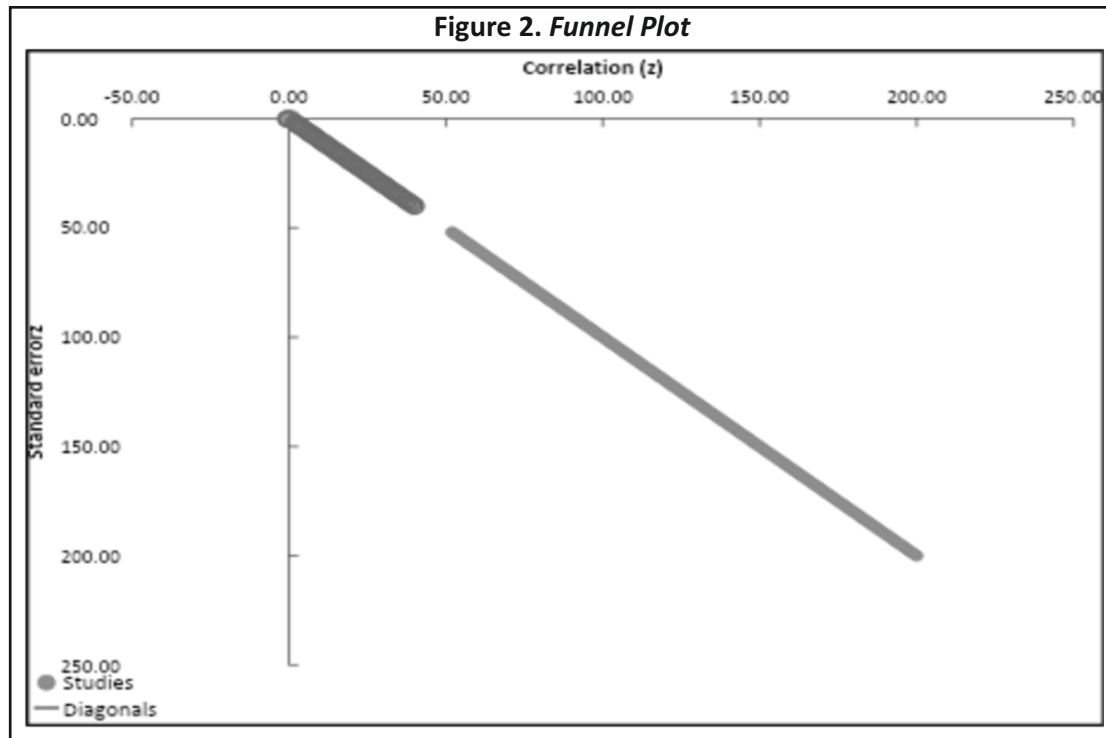


Table 4. Publication Bias Analysis

Publication Bias Analysis			
Combined Effect Size	Observed	Heterogeneity	
Correlation (Z)	0.60	Q	2357.73
SE (Z)	0.01	pQ	0.00
CI Lower limit	0.58	I^2	0.9784
CI Upper limit	0.62	T^2	0.21
PI Lower limit	-0.22	T	0.46
PI Upper limit	1.42		
Combined Effect Size	Adjusted	Trim and Fill	On
Correlation (Z)	0.56	Estimator for missing studies	Leftmost Run/ Rightmost Run
SE (Z)	0.01	Search from mean	Left
CI Lower limit	0.54	Number of imputed studies	1
CI Upper limit	0.58		
PI Lower limit	-0.36		
PI Upper limit	1.48		

👉 **Imputing Missing Studies** : Since an asymmetry is observed, the procedure imputes missing studies to “balance” the plot. One study was imputed: A study on the left side would have resulted in a smaller or negative effect and was imputed by Trim-and-Fill. The adjusted pooled effect size decreased slightly from 0.60 (Observed) to 0.56 (Adjusted). This decrease means that the initial effect size may have been inflated due to publication bias (refer to Table 4).

Heterogeneity and Its Usefulness in Dealing with Bias

When evaluating the efficacy of publication bias adjustment, heterogeneity also plays a crucial role.

↳ **High heterogeneity (97.84%, I^2)** : The observed asymmetry in the funnel plot could be ascribed to actual variations in study effects as well as publication bias because of the considerable level of heterogeneity between studies. This makes the prejudice more difficult to identify. Tau-squared ($T^2 = 0.21$) is significant between-study heterogeneity, which makes it difficult to distinguish between the effects of bias and true heterogeneity.

↳ **Adjusted for Potential Publication Bias** : The effect size is still significant, albeit decreased to a value of $Z = 0.56$. The slight increase in the upward direction of the observed estimate would be minor. The PI is widened to $(-0.36, 1.48)$, indicating increased uncertainty due to adjustment for bias. Moderately strong and significant effects in the unadjusted result would still be inflated by publication bias. The modified data reveals a somewhat smaller effect size with a modest upward bias, and Trim-and-Fill identified one missing study. The observed variation may be the result of actual differences between studies rather than pure bias, which makes interpretation difficult, given the large heterogeneity of 97.84%. With the adjustment, the effect is still significant, thus indicating that, although publication bias may exist, it should not fully account for the observed effect.

Conclusion

This study is focused on a meta-analytical approach to cognize the pooled effect of CRM on a firm's performance. The meta-analysis is based on 51 studies and a total of 11,081 sample sizes or subjects. The random effects model is applied in meta-analysis to evaluate the variation in the true effects of studies. It uses Z -values to assess the overall effect size, confidence level, one-tailed p -values, and total sample size. The combined effect size is the point estimate for the overall effect of the intervention or variable being studied. The I^2 statistic is the proportion of total variation across studies caused by heterogeneity, which is highly significant at an I^2 of 97.25%. The PI is wider than the confidence interval, meaning there is greater uncertainty about the effect size in future studies. $T^2(Z)$ and $T(Z)$ statistics are indicators of the estimate of between-study variance and high precision. The unadjusted pooled effect size is found to be powerful and significant.

The PI accounts for between-study variability and found zero is part of it. It is, therefore, important to check for publication bias within the included studies. One statistical method for the detection and control of publication bias is the Trim-and-Fill method. It involves trimming asymmetric studies, which suggest that certain studies are missing because of biases, and imputing missing studies to balance the plot. A method useful in handling high heterogeneity is in cases whereby the observed asymmetry may be both due to publication bias as well as real differences between the study effects. However, the method can still detect one missing study, which indicates that though publication bias may exist, but should not fully account for the observed effect. The method's effectiveness depends on the heterogeneity between studies and the degree of bias.

Overall, this study examines and finds from detailed analysis that organizations can attain significant mileage by using CRM, particularly in the identification of customers, retention of customers, offering service excellence, and building customer engagement models, thereby contributing to enhanced firm performance, sales revenue, profitability, and credibility for the organization. These insights, along with findings from earlier research or studies, should definitely help organizations and leaders chart their path for growth, expansion, diversification, and consolidation.

Managerial Implications

The managers should note that although the observed effect size supports the adoption of CRM, the presence of publication bias suggests that the true impact may be slightly smaller than initially estimated. This uncertainty should be incorporated into decisions. The high heterogeneity indicates that the efficacy of the interventions may vary significantly across different settings or populations ($I^2 = 97.84\%$). Pilot testing of the strategy should be done in their environment so that it is compatible with local conditions. One should gather insights from unpublished studies, industry reports, or internal organizational data since they are based upon hands-on experience on the ground realities of business, in addition to the scientific, systematic, and published findings. It can be said that open data sharing and collaboration with researchers from academia or industry will provide better or enhanced access to a wider evidence base. Continuous monitoring of key performance indicators will enhance intervention impacts through real-time tracking. Adaptive management practices should utilize emerging data to refine strategies with the help of a responsive and iterative approach.

Limitations of the Study and the Way Forward

This study has some limitations despite efforts to ensure accuracy and comprehensiveness. The limitations may be in terms of internal validity (causal relationships), construct validity (accuracy of measurement), statistical conclusion validity (reliable statistics), and external validity (generalizability). These limitations may impact the reliability, accuracy, and applicability of the findings. Meta-analysis typically included a small subset of studies on a topic, which may have introduced selection bias. Research involving small sample sizes often exhibits low statistical power and large standard errors. Heterogeneity in methods and data analysis may have led to misleading inferences, as the meta-analysis relies on shared subjectivity rather than pure objectivity. Even high-quality research could prove unreliable if the methodology employed in the meta-analysis were weak. Additionally, the inability to find similar studies on the subject could have resulted in incorrect conclusions.

Future studies should address these limitations by incorporating more unpublished papers, rejected publications, and regulatory data to capture the dynamic relationship between CRM and firm performance comprehensively. The application of meta-structural equation modeling could provide deeper insights into causal relationships. Longitudinal studies should be conducted to experimentally validate the effect of CRM on firm performance over time. The findings of this meta-analysis can serve as a benchmark for future research, allowing the replacement of mean effect sizes in null hypothesis testing. Future research should also explore sector-specific nuances in CRM and customer behavior, considering that foundational principles may differ across industries. Expanding the breadth and depth of CRM studies will help elucidate its true impact on firm performance and guide strategic decision-making effectively. Further expansion in breadth and depth of research into the impact of CRM on firm performance can be beneficially useful when researching sector-specific nuances. Even though the underlying principles of customer management and engagement remain consistent, the complexities of CRM and customer behavior differ in various industries. This area can, therefore, have a significant amount of future research benefits.

Authors' Contribution

Dr. Subhasish Das and Dr. Amiya Kumar Mohapatra conceptualized the idea and developed the research framework. Further, Dr. Subhasish Das and Dr. Shailesh Pandey substantially extracted the research papers from reputed publishers to find the research gaps. Dr. Amiya Kumar Mohapatra and Dr. Subhasish Das analyzed the data by adopting suitable tools and techniques. Dr. Subhasish Das, Dr. Amiya Kumar Mohapatra, and

Dr. Yayati Nayak systematically analyzed the results/findings and drafted a detailed manuscript. Dr. Amiya Kumar Mohapatra, Dr. Shailesh Pandey, and Dr. Yayati Nayak concluded the research outcomes along with the required implications of the study.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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