Impact of Data Analytics Capabilities on CRM Systems' Effectiveness and Business Profitability

An Empirical Study in the Retail Industry

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Abstract: In the current digital era, understanding the role of Data Analytics Capabilities (DAC) in Customer Relationship Management (CRM) systems is essential for businesses seeking better decision-making. While DAC is acknowledged as a Critical Success Factor (CSF) for CRM systems, there is a gap in empirical evidence quantifying its effect on business profitability. This study aims to (1) present the conceptual foundation of the impact of DAC for CRM systems on marketing decisions and business profitability, and (2) empirically estimate the impact of integrating DAC on marketing performance and business profitability. Focusing on the retail sector, the study gathered 131 questionnaires from employees involved in CRM and DAC in Lebanon, and used the SPSS tool for data analysis. The research findings provide advanced empirical evidence of the importance of DAC as a CSF for CRM systems, alongside people, process, and technology dimensions. Results show that the integration of DAC represents a significant step forward in enhancing the effectiveness of CRM systems and achieving better business profitability. This study challenges the conventional understanding of technology's role in improving business outcomes, thus providing valuable theoretical and practical implications for organizations aiming to enhance their CRM systems.

Keywords: Data analytics capabilities, customer relationship management, critical success factors, business profitability, empirical evidence

Introduction

In the contemporary digital era, consumers exhibit evolving preferences, which are influenced by the rapid advancements in new technologies (Song, 2021). To understand and cater to these customers, businesses collect vast amounts of customer data from various sources, such as

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social media, server logs, web click streams, mobile apps and databases. However, the value of this data lies in the tools that can process and analyse it (Rana *et al.*, 2021). For instance, machine-learning algorithms can optimize prospect scoring by identifying prospects who share similar traits with existing customers, enabling salespeople to prioritize their actions towards the most promising sales opportunities (Sawal *et al.*, 2022).

Data Analytics Capabilities (DAC) have emerged for Customer Relationship Management (CRM) systems to balance with other Critical Success Factors (CSFs), mainly identified as people, process and technology (Chapman, 2019; Mikalef & Krogstie, 2020; Shahbaz *et al.*, 2020; Akter *et al.*, 2020; Song & Liang, 2021; Jabado & Jallouli, 2021). DAC allow businesses to gain a deeper understanding of their customers, make better decisions, enhance the customer experience, predict customer behaviour, increase efficiency, prevent data fragmentation, and implement data-driven marketing and sales strategies (Rana *et al.*, 2021; Chatterjee *et al.*, 2022). These capabilities enable businesses to optimize their CRM strategies to form responses to real-time shifts in customers' actions and behaviour (Mahafzah *et al.*, 2020; Maulana & Nalitupulu, 2022), thus improving their overall competitive performance (Chapman, 2019; Mahafzah *et al.*, 2020; Maulana & Nalitupulu, 2022).

Despite the growth in data quantity, speed, and diversity, there is a gap in empirical research about how DAC translates into competitive performance (Maulana & Nalitupulu, 2022). Furthermore, research on effective integration of DAC in operations and necessary organizational capabilities is limited (Kaabi & Jallouli, 2019; Jallouli & Kaabi, 2022). There is a recognized need for more empirical evidence to substantiate the impact of DAC initiatives on business value (Mikhalef *et al.*, 2020). The debate continues in academic and business circles about the conditions under which big data analytics can enhance business profitability (Mikhalef *et al.*, 2020).

Recently, a systematic literature review (SLR) conducted by Jabado & Jallouli (2023) highlighted the transversal role of DAC with other CSFs for CRM systems (technology, people, and process), along with its impact on firms' intrinsic outcomes (marketing decisions) and extrinsic outcomes (net benefits). The SLR results provided, for each dimension, the retained variables, measurement scales and items. It also argues that the integration of DAC as a CSF strengthens the impact of all CSFs (technology, people, process, DAC) on firms' intrinsic (marketing decisions and customer satisfaction) and extrinsic outcomes (firms' profitability presented by net benefits for firms and customers). These findings are supported by theoretical grounding, yet highlight a gap in empirical evidence.

The purpose of this paper is two-fold: (1) to present the conceptual foundation of the impact of DAC for CRM systems on marketing decisions and business profitability; and (2)

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empirically to estimate the impact of integrating DAC on marketing performance and business profitability. Indeed, this study aims to answer the following question: To which extent do CRM systems, integrating DAC, impact marketing decisions and business profitability? The proposed framework will be empirically tested in the context of the retail industry.

The first part of the study will provide a brief theoretical background about CRM systems and DAC, along with the research hypotheses for successful CRM implementation. The second part will discuss the quantitative method adopted to estimate the impact of DAC on CRM effectiveness and business profitability. The third part will present the data analysis with the results, followed by the discussion, while emphasising the implications of the research. The last part will conclude this study and describe its limitations, with recommendations for future research.

Theoretical Background and Research Hypotheses

The following section will provide a brief literature review about the theoretical framework guiding the study, along with the relevant research hypotheses to be tested.

CRM Critical Success Factors (CSFs)

Pan *et al.* (2007) describe CRM 'success factors' as the fundamental elements necessary for any CRM implementation to succeed. Critical Success Factors (CSFs) are identified as the key elements influencing an organization's achievement: Indeed, Guerola-Navarro *et al.* (2020) conceptualize CRM as comprising three core components: sales, marketing, and services, highlighting the importance of a customer-focused strategy in contemporary marketing practices.

People, process, technology framework

Originating in the 1970s for salesforce automation, CRM integrates people, processes, and technology (PPT) to manage relationships, focusing on customer retention and relationship development (Alnofeli *et al.*, 2023). In the PPT framework, maintaining balance among components is important: any imbalance compromises its effectiveness (Dąbrowska *et al.*, 2022; Biagi, Patriarca & Di Gravio, 2021). Thus, skilled people and well-designed processes are essential, alongside advanced technology (Biagi, Patriarca & Di Gravio, 2021). However, with growing technological influence, the framework's relevance is challenged (Davenport *et al.*, 2020). Wang & Dong (2022) suggest that integrating "data" might redefine and enhance its success parameters. Indeed, several studies attempted to investigate how DAC have become essential as a critical success factor for processing the vast amount of data collected from CRM systems, in addition to the PPT framework (Chapman, 2019; Jabado & Jallouli, 2021; 2023; Mikalef & Krogstie, 2020; Shahbaz *et al.*, 2020; Akter *et al.*, 2020; Song & Liang, 2021):

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Technology dimension - Integration of ERP system with CRM functionality

Previous studies highlighted the importance of unified data platforms, by integrating the Enterprise Resource Planning (ERP) system with CRM functionality, such as the omni-channels and suppliers' portals (Chen *et al.*, 2018; 2020). It provides organizations with the necessary tools to stay competitive in today's market. By leveraging the insights gained from this integration, businesses can improve their intrinsic outcomes (marketing decisions) such as customer satisfaction, better track their customer relationships, and optimize their operations (Kitchens *et al.*, 2018). Therefore, the following hypothesis will be tested:

H1: Technology – 'Integration of ERP system with CRM functionality' has a positive impact on Intrinsic Outcomes – 'Effective Marketing Decisions & Customer Satisfaction'.

People dimension – internal commitment: 'human skills'

The success of CRM depends not only on the use of technology but also on the internal commitment of employees (human skills) to customer satisfaction and involvement in marketing decisions through customer relationship management: Hamida *et al.* (2022) emphasize the importance of employee commitment and buy-in for successful CRM implementation. Employee commitment allows them to take ownership of customer interactions and provide high-quality customer service. This can be fostered by providing training and development opportunities, creating a culture of customer service, and recognizing and rewarding employee contributions to CRM (Shahbaz *et al.*, 2020). As such, the following hypothesis will be tested:

H2: People – 'Human Skills' have a positive impact on Intrinsic Outcomes – 'Effective Marketing Decisions & Customer Satisfaction'.

Process dimension – 'Process holistic approach and marketing channel strategies'

Successful implementation of CRM requires more than just the adoption of technology; it also involves focusing on underlying processes and organizational structures, focusing mainly on a process holistic approach and on marketing channel strategies for traditional stores and online shopping. This would ensure improved intrinsic outcomes (marketing decisions and better customer satisfaction) (Aljawarneh *et al.*, 2020; Kaabi & Jalouli, 2019; Rund, 2018). Thus, the following is hypothesized:

H3: Process – 'Process Holistic Approach and Effective Marketing Strategies' has a positive impact on Intrinsic Outcomes – 'Effective Marketing Decisions & Customer Satisfaction'.

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Data analytics capabilities dimension

Gupta & Chandra (2020) describe DAC as the process of converting the extensive data produced by CRM systems into impactful marketing strategies, thereby enhancing the overall performance of businesses. They can facilitate predictive modelling, forecasting, and the identification of potential cross-selling or upselling opportunities. Furthermore, DAC can be divided into three interconnected domains aimed at improving customer experience, decision-making, and overall strategy ("Real-Time Analytics", 2018): proactive analytics, which involves the use of AI to integrate customer awareness and marketing efforts (De Mauro *et al.*, 2022); contextual analytics, which focuses on leveraging real time insights from customer interactions to refine marketing approaches (Akter *et al.*, 2020); and the ability to unify customer data platforms across both online and physical stores ("Real-Time Analytics", 2018).

Intrinsic outcomes dimension – 'Customer satisfaction and effective marketing strategies'

Leveraging new technologies along with DAC empower companies to enhance customer experiences, make informed decisions, and drive business success in the context of CRM (Praful Bharadiya, 2023). Such capabilities foster personalized marketing, boosting customer satisfaction and loyalty (Chen *et al.*, 2020). Data analytics also spotlight customer trends, aiding targeted marketing strategies (Praful Bharadiya, 2023). By analysing CRM data, companies obtain strategic insights that refine marketing decisions and customer satisfaction, and can pinpoint growth opportunities (Mahafzah *et al.*, 2020; Maulana & Nalitupulu, 2022). As such, when DAC is included as a CSF for CRM systems, the following hypothesis will be tested to assess the impact on firms' intrinsic outcomes:

H4: 'Data Analytics Capabilities' has a positive impact on Intrinsic Outcomes – 'Effective Marketing Decisions & Customer Satisfaction'.

Extrinsic outcomes' dimension – business profitability 'net benefits'

CRM efficiency is optimized (firms' net benefits) only when data is centralized in one system and CRM features are accessible to all relevant stakeholders in the company (Maulana & Nalitupulu, 2022). For example, CRM solutions will involve front- and back-of-house departments, IT support, suppliers' portals, call centres, sales, marketing and commercial teams; they would be all unified through a centralized information system for effective decision-making and an increase in customer retention in traditional stores and online, leading to a boost in a firms' profitability (Dixit, 2022). As such, the following is hypothesized:

H5: Technology – 'Integration of ERP system with CRM functionality' has a positive impact on Extrinsic Outcomes – 'Net Benefits'.

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Berg *et al.* (2023) emphasize the importance of employees' involvement in how digital technologies are used and deployed. This involvement suggests that human skills, particularly in decision-making and technology application, are essential for optimizing the use of technology in the workplace. Furthermore, the advocacy for a human-centred design in technology implies a recognition of the value of human skills in shaping technology to meet human needs, rather than allowing technology dictate outcomes. This approach can lead to more effective and beneficial use of technology, impacting business profitability.

In contrast, Parker & Grote (2020) point out that heavy reliance on digital technologies, such as Knowledge Management Systems (KMSs), reduces the need for interpersonal knowledge-sharing and social interaction among colleagues. This diminished human interaction can lead to a more alienated workforce. This can negatively affect employee engagement and satisfaction. Disengaged employees are typically less productive and less innovative, which can adversely impact overall business profitability and performance. Based on previous literature, the following hypothesis will be tested:

H6: People – 'Human Skills' has a positive impact on Extrinsic Outcomes – 'Net Benefits'.

Hsu *et al.* (2021) emphasize the efficiency of CRM processes when they align with a company's strategic objectives, including customization and efficient data management. Effective CRM systems should streamline business procedures, support new product development, and enhance management capabilities. A customer-centric approach is critical for improving interdepartmental collaboration and data exchange, thus boosting customer relationship efficiency (Hargreaves *et al.*, 2018; Rahimi, 2022). Presently, businesses face challenges in customer analytics capabilities due to the complexity of data extracted from e-commerce platforms. A key challenge is creating a reliable, comprehensive data architecture for processing consumer insights, which is essential for shaping future marketing strategies, both online and in-store ("Real-Time Analytics", 2018). Barusman & Habiburrahman (2022) highlight the necessity of a holistic process that fosters collaboration among stakeholders, thereby enhancing the role of CRM systems in linking information technology with business profitability. As such, the following will be hypothesized:

H7: Process – 'Process Holistic Approach and Effective Marketing Strategies' has a positive impact on Extrinsic Outcomes – 'Net Benefits'.

As discussed in previous literature, integrating DAC into CRM systems is recognized as a key approach for achieving significant business outcomes (Gupta & Chandra, 2020). This multifaceted approach includes ("Real-Time Analytics", 2018): aligning CRM with a company's strategic objectives; enhancing business process efficiency; and improving sales performance. Adopting a customer-centric approach through data-driven insights enhances

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customer relationships and satisfaction, thereby positively influencing business outcomes. Additionally, a holistic and collaborative integration of data analytics in CRM ensures seamless alignment with business strategies, contributing to increased profitability and operational efficiency (Akter *et al.*, 2020). The combination of these factors leads to enhanced operational efficiency, greater customer satisfaction, and ultimately, improved business profitability (Chapman, 2019; Mahafzah *et al.*, 2020; Maulana & Nalitupulu, 2022). As such, the following hypothesis will be tested:

H8: 'Data Analytics Capabilities' has a positive impact on Extrinsic Outcomes – 'Net Benefits'.

Previous studies explored CRM benefits, highlighting its ability to improve both firm performance (marketing decisions) and customer satisfaction. Perceived sales performance and competitive performance were identified as two critical components in understanding the net benefits of CRM (Chatterjee *et al.*, 2022). Specifically, Sawal *et al.* (2022) confirmed that perceived sales performance leads to higher levels of customer satisfaction, which translates into improved competitive advantage. As such, the following is hypothesized:

H9: Intrinsic Outcomes – 'Effective Marketing Decisions & Customer Satisfaction' has a positive impact on Extrinsic Outcomes – 'Net Benefits'.

Research model

The model guiding this study is presented in Figure 1.

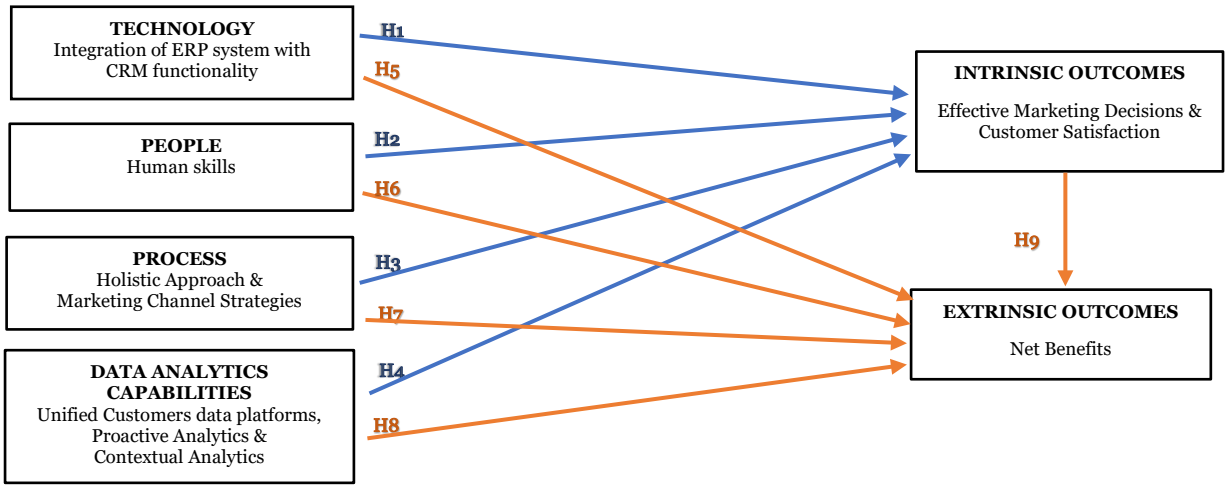

Figure 1. Research Model of the impact of Technology, People, Process and Data Analytics Capabilities on Effective Marketing Decisions, Customer Satisfaction and Net Benefits

Figure 1 synthesizes all dimensions of CSFs for CRM successful implementation. The general structure of the framework allows the analysis of: (1) the first level that involves the critical success factors of CRM systems by the independent variables of Technology, People, Process and DAC; (2) the second level, which examines Intrinsic Outcomes through the mediating

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variables 'Effective Marketing Decisions and Customer Satisfaction'; and (3) the last level, which measures the Business Profitability by the dependent variable 'Net Benefits'.

Methodology

This section outlines the methodology used to answer the research question: 'To which extent can CRM systems, integrating DAC, impact marketing decisions and business profitability?' Through the SPSS statistical tool, several statistical analyses were conducted on the data collected from the surveys.

Sample design and data collection

The study's target population comprised 131 employees who were primary users of the ERP system at 42 retail branches in Lebanon. The choice of this population, although considered small, is significant: indeed, the integration of the CRM system with the existing ERP is at its early stages in most branches, providing a ripe context for the research. Thus, the 131 employees constituted the only target population available that could serve as respondents in this study.

A questionnaire-based survey was utilized for primary data collection and testing the research model, using a 5-point multidimensional Likert-type scale. It contained questions based on Jabado & Jallouli's (2023) SLR findings, covering the six dimensions of the research model — Technology, People, Process, DAC, Intrinsic and Extrinsic Outcomes — along with the relevant measurement scales. Created with Google Forms, the questionnaire link was distributed to all 131 ERP-CRM users.

Data collection started on June 1, 2021, and ended on August 31, 2021. All 131 responses were valid. Respondents provided demographic information about their gender, age, education, company position, and ERP system usage, along with their answers to the variable-based questions.

Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) was used to explore the underlying structure of the CSF dimensions in CRM implementation, including Technology, People, Process, and DAC (Hair *et al.*, 2010). The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA) values for all dimensions exceeded the acceptable threshold of 0.6 (Brown, 2006), with an overall KMO = 0.749 (Table 1), indicating that data is suitable for factor analysis. Bartlett's Test of Sphericity (Table 1) showed a significant Chi-Squared value of 15300.799 (df = 4278, Sig. = 0.000), indicating that the variables are also correlated and suitable for a factor analysis (Brown, 2006).

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Table 1. KMO and Bartlett's Test

Factor Analysis Dimension	KMO MSA	Bartlett's Test of Sphericity		
		Approx. Chi-Squared (χ^2)	df	Sig.
All Dimensions of CSFs (Technology, People, Process, DAC)	0.749	15300.799	4278	0.000
Technology	0.856	871.167	45	0.000
People	0.857	1052.945	66	0.000
Process	0.922	2986.349	276	0.000
Data Analytics Capabilities	0.893	4112.671	666	0.000

The Principal Component Analysis (PCA) further reveals that the cumulative variance explained is 80%. These results indicate a strong representation of the data structure of the critical success factors through the extracted components: Technology, People, Process, and DAC (Hair *et al.*, 2010). The next step involves applying various reliability and validity tests to verify the factor structure previously identified.

Table 2. Summary of Reliability and Validity Indicators

Dimension	Sub-Dimension	*Measurement Scale*	Code	# of Items	Cronbach Alpha	Range of Inter-Item Correlations	AVE
Whole Questionnaire					**0.989**		
6	**11**	***24***		**121**			
Technology		***2***	**TECH**	**10**	**0.907**		
	Integration of ERP system with CRM functionality	*System Quality*	SQ	5	0.968	0.895** to 0.927**	0.738
		Knowledge Stock	KS	5	0.893	0.721** to 0.941**	0.659
People		***3***	**PEO**	**12**	**0.926**		
	Internal Commitment (Human Skills)	*Customer Interaction Mgmt Capability*	CIMC	5	0.918	0.703** to 0.934**	0.756
		Customer Orientation	CO	4	0.866	0.700** to 0.914**	0.705
		Customers' Involvement	CI	3	0.905	0.858** to 0.930**	0.767
Process		***5***	**PRO**	**24**	**0.97**		
	Process Holistic Approach	*Organizational Structure*	OS	3	0.84	0.846** to 0.886**	0.71
		Customer-Centric Organizational System	CCOS	5	0.876	0.723** to 0.934**	0.625
		Sales Automation	SA	6	0.943	0.815** to 0.950**	0.773
	Marketing Channel Strategies	*Marketing Channel Strategies*	MCS	5	0.895	0.796** to 0.871**	0.733
		Marketing Automation	MA	5	0.955	0.880** to 0.932**	0.827
Data Analytics Capabilities		***7***	**DAC**	**37**	**0.966**		
	Unified Customer Data platforms	*Knowledge Mgmt Systems*	KMS	4	0.894	0.794** to 0.932**	0.67
		Advanced Analytics	AA	4	0.877	0.797** to 0.913**	0.693
		IT Capability	IC	4	0.89	0.756** to 0.848**	0.697
	Proactive Analytics Capabilities	*Big DAC (Human Skills & Intangible)*	BDAC-HI	10	0.929	0.635** to 0.873**	0.534
		Improved Relation Knowledge	IRK	3	0.923	0.902** to 0.956**	0.842
	Contextual Analytics	*Big DAC (Data & Technology)*	BDAC-DT	8	0.925	0.722** to 0.843**	0.691
		Customer Relationship Upgrading Capabilities	CRUC	4	0.893	0.818** to 0.920**	0.811
Intrinsic Outcomes		***5***	**IO**	**25**	**0.955**		
	Effective Marketing Decisions	*Marketing Capabilities*	MC	4	0.851	0.708** to 0.903**	0.822
		Dynamic Capabilities	DC	9	0.91	0.571** to 0.879**	0.683
		Better Customer Services (Perceived)	BCSP	4	0.873	0.757** to 0.886**	0.807
		Personalization	PER	3	0.928	0.889** to 0.945**	0.837
	Customer Satisfaction	*Customer Satisfaction & Loyalty*	CSL	5	0.931	0.772** to 0.945**	0.812
Extrinsic Outcomes		***2***	**NB**	**13**	**0.946**		
	Net Benefits	*Perceived Sales Performance*	PSP	3	0.94	0.896** to 0.934**	0.792
	Business Profitability	*Competitive Performance*	CP	10	0.936	0.668** to 0.953**	0.661

** sig. at p<0.05

Reliability and validity analysis

Table 2 provides a summary of the research model's structure, along with the relevant reliability and validity indicators. Cronbach's alpha values range from .851 to .989 across all

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dimensions and exceed the recommended threshold of 0.7 (Hair, 2010), thus indicating that the items have relatively high internal consistency. Typically, for a scale to be considered reliable, the inter-item correlation should range between 0.2 to 0.8 (Hair, 2010). Table 2 indicates that the ranges of inter-item correlations meet this criterion, indicating good reliability.

Convergent validity was also assessed through Average Variance Extracted (AVE): the lowest value being 0.534 for DAC (Human Skills and Intangible), and the highest being 0.842 for DAC (Improved Relation Knowledge). Moreover, all values exceed the acceptable threshold of 0.5 (Cohen, 1988), meaning that a significant proportion of variance in the items is captured by the factor. Additionally, the square root of AVE (√AVE) is greater than the inter-construct correlations, supporting discriminant validity (Hair, 2010).

Regression analysis

The Multiple Linear Regression (MLR) analysis aimed at examining the impact of CSFs for CRM systems on Intrinsic Outcomes (Effective Marketing Decisions and Customer Satisfaction). This section will provide the statistical tests that were used to check the assumptions of the regression analysis.

Normality tests (Appendix), including Kolmogorov-Smirnov and Shapiro-Wilk, were performed, yielding p-values greater than 0.05 for most dimensions, suggesting that the assumption of normality was not violated (Razali & Wah, 2011). Skewness and kurtosis results fell within the acceptable range of -2 to +2, indicating no significant deviation from normality. Additionally, histograms and Q-Q plots complemented the normality analysis by providing a visual validation of the data distribution for each dimension.

The Variance Inflation Factor (VIF) was used to assess multicollinearity among predictors (Tables 3 to 5), with all VIF values below the threshold of 10 (Vittinghoff *et al.*, 2012), suggesting that collinearity was not a concern.

Additionally, the linearity between the independent variables (Technology, People, Process, DAC) and the dependent variables (Intrinsic Outcomes & Net Benefits) was tested. Results confirmed a significant linearity between all independent variables and dependent ones.

Next, a regression analysis will be conducted to determine the directionality and causality of these relationships.

Findings: Hypotheses Testing

Results for H1 though H4 are summarized in Table 3: Process (H2), DAC (H3) and People (H4) significantly predicted intrinsic outcomes ($F= 159.667$, $p < .001$), but Technology did not

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(β = -0.010, t = -0.140, p = 0.890). One potential rationale could be that the integration of the ERP system in the studied stores is still in the preliminary stages, and it often takes time before the outcomes are evident and discernible. Indeed, employees might not immediately notice improvements in operational efficiency, data accessibility, or workflow automation that the ERP system results in (Sawal *et al.*, 2022). The overall results were statistically significant, explaining 79% (R^2 = .790) of the variance in Intrinsic Outcomes (Effective Marketing Decisions and Customer Satisfaction).

Table 3. Summary of Multi Linear Regression (H1 to H4): Outcome IO

Hypothesis	Independent Variable (Predictor)	R	R^2	F	Sig (F)	Beta (β)	t	Sig (t)	(VIF)	Status
H1 (TECH => IO)	**TECH**	-	-	-	-	-0.010	-0.140	0.890	-	Not Supported
H2 (PRO => IO)	**PRO**	0.889	0.790	159.667	0.000	0.504	6.120	0.000	3.951	Supported
H3 (DAC => IO)	**DAC**					0.333	3.114	0.000	5.420	Supported
H4 (PEO => IO)	**PEO**					0.163	2.144	0.034	3.074	Supported

Stepwise Method / df (Regression)=3, df (Residual) = 127, N = 130

The MLR analysis then assessed the prediction of Net Benefits for the Firm and Customers (Profitability) through Technology, People, Process, and DAC. Results for H5 though H8 are summarized in Table 4.

Table 4. Summary of Multi-Linear Regression (H5 to H8): Outcome NB

Hypothesis	Independent Variable (Predictor)	R	R^2	F	Sig (F)	Beta (β)	t	Sig (t)	(VIF)	Status
H5 (TECH => NB)	**TECH**	-	-	-	-	-0.080	-0.935	0.352	-	Not Supported
H6 (PEO => NB)	**PEO**	-	-	-	-	0.334	0.295	0.769	-	Not Supported
H7 (PRO => NB)	**PRO**	0.851	0.724	167.841	0.000	0.493	4.987	0.000	3.896	Supported
H8 (DAC => NB)	**DAC**					0.508	4.632	0.000	3.896	Supported

Stepwise Method / df (Regression)=2, df (Residual) = 128, N = 130

Process (H7) and DAC (H8) were significant predictors of Net Benefits (F = 167.841, p < .001), with Technology (H5: β = -0.080, t = -0.935, p = 0.352) and People (H6: β = 0.334, t= 0.295, p = 0.769) showing no effect. Overall, results are significant, explaining 72.4% (R^2 = .724) of the variance in Net Benefits. Furthermore, a simple linear regression analysis assessed the prediction of Net Benefits for the Firm and Customers (Profitability) through Intrinsic Outcomes (Effective Marketing Decisions & Customer Satisfaction). Table 5 reports the findings of testing hypothesis (H9).

Table 5. Summary of Simple Linear Regression (H9): Outcome NB

Hypothesis	Independent Variables (Predictor)	R	R^2	F	Sig (F)	Beta (β)	t	Sig (t)	(VIF)	Status
H9 (IO => NB)	**IO**	0.888	0.788	480.205	0.000	0.939	21.914	0.000	1.000	Supported

Stepwise Method / df (Regression)=1, df (Residual) = 129, N = 130

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Results are statistically significant ($F = 480.205$, $p < .001$), indicating that Intrinsic Effective Marketing Decisions and Customer Satisfaction are a strong predictor of a firms' Business Profitability.

Overall, MLR results are highly significant with large F values and non-significant results for Technology, suggesting that, while Technology is an important factor, it may not directly influence outcomes as strongly as Process and DAC. These results provide answers to the research objectives and questions; they suggest that 'Process' and 'DAC' are critical factors contributing to both "Marketing Decisions and Customer Satisfaction" and "Net Benefits", highlighting the importance of efficient processes and data analytics in achieving organizational goals. Conversely, the integration of ERP with CRM technology, while essential, may not directly predict these outcomes. These results emphasize the importance of DAC's integration, along with "Human Skills" and "Process Holistic Approach", in enhancing CRM systems' effectiveness and boosting profitability. Technology as defined in this model does not appear to have a significant direct effect, nor do human skills alone. However, when these are combined with process and DAC strategies, they may still contribute to overall outcomes.

Discussion and Implications

This study highlights the critical role of DAC in CRM systems within the retail industry. This emphasizes the growing significance of DAC in conjunction with Technology, People, and Process, in line with the trend towards data-driven decision-making in retail (Mahafzah *et al.*, 2020; Maulana & Nalitupulu, 2022). The findings underscore the necessity for retail industries to develop solid analytics capabilities to maintain competitiveness (Chapman, 2019; Jabado & Jallouli, 2021; 2023; Mikalef & Krogstie, 2020; Shahbaz *et al.*, 2020; Akter *et al.*, 2020; Song & Liang, 2021) . The study also reveals the importance of harmonizing Technology, People, Process and DAC in CRM systems. The results suggest that successful CRM systems should encompass a combination of advanced technological tools, skilled personnel, and well-designed processes (Dąbrowska *et al.*, 2022; Biagi, Patriarca & Di Gravio, 2021) in addition to DAC (Kaabi & Jallouli, 2019).

Interestingly, MLR results indicate that technology, specifically CRM-ERP integration, does not significantly impact intrinsic and extrinsic outcomes. This finding suggests a potential underutilization or immature integration of technology in the sample studied, highlighting a gap between technological capability and its effective application (De Mauro *et al.*, 2022). This calls for an improved alignment between technological infrastructure and business strategies (Chen *et al.*, 2018; 2020). Furthermore, the study finds that Process positively influences both intrinsic outcomes and net benefits, highlighting the importance of holistic approaches and

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effective marketing strategies in CRM (Aljawarneh *et al.*, 2020). This indicates the need for an integrated CRM approach that combines various customer needs.

The significant positive impact of DAC on both intrinsic and extrinsic outcomes reinforces its important role in enhancing marketing decisions, customer satisfaction, and profitability. This aligns with the increasing trend of data-driven decision-making in the retail industry (Praful Bharadiya, 2023;). Moreover, there is an emphasis on the complex role of human skills in CRM systems, where People's impact is significant on marketing decisions and customer satisfaction, but not on net benefits. This suggests that, while employee capabilities and internal commitment are essential (Hamida *et al.*, 2022), their direct financial contributions may be moderated by several factors, to be further examined (Berg *et al.*, 2023; Biagi, Patriarca & Di Gravio, 2021).

On a theoretical level, the findings contribute to the existing literature by empirically validating the integration of DAC as a CSF in CRM systems, a relatively underexplored area in existing research. This shifts the traditional focus from technology-centric factors to a more balanced view that considers the interplay of technology with processes, people, and data analytics. This adds a new dimension to the theoretical understanding of CRM success factors, emphasizing the role of Data Analytics Capabilities in addition to the traditional factors of Technology, People, and Process. The study also broadens the scope of CRM implementation theory by focusing on the interplay between Process, DAC, and People, moving beyond Technology. This comprehensive approach provides new insights, especially in retail, and proposes a more balanced CRM model integrating technological, analytical, human, and process elements.

On a managerial level, and to the best of our knowledge, it is the first study that provides empirical evidence in the retail industry, through a quantitative study, of the positive effect of DAC and Process as CSFs for CRM systems on Net Benefits. Subsequently, results have important practical implications for businesses seeking to improve their profitability through the adoption of CRM strategies. The research also emphasizes the need for organizations in the retail industry to carefully balance the implementation of CRM systems: managers should prioritize process optimization, employee training, and DAC over solely focusing on technological integration of CRM systems. A holistic approach can lead to more effective marketing decisions and enhanced customer satisfaction to maximize net benefits.

Overall, the study emphasizes the multifaceted nature of CRM systems and the synergistic interplay between Technology, People, Process, and DAC. This comprehensive approach is essential in the retail sector to maximize the benefits of CRM systems, emphasizing the need for continuous training and development in the CRM domain (Kumar & Mokha, 2021) to

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enhance overall customer satisfaction and profitability for practitioners in the retail industry looking to optimize their CRM strategies (Akter *et al.*, 2020).

Conclusions, Limitations and Recommendations

CRM systems have been widely adopted by organizations as a means of improving customer satisfaction and loyalty, and, ultimately, business performance. Previous literature has established that the dimensions of People, Process and Technology (PPT) are CSFs for CRM systems. Additionally, the literature review indicates that DAC has also been identified as a CSF for CRM systems in previous studies (Chapman, 2019; Mikalef & Krogstie, 2020; Shahbaz *et al.*, 2020; Akter *et al.*, 2020; Song & Liang, 2021). This research has provided, through a survey in the context of retail industry, empirical estimations of the impact of DAC, People, Process and Technology as critical factors for successful CRM implementation.

This study is, to the best of our knowledge, the first of its kind to investigate the role of DAC as a CSF for CRM systems. To answer the research question and test the research hypotheses, an EFA was conducted to test the inclusion of DAC in the CSFs framework for successful CRM implementation (Wang & Dong, 2022). As well, the results of the MLR have provided empirical evidence for the importance of DAC as a CSF for CRM systems, in addition to the three dimensions largely accepted in the PPT framework. Furthermore, this research has confirmed that, when DAC and a process holistic approach are integrated together as CSFs of CRM systems, they have a significant positive impact on effective marketing decisions, customer satisfaction and profitability in the retail industry. The role of people and technology is yet to be examined further to assess the type of interaction they hold with other dimensions.

The study's geographical and industry-specific limitations are acknowledged. Its cross-sectional nature also overlooks temporal changes, especially in early ERP-CRM integration phases. Future research should: (1) explore case studies in diverse sectors with CRM and ERP integration to understand the benefits and challenges; (2) assess DAC and ERP-CRM integration effects across industries; (3) examine how CSFs collectively influence CRM efficiency; (4) look at customer perspectives on CRM outcomes; (5) conduct longitudinal research on the shifting impact of CSFs on CRM; (6) investigate how human skills and technological integration enhance CRM systems; and (7) analyse the roles of Technology and People on CRM profitability and benefits amid technological and analytical advancements.

References

Akter, S., Michael, K., Uddin, M. R., McCarthy, G., & Rahman, M. (2020): Transforming business using digital innovations: the application of AI, blockchain, cloud and data analytics. *Annals of Operations Research*, *308*(1–2), 7–39. https://doi.org/10.1007/s10479-020-03620-w

Aljawarneh, N. M., Sokiyna, M., Obeidat, A. M., Alomari, K. A. K., Alradaideh, A. T., & Alomari, Z. S. (2020). The Role of CRM Fog Computing on Innovation and Customer Service Quality: an Empirical Study. *Marketing and Management of Innovations*, *2*, 286–297. https://doi.org/10.21272/mmi.2020.2-21

Alnofeli, K., Akter, S., & Yanamandram, V. (2023). Understanding the Future trends and innovations of AI-based CRM systems. In Akter, S., & Fosso Wamba, S. (eds), *Handbook of Big Data Research Methods*, chapter 17. https://doi.org/10.4337/9781800888555

Barusman, A. R. P., & Habiburrahman, H. (2022). The role of supply chain management and competitive advantage on the performance of Indonesian SMEs. *Uncertain Supply Chain Management*, *10*(2), 409–416. https://doi.org/10.5267/j.uscm.2021.12.011

Berg, J., Green, F., Nurski, L., & Spencer, D. A. (2023, May 26). Risks to job quality from digital technologies: Are industrial relations in Europe ready for the challenge? *European Journal of Industrial Relations*, *29*(4), 347–365. https://doi.org/10.1177/09596801231178904

Biagi, V., Patriarca, R., & Di Gravio, G. (2021). Business Intelligence for IT Governance of a Technology Company. *Data*, *7*(1), 2. https://doi.org/10.3390/data7010002

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York: Guilford Press.

Chapman, C. (2019). Commentary: mind your text in marketing practice. *Journal of Marketing*, *84*(1), 26–31. https://doi.org/10.1177/0022242919886882

Chatterjee, S., Chaudhuri, R., & Vrontis, D. (2022). Big data analytics in strategic sales performance: mediating role of CRM capability and moderating role of leadership support. *EuroMed Journal of Business*, *17*(3), 295–311. https://doi.org/10.1108/EMJB-07-2021-0105

Chen, R. R., Ou, C. X., Wang, W., Peng, Z., & Davison, R. M. (2020). Moving beyond the direct impact of using CRM systems on frontline employees' service performance: The mediating role of adaptive behaviour. *Information Systems Journal*, *30*(3), 458–491. https://doi.org/10.1111/isj.12265

Chen, S. (2018). Estimating customer lifetime value using Machine Learning techniques. In Thomas, C. (ed.), *Data mining*. IntechOpen (pp. 17–34). https://doi.org/10.5772/intechopen.76990

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum.

Dąbrowska, J., Almpanopoulou, A., Brem, A., Chesbrough, H., Cucino, V., Di Minin, A., Giones, F., Hakala, H., Marullo, C., Mention, A., Mortara, L., Nørskov, S., Nylund, P. A., Oddo, C. M., Radziwon, A., & Ritala, P. (2022). Digital transformation, for better or worse: a critical multi-level research agenda. *R&D Management*, *52*(5), 930–954. https://doi.org/10.1111/radm.12531

Dixit, S. (2022). Artifical Intelligence and CRM: A Case of Telecom Industry. In Singh, S. (ed.), *Artificial Intelligence and CRM. Advances in Marketing, Customer Relationship Management, and E-Services*, pp. 92–114. https://doi.org/10.4018/978-1-7998-7959-6.ch006

Davenport, T., Guha, A., Grewal, D., & Bressgott, T. (2020). How artificial intelligence will change the future of marketing. *Journal of the Academy of Marketing Science*, *48*(1), 24–42. https://doi.org/10.1007/s11747-019-00696-0

De Mauro, A., Sestino, A., & Bacconi, A. (2022). Machine learning and artificial intelligence use in marketing: a general taxonomy. *Italian Journal of Marketing*, *2022*(4), 439–457. https://doi.org/10.1007/s43039-022-00057-w

Guerola-Navarro, V., Oltra-Badenes, R., Gil-Gomez, H., & Gil-Gomez, J. A. (2020). Research model for measuring the impact of customer relationship management (CRM) on performance indicators. *Economic Research-Ekonomska Istraživanja*, *34*(1), 2669–2691. https://doi.org/10.1080/1331677X.2020.1836992

Gupta, M. K., & Chandra, P. (2020). A comprehensive survey of data mining. *International Journal of Information Technology*, *12*(4), 1243–1257. https://doi.org/10.1007/s41870-020-00427-7

Gil-Gomez, H., Guerola-Navarro, V., Oltra-Badenes, R., & Lozano-Quilis, J. A. (2020, January 1). Customer Relationship Management: Digital Transformation and Sustainable Business Model Innovation. *Economic Research-Ekonomska Istraživanja*, *33*(1), 2733–2750. https://doi.org/10.1080/1331677x.2019.1676283

Hair, J. F., Black, W. C., Babin, B., & Anderson, R.E. (2010). *Multivariate data analysis.* Pearson Prentice Hall.

Hargreaves, I., Roth, D., Karim, M. R., Nayebi, M., & Ruhe, G. (2018). Effective Customer Relationship Management at ATB Financial: A Case Study on Industry-Academia Collaboration in Data Analytics. In Moshirpour, M., Far, B., & Alhajj, R. (eds), *Highlighting the Importance of Big Data Management and Analysis for Various Applications*. Studies in Big Data, volume 27. Springer, Cham., pp. 45–59. https://doi.org/10.1007/978-3-319-60255-4_4

Hsu, S. H. Y., Tsou, H. T., & Chen, J. S. (2021, September). "Yes, we do. Why not use augmented reality?" customer responses to experiential presentations of AR-based applications. *Journal of Retailing and Consumer Services*, *62*, 102649. https://doi.org/10.1016/j.jretconser.2021.102649

Jabado, R., & Jallouli, R. (2021). An Enriched Framework for CRM Success Factors Outlining Data Analytics Capabilities' Dimension. International Conference on Business and Technology, 2020: The Importance of New Technologies and Entrepreneurship in Business Development: In the Context of Economic Diversity in Developing Countries, pp. 102–130. https://doi.org/10.1007/978-3-030-69221-6_9

Jabado, R., & Jallouli, R. (2023). A Systematic Literature Review on CRM Critical Success Factors. In Jallouli, R., Bach Tobji, M. A., Belkhir, M., Soares, A. M., & Casais, B. (eds), *Digital Economy. Emerging Technologies and Business Innovation. ICDEc 2023*. Lecture Notes in Business Information Processing, volume 485. Springer, Cham. https://doi.org/10.1007/978-3-031-42788-6_15

Jallouli, R., & Kaabi, S. (2022). Mapping top strategic e-commerce technologies in the digital marketing literature. *Journal of Telecommunications and the Digital Economy*, *10*(3), 149–164. https://doi.org/10.18080/jtde. v10n3.554

Hamida, A., Alshehhia, A., Abdullaha, A., & Mohamed, E. (2022, November 15). Key Success Factors for Customer Relationship Management (CRM) Projects within SMEs. *Emirati Journal of Business, Economics and Social Studies*, *1*(2). https://doi.org/10.54878/ejbess.176

Kaabi, S., & Jallouli, R. (2019). Overview of e-commerce technologies, data analysis capabilities and marketing knowledge. In Jallouli, R., Bach Tobji, M. A., Bélisle, D., Mellouli, S., Abdallah, F., & Osman, I. (eds), *ICDEc 2019*. Lecture Notes in Business Information Processing, volume 358, pp. 183–193. Springer, Cham. https://doi.org/10.1007/978-3-030-30874-2_14

Kitchens, B., Dobolyi, D., Li, J., & Abbasi, A. (2018). Advanced customer analytics: Strategic value through integration of relationship-oriented big data. *Journal of Management Information Systems*, *35*(2), 540–574. https://doi.org/10.1080/07421222.2018.1451957

Kumar, P., & Mokha, A. K. (2021, February 14). Relationship between E-CRM, Customer Experience, Customer Satisfaction and Customer Loyalty in Banking Industry: A Review of Literature. *RESEARCH REVIEW International Journal of Multidisciplinary*, *6*(2), 127–137. https://doi.org/10.31305/rrijm.2021.v06.i02.022

Mahafzah, A., Mohammad Aljawarneh, N., Abdel Kader Alomari, K., Altahat, S., & Saleh Alomari, Z. (2020). Impact of customer relationship management on food and beverage services quality: the mediating role of employees satisfaction. *Humanities and Social Sciences Review*, *8*(2), 222–230. https://doi.org/10.18510/hssr.2020.8226

Maulana, A., & Napitupulu, T. A. (2022). Lost won opportunity prediction in sales pipeline B2b CRM using machine learning. *Journal of Theoretical and Applied Information Technology*, *100*(10), 3486-3496. http://www.jatit.org/volumes/Vol100No10/31Vol100No10.pdf

Mikalef, P., & Krogstie, J. (2020). Examining the Interplay Between Big Data Analytics and Contextual Factors in Driving Process Innovation Capabilities. *European Journal of Information Systems*, *29*(3), 260–287. https://doi.org/10.1080/0960085x.2020.1740618

Pan, Z., Ryu, H., & Baik, J. (2007). A case study: CRM adoption success factor analysis and six sigma DMAIC application. 5th ACIS International Conference on Software Engineering Research, Management & Applications (SERA 2007). https://doi.org/10.1109/sera.2007.6

Parker, S. K., & Grote, G. (2020, February 13). Automation, Algorithms, and Beyond: Why Work Design Matters More Than Ever in a Digital World. *Applied Psychology*, *71*(4), 1171–1204. https://doi.org/10.1111/apps.12241

Praful Bharadiya, J. (2023). A Comparative Study of Business Intelligence and Artificial Intelligence with Big Data Analytics. *American Journal of Artificial Intelligence*, *7*(1), 24–30. https://doi.org/10.11648/j.ajai.20230701.14

Rana, N. P., Chatterjee, S., Dwivedi, Y. K., & Akter, S. (2021). Understanding dark side of artificial intelligence (AI) integrated business analytics: assessing firm's operational inefficiency and competitiveness. *European Journal of Information Systems*, *31*(3), 364–387. https://doi.org/10.1080/0960085x.2021.1955628

Rahimi, R. (2022, July 28). Customer Relationship Management (CRM). *Encyclopedia of Tourism Management and Marketing*. https://doi.org/10.4337/9781800377486

Razali, N. M., & Wah, Y. B. (2011). Power Comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling Tests. *Journal of Statistical Modeling and Analytics*, *2*, 21–33.

"Real-Time Analytics: The Key to Unlocking Customer Insights & Driving the Customer Experience". (2018). Harvard Business Review Analytical Services Report. SAS. Retrieved 10 April 2023 from https://www.sas.com/en/whitepapers/real-time-analytics-109676.html

Sawal, A. B., Ahmad, M., Muralitharan, M. A., Loganathan, V., & Jhanjhi, N. Z. (2022). Machine Intelligence in Customer Relationship Management in Small and Large Companies. *Empowering Sustainable Industrial 4.0 Systems With Machine Intelligence*, 132–153. https://doi.org/10.4018/978-1-7998-9201-4.ch007

Shahbaz, M., Gao, C., Zhai, L., Shahzad, F., Abbas, A., & Zahid, R. (2020). Investigating the impact of big data analytics on perceived sales performance: the mediating role of customer relationship management capabilities. *Complexity*, *2020*, 1–17. https://doi.org/10.1155/2020/5186870

Shapiro, S. S., & Wilk, M. B. (1965). An Analysis of Variance Test for Normality (Complete Samples). *Biometrika, 52*, 591–611.

Song, D., & Liang, C. (2021). Application research of data mining technology in customer relationship management. In: 2021 4th International Conference on Advanced Electronic Materials, Computers and Software Engineering (AEMCSE). https://doi.org/10.1109/aemcse51986. 2021.00244

Wang, Z., & Dong, F. (2022). Experience of Pro-Poor Tourism (PPT) in China: A Sustainable Livelihood Perspective. *Sustainability*, *14*(21), 14399. https://doi.org/10.3390/su142114399

Vittinghoff, E., Glidden, D. V., Shiboski, S. C., & McCulloch, C. E. (2012, March 6). *Regression Methods in Biostatistics*. Springer Science & Business Media. https://books.google.ie/books?id=boMUM6N8V4wC

Appendix

Table A1. Summary: Descriptive Statistics for Normality Tests

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
TECH	0.129	30	0.200*	0.956	30	0.241
PEO	0.135	30	0.172	0.950	30	0.164
PRO	0.162	30	0.044	0.947	30	0.141
DAC	0.127	30	0.200*	0.945	30	0.123
IC	0.150	30	0.081	0.941	30	0.098
NB	0.213	30	0.001	0.931	30	0.051

* This is a lower bound of the true significance.
a. Lilliefors Significance Correction

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