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The Impact of IoT on CRM, from Smarter Data Collection to Better Customer Engagement

Alisa HARKAI[1]

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Abstract

The integration of the Internet of Things (IoT) into Customer Relationship Management (CRM) systems is reshaping how businesses interact with their customers, offering new opportunities for enhanced engagement and service personalisation. This paper investigates the impact of IoT on CRM, focusing on its ability to transform traditional data collection methods into real-time, actionable insights. The main objective is to explore how IoT can improve the accuracy and timeliness of customer data, enabling businesses to anticipate customer needs and deliver more targeted, relevant experiences. Through a combination of case studies and customer behaviour analysis through for example the application of machine learning algorithms for behavioural insights, the paper highlights the role of IoT in driving more efficient customer service, enabling personalised marketing strategies, and fostering deeper customer relationships. The results indicate that IoT not only enhances operational efficiency but also plays a critical role in building long-term customer loyalty by providing brands with the tools to engage customers in meaningful ways. In conclusion, the paper emphasises the significant potential of IoT in revolutionising CRM practices, offering businesses the ability to create more dynamic and personalised customer experiences that lead to increased satisfaction and stronger brand loyalty.

Keywords: IoT, CRM, customer engagement, customer behaviour, data collection.

1. Introduction

The Internet of Things (IoT) is increasingly transforming customer relationship management (CRM) (Buttle & Maklan, 2019) by providing businesses with real-time data from interconnected devices. This data allows organisations to understand customer behaviour, preferences, and needs in a more detailed and proactive manner. By integrating IoT into CRM systems, companies can go beyond

[1] Bucharest University of Economic Studies, Bucharest, Romania, harkaialisa22@stud.ase.ro.

traditional engagement methods and offer more personalised experiences based on insights from connected devices (Jeyakumar, 2024).

IoT-driven data collection enables businesses to anticipate customer needs and deliver services before they are even requested, shifting CRM from a reactive to a proactive approach. For example, sensors in retail environments can track customer movements and product interests, leading to more effective inventory management and tailored marketing strategies. These insights also help improve customer satisfaction by offering more targeted offers and personalised communications (Kanhasoft, 2024).

Overall, the impact of IoT on CRM systems is profound, creating opportunities for businesses to enhance customer engagement while also presenting new challenges. Understanding these dynamics is essential for organisations seeking to leverage IoT technologies to foster stronger, more personalised relationships with their customers (Abu Ghazaleh & Zabadi, 2020; Wang & Bayanati, 2023).

In this paper, we will explore the various dimensions of IoT's impact on CRM. Section 1 will focus on the impact of IoT in modern CRM systems, examining how IoT enables more personalised and data-driven customer interactions. Section 2 will delve into IoT data collection and processing, discussing how sensor-generated data provides insights into customer behaviour and the challenges businesses face in integrating and managing this data. Section 3 will highlight the business benefits of IoT-driven CRM, particularly in predictive customer support and optimising sales and marketing strategies. Finally, the conclusion will summarise the key findings and explore the future implications of IoT in CRM systems.

2. The Impact of IoT on Modern CRM

As businesses continue to evolve, the use of connected technologies is becoming a game-changer in customer relationship management. By integrating smart devices and sensors, organisations can gather valuable insights into the broader customer journey, from product usage to post-purchase behaviour. This emerging landscape is paving the way for more agile CRM systems that can proactively adapt to customer needs, creating opportunities for businesses to improve engagement and strengthen brand loyalty.

One significant impact of IoT in CRM is the ability to offer personalised and predictive services. By leveraging real-time data from IoT devices, such as smart home systems, wearables, and IoT-enabled vehicles, businesses can understand customer behaviour in unprecedented detail. For example, retailers can use IoT sensors to track how customers interact with products, allowing for real-time personalised offers or product recommendations based on customer preferences and past behaviours. This integration helps businesses enhance customer engagement, reduce churn, and improve satisfaction (Chui & Manyika, 2015).

Another advantage of IoT in CRM is the improved customer support it enables. IoT data allows businesses to identify potential issues before they become problems. For instance, in industries like manufacturing or home appliances, businesses can receive data on product usage and performance, enabling them to

offer preventive maintenance or automatic repairs. This approach not only improves customer satisfaction by ensuring products are always functioning optimally, but also helps businesses reduce operational costs (Hassan et al., 2020).

Furthermore, IoT enhances CRM by improving operational efficiencies. The data collected from IoT devices can help businesses optimise their processes, from inventory management to sales forecasting. Real-time data from connected devices allows businesses to adjust their inventory based on customer demand, ensuring products are always in stock and improving customer satisfaction (Chen et al., 2022). Moreover, the ability to analyse this data helps in predicting future trends, ensuring businesses can stay ahead of the market and respond to customer needs more effectively (Kadence, 2024).

In addition to the benefits already outlined in the previous paragraphs, it is important to highlight several other significant advantages and positive impacts of IoT in CRM. These additional benefits, detailed in Table 1, further demonstrate how IoT can revolutionise customer relationship management by enhancing service quality, automating processes, and providing deeper insights into customer behaviour and needs (Wang & Bayanati, 2023).

Table 1. Key Benefits of IoT in Customer Relationship Management (CRM)

Benefit	Description
Enhancing customer relationship management	Interaction with the organisation's knowledge bank
Improving service quality	Reduce communication cycle times
Reporting problems in real-time	Appropriate reporting to the customer service department
Providing the best service	Use a holistic view of customer information
Automated and fixed instructions	Use the latest knowledge management database and cognitive systems
Anticipating potential issues	Create service opportunities to solve problems before they occur
Reducing support costs	Decrease customer calls and improve support KPIs
Smart ordering	Predict customer needs and streamline the ordering process

Source: own elaboration of the author.

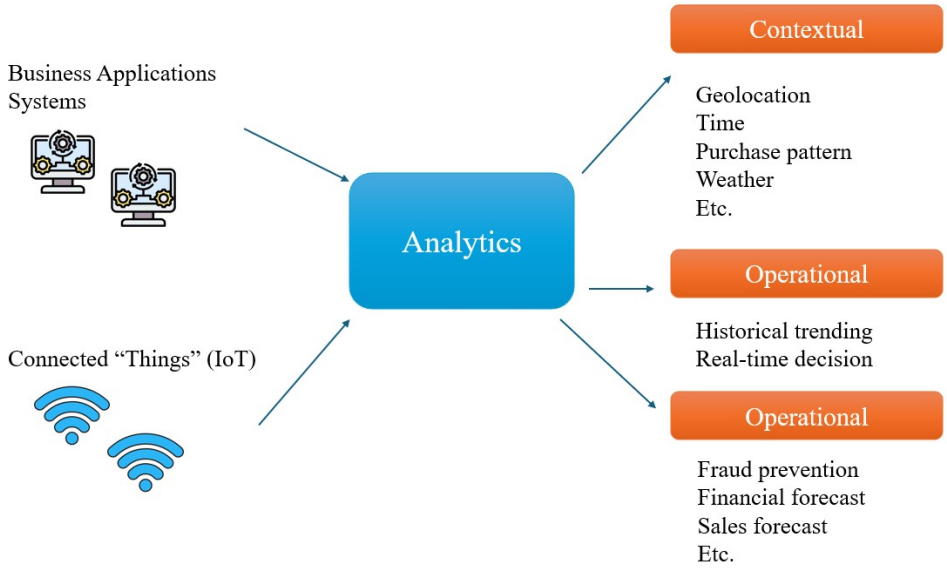
The implications of IoT in CRM can be categorised into three levels: contextual, operational, and predictive.

1. *Contextual Implications:*
   - Real-time data helps understand customer circumstances and preferences.
   - Personalised interactions are based on environmental conditions and customer behaviour.
   - Customer experiences are enhanced by tailoring services to specific contexts.

2. *Operational Implications:*
   - Real-time data helps understand customer circumstances and preferences.
   - Personalised interactions are based on environmental conditions and customer behaviour.
   - Customer experiences are enhanced by tailoring services to specific contexts.
3. *Predictive Implications:*
   - Advanced analytics anticipate customer needs and potential issues.
   - Trends are forecasted and anomalies are detected before they become problems.
   - Service opportunities are created by addressing issues proactively.

These various levels of impact, encompassing contextual, operational, and predictive implications, are comprehensively depicted in Figure 1. This figure provides a visual representation of how the IoT technology can be integrated into CRM systems to enhance customer interactions, streamline operations, and predict future needs, thereby offering a holistic view of the transformative potential of IoT in customer relationship management.

Figure 1. Visual representation of IoT integration in CRM systems

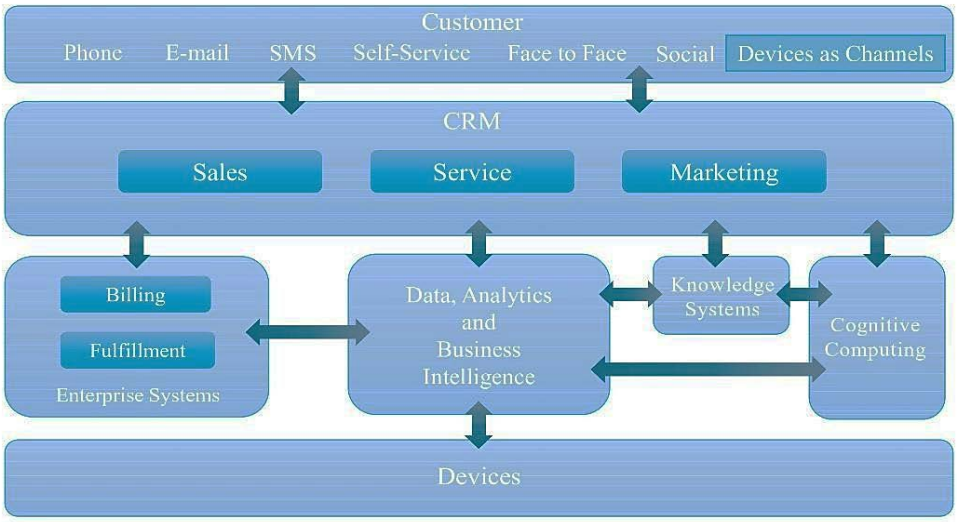


Source: adapted from Wang and Bayanati (2023).

Having examined the impact of IoT on CRM systems and the three levels of influence—operational efficiency, customer engagement, and strategic decision making— it becomes evident that these dimensions are deeply interconnected. The ability of IoT to provide real-time insights enhances operational efficiency, which in turn enables more personalised and responsive customer interactions. These improved interactions contribute to a richer dataset, allowing businesses to

refine their strategies and drive long-term customer relationship improvements. The interplay between these levels highlights the necessity of a structured approach to integrating IoT within CRM systems. To establish a comprehensive understanding of this integration, it is essential to analyse a conceptual framework (see Figure 2) that encapsulates the core components and interactions within an IoT-driven CRM system. This framework will serve as a foundation for understanding how businesses can effectively leverage IoT technology to optimise customer experiences, streamline processes, and support data-driven decision making.

Figure 2. The conceptual framework of an IoT-Based CRM System



Source: adapted from Wang and Bayanati (2023).

As we can deduct from Figure 2, the integration of Internet of Things (IoT) technology into Customer Relationship Management (CRM) systems has revolutionised how businesses interact with customers, offering real-time insights and personalised experiences. A conceptual framework illustrating this integration comprises several interconnected layers, each playing a pivotal role in harnessing IoT capabilities to enhance CRM functionalities. Next, we will explain each layer from the emphasised conceptual framework.

1. *Devices Layer*

This foundational layer encompasses IoT devices and sensors that collect real-time data on customer behaviours, product usage, and environmental conditions. These devices serve as the primary touchpoints for data acquisition, enabling the system to capture nuanced insights into customer interactions (AltexSoft, 2023). For instance, smart home devices can monitor user preferences, providing valuable data for personalised marketing strategies.

2. *Data Transmission Layer*

Once data is collected, it traverses through communication networks such as Wi-Fi, Bluetooth, or LPWAN to reach centralised processing units. This layer ensures the seamless and secure transfer of data from IoT devices to the core systems, maintaining data integrity and minimising latency (AltexSoft, 2023). Effective data transmission is crucial for real-time analytics and responsive CRM actions.

3. *Data Processing and Analytics Layer*

At this stage, the aggregated data undergoes processing using advanced analytics, machine learning algorithms, and cognitive computing techniques. This layer transforms raw data into actionable insights, facilitating predictive analytics and trend identification (Itransition, 2024). For example, analysing usage patterns can help predict future customer needs, allowing businesses to proactively offer relevant solutions.

4. *Enterprise Systems Layer*

This layer integrates processed data into existing enterprise applications such as Enterprise Resource Planning (ERP) and Supply Chain Management (SCM). By embedding IoT-derived insights into these systems, organisations can optimise operations, enhance resource allocation, and improve overall efficiency (Wipro, 2023). For instance, real-time inventory data can streamline supply chain processes, reducing overhead costs.

5. *CRM Application Layer*

Building upon the insights from the analytics and enterprise systems layers, this layer focuses on enhancing customer interactions. It enables personalised marketing campaigns, tailored product recommendations, and proactive customer support. By leveraging IoT data, businesses can create more meaningful and engaging customer experiences, fostering loyalty and satisfaction (Wang & Bayanati, 2023).

6. *User Interface Layer*

The topmost layer presents the synthesised information through dashboards and reporting tools to CRM managers and customer service representatives. It offers a comprehensive view of customer interactions, system performance, and key metrics, supporting informed decision making and strategic planning. Effective user interfaces ensure that the insights derived from IoT data are accessible and actionable for end-users (Deloitte, 2023).

This multilayered framework underscores the synergy between IoT and CRM systems, highlighting how data flows from physical devices to strategic decision making platforms. By systematically integrating IoT capabilities into CRM, organisations can achieve a holistic understanding of their customers, leading to enhanced engagement, improved operational efficiency, and sustained competitive advantage.

3. IoT Data Collection and Smarter Data Collection

3.1 Types of Data Collected through IoT Devices

Integrating Internet of Things (IoT) devices with Customer Relationship Management (CRM) systems represents a transformative approach to understanding customer behaviour, preferences, and needs in real time. As businesses increasingly adopt data-driven strategies, the ability to gather rich, continuous streams of customer-related data becomes essential for delivering personalised experiences and optimising operational efficiency. IoT devices serve as a critical bridge between physical customer interactions and digital CRM platforms, enabling organisations to capture actionable insights across various touchpoints. The table below outlines specific data types relevant to CRM, the IoT devices used for their collection, and the corresponding actions involved (see Table 2).

Table 2. IoT data types relevant to CRM and their collection methods

Type of Data	IoT Devices Used for Collection	Actions Involved
Product Usage Data	Smart appliances, connected vehicles, industrial machinery	Monitoring how customers use products to offer personalised recommendations and proactive maintenance (Kanhasoft, 2024)
Environmental Data	Smart home sensors, wearable health devices	Assessing ambient conditions like temperature and air quality to enhance customer comfort and health (Benefits of CRM, 2024)
Behavioural Data	Wearable fitness trackers, smart home systems, mobile applications	Understanding customer behaviour patterns to tailor marketing strategies and improve user experience (Nutshell, 2024)
Transactional Data	Point-of-sale systems, e-commerce platforms, subscription services	Analysing purchase histories and payment methods to identify buying patterns and enhance customer engagement (Nutshell, 2024)

Source: own elaboration of the author.

The integration and analysis of these data types enable organisations to construct a comprehensive customer profile, facilitating advanced personalisation strategies, strengthening customer engagement, and optimising CRM operations through informed, data-driven decision making.

3.2 Data Integration from Multiple IoT Sources

The integration of IoT data into CRM systems offers companies the opportunity to develop a more nuanced understanding of their customers by combining various data streams from connected devices. This integration goes beyond simply enhancing customer profiles; it enables the development of dynamic customer journeys based on real-time data. For instance, environmental data such as temperature, humidity, or ambient noise levels, collected through smart devices, can be used to tailor services in a context-sensitive manner. Additionally, combining transactional data with location-based insights allows businesses to offer geographically relevant promotions or personalised offers based on a customer's past behaviour and preferences. This multidimensional view allows marketing teams to segment customers with greater precision, designing campaigns that are highly targeted and informed by actionable data. IoT integration also facilitates a seamless experience across multiple touchpoints, as customer interactions and behaviours are tracked continuously, providing support teams with the ability to resolve issues faster and with more accuracy. The holistic view created through IoT data helps not only in improving service quality but also in proactively anticipating issues and opportunities before they arise. The following details will show in clear steps how IoT data is integrated for a holistic customer view and for improving marketing decisions.

Beyond the integration of diverse data streams, the core of leveraging IoT for enhanced CRM lies in the sophisticated analysis of this unified data, particularly concerning customer behaviour. Our approach to customer behaviour analysis primarily leverages the aggregated and pre-processed data described in steps 1-3 below, focusing on identifying patterns and predicting future needs. Specifically, machine learning algorithms, such as clustering for customer segmentation and predictive models for churn anticipation or product recommendations, were applied to the real-time and historical behavioural data collected from IoT devices (e.g., product usage, interaction patterns) and traditional CRM channels (e.g., purchase history, service logs). This analytical layer transforms raw data into actionable insights, enabling businesses to not only understand past behaviour but also to proactively tailor experiences and services, thereby shifting CRM from a reactive to a proactive approach. The insights derived from this analysis are then fed into the "Actionable Customer 360 View" (step 5) to inform hyper-personalised campaigns and proactive support initiatives.

1. *Unified Data Collection Across IoT and Traditional Channels*
    - Smart devices (e.g., wearables, smart home systems, connected cars) collect continuous data about user behaviour, preferences, and real-time conditions. This data is gathered alongside traditional customer data from CRM systems, websites, mobile apps, and service logs, forming the foundation for holistic insight.
2. *Secure Transmission and Pre-Processing of IoT Data*
    - IoT data is transmitted to cloud platforms or edge servers using secure protocols. Before integration, data is cleaned, filtered, and sometimes pre-

analysed to remove noise, ensure accuracy, and reduce latency or bandwidth requirements.

3. *Intelligent Data Integration and Identity Resolution*
   - Advanced integration tools consolidate IoT data with existing customer profiles by resolving identities across devices and touchpoints (e.g., matching device IDs to user accounts). This step creates a unified and consistent customer dataset, crucial for generating personalised insights.
4. *Real-Time Analytics and Insight Generation*
   - With unified data in place, real-time analytics engines detect patterns such as usage habits, potential technical issues, or emerging needs. Machine learning models enrich this with predictions—for example, anticipating churn, recommending products, or detecting support needs proactively.
5. *Actionable Customer 360 View for Marketing and Support*
   - The system generates a dynamic Customer 360 profile—aggregating behavioural, contextual, and historical data. Marketing teams can use it to trigger hyper-personalised campaigns, while support teams leverage it to offer proactive, context-aware assistance—often before customers even realise there is an issue.

4. Leveraging IoT to Deepen Customer Relationships and Drive Long-Term Engagement

Building on the unified Customer 360 view enabled by IoT integration, organisations can move beyond passive data collection and toward actively nurturing customer relationships. IoT technologies not only improve operational responsiveness but also unlock powerful new opportunities for personalised engagement, loyalty-building, and long-term customer retention.

In this chapter, we explore how businesses are using IoT to deliver smarter loyalty programmes and maintain deeper customer connections over time. We also highlight real-world case studies of successful IoT integration within CRM strategies, showcasing the tangible benefits of data-driven engagement.

4.1 Driving Customer Retention with IoT-Powered Loyalty Programmes

The incorporation of Internet of Things (IoT) technologies into Customer Relationship Management (CRM) systems brings about a major shift in how businesses engage with, retain, and build loyalty among their customers. Historically, loyalty programmes have relied on transactional models, rewarding customers for repeat purchases through generic point systems or periodic offers. However, these programmes often struggled to capture the evolving preferences, behaviours, and contexts of customers in real time. IoT fills this gap by enabling continuous, context-sensitive, and personalised interactions, enhancing the relevance and effectiveness of loyalty programmes.

At the core of this transformation is the real-time data acquisition enabled by IoT devices. From smart wearables and connected vehicles to home automation systems and industrial sensors, IoT devices generate a steady stream of behavioural and usage data. This data is transmitted to centralised CRM platforms, where it can be analysed and interpreted to extract meaningful insights about customer needs, preferences, and lifecycle stages (Nutshell, 2024). For instance, fitness trackers may reveal when a customer is most active, while smart refrigerators can signal consumption trends and replenishment habits.

Based on this information, businesses can design responsive loyalty programmes that adapt dynamically to individual behaviours. Instead of offering static discounts or impersonal rewards, organisations can deliver highly tailored incentives—such as replenishment reminders with embedded discounts, milestone-based achievements aligned with user activity, or context-aware offers that reflect recent behaviour or location. This transition from transactional to experiential loyalty significantly increases customer perceived value, making them feel understood and appreciated.

Moreover, IoT allows for proactive engagement rather than reactive service. For example, connected products can alert the CRM system when maintenance is due or when usage drops significantly—indicating potential churn risk. Businesses can then trigger timely interventions, such as offering extended warranties, product upgrade suggestions, or exclusive loyalty bonuses to re-engage the customer. This strategic anticipation of customer needs reinforces trust and builds emotional loyalty (Antavo, (2024), a factor shown to be more powerful in long-term retention than transactional rewards alone.

In addition, IoT integration enables businesses to segment their customer base with greater precision. Rather than relying solely on demographics or purchase history, segmentation can now be enriched with real-time behavioural data. This allows for the creation of micro-segments and hyper-personalised campaign triggers, ensuring that loyalty efforts are not only relevant but also efficient in resource allocation. Customers benefit from experiences that resonate with their lifestyle, while companies benefit from higher engagement rates and reduced churn.

Importantly, the continuous feedback loop generated by IoT data creates a virtuous cycle of improvement. Each customer interaction refines the loyalty programme's predictive accuracy and responsiveness. This creates adaptive loyalty ecosystems, where programme value evolves in step with customer behaviour, thereby strengthening long-term engagement.

4.2 Case Studies of Successful IoT Integration in CRM

Understanding how companies integrate modern technologies into their Customer Relationship Management (CRM) systems is essential for appreciating their impact on operational efficiency and customer satisfaction. Below are several real-life case studies that illustrate how companies have successfully implemented CRM to enhance customer relationships and overall performance:

1. **Automotive Industry:** Connected Cars for Predictive Maintenance and Proactive Customer Service
   - **Type of IoTs:** Connected cars, equipped with telematics units, embedded sensors (e.g., engine diagnostics, tire pressure monitoring, braking systems, battery health), and GPS modules.
   - **Features or Structure:** These vehicles act as mobile IoT hubs, continuously collecting vast amounts of data on vehicle performance, operational status, driving patterns, and geographical location. The telematics unit transmits this data wirelessly (via cellular networks) to cloud-based platforms. This platform integrates with the manufacturer's CRM system and service networks. For instance, platforms like Salesforce's Connected Vehicle App (Salesforce, 2023) are designed to help automakers integrate and leverage this data.
   - **Context of Usage in CRM:**
     - **Proactive Maintenance:** When a sensor detects a deviation from normal operating parameters (e.g., an engine component showing signs of wear, low fluid levels, or an impending battery failure), this diagnostic data is sent to the CRM. Manufacturers like Tesla (Appinventiv, 2025) use this data for over-the-air software updates and predictive maintenance, while systems like General Motors' OnStar proactively notify customers for service appointments before a breakdown occurs. This allows the service centre to have parts ready and schedule efficiently.
     - **Personalised Service and Offers**: Data on driving habits (e.g., aggressive braking, high mileage), often collected by companies like Ford (Appinventiv, 2025) through their connected car systems, can inform the CRM to offer personalised recommendations for vehicle upgrades, specific tire types, or even tailored insurance plans. Location data can be used to suggest nearby service centres or points of interest.
     - **Emergency Assistance:** In case of an accident detected by impact sensors, the system can automatically alert emergency services with precise location data, simultaneously notifying roadside assistance and the customer's predefined emergency contacts, all managed through the CRM system.
   - **Impact Statistics:**
     - **Predictive Maintenance (Impact):** Research shows that predictive maintenance can reduce overall maintenance costs by 18-25% and cut unplanned downtime by up to 50% (IIoT World, 2025).
     - **Operational Efficiency (General):** Data-driven scheduling, enabled by IoT in manufacturing and operations, can lead to average reductions of 12-18% in labour costs (Number Analytics, 2025a).
2. **Smart Home Appliances: Enhanced User Experience and Predictive Support**
   - **Type of IoTs:** Smart home appliances, such as refrigerators, washing machines, ovens, and climate control systems (HVAC), embedded with

sensors (e.g., temperature, humidity, motor performance, internal cameras for refrigerators, water leakage detection) and Wi-Fi/Bluetooth connectivity modules.

- **Features or Structure:** These appliances are designed to connect to the internet, allowing them to send operational data to manufacturers' cloud platforms and receive commands via mobile applications. The sensors collect data on usage patterns, performance metrics, energy consumption, and self-diagnostics. This data feeds directly into the manufacturer's CRM, often facilitated by integrations with smart home platforms like Amazon Alexa (Kanhasoft, 2024), Google Home, or Samsung SmartThings.
- **Context of Usage in CRM:**
  - **Predictive Maintenance and Proactive Support:** If a smart appliance's internal sensor detects a potential issue (e.g., a refrigerator motor operating inefficiently, a washing machine pump showing signs of impending failure), this diagnostic data is automatically transmitted to the manufacturer's CRM. The CRM can proactively notify the customer, offer remote troubleshooting, or schedule a service visit, often before the customer even notices the problem, significantly improving customer satisfaction and reducing downtime.
  - **Automated Reordering/Replenishment:** For smart refrigerators with internal cameras and inventory sensors (e.g., in concepts developed by manufacturers like LG or Samsung), the CRM can track food levels. When certain items are low, it can trigger notifications to the customer or integrate with grocery delivery services for automated reordering, creating a seamless customer experience.
  - **Personalised Usage Tips:** Based on how an appliance is used (e.g., frequent oven cycles for baking), the CRM can send personalised recipes, energy-saving tips, or suggestions for compatible accessories, enhancing product utility and customer satisfaction.
- **Impact Statistics:**
  - **Energy Savings:** A smart thermostat alone can save homeowners up to 10-15% on heating and cooling bills, while a fully optimised smart home can save hundreds of dollars annually (BKV Energy, 2025).

3. **Retail: In-Store Customer Behaviour Analysis and Personalised Engagement**
   - **Type of IoTs:** In retail environments, common IoT devices include Bluetooth Low Energy (BLE) (Wikipedia, 2025) beacons, RFID (Radio-Frequency Identification) (GS1 US, 2025) tags, and AI-powered smart cameras.
   - **Features or Structure:**
     - Beacons: Small, battery-powered devices that broadcast short-range signals to customers' smartphones (if the store's app and Bluetooth are enabled). They pinpoint a customer's micro-location within the store.
     - RFID Tags: Attached to individual products or pallets, these tags allow

for automated, real-time inventory tracking, monitoring product movement from stockroom to shelf, and even identifying items in fitting rooms.
    - Smart Cameras: Utilise computer vision and AI to anonymously track customer pathways, dwell times in specific areas, and overall store traffic patterns, creating heatmaps of activity.
- **Context of Usage in CRM:**
    - **Hyper-Personalised In-Store Offers:** As a customer enters a specific department (detected by beacons), the CRM, linked to their purchase history and preferences, can send a personalised push notification to their smartphone app with discounts on relevant products, items from their online wish list, or loyalty rewards. For instance, Macy's has experimented with beacon technology to engage customers with personalised offers and navigation assistance within their stores (Umbel, 2014).
    - **Optimised Store Layout and Product Placement:** Data from RFID tags (e.g., used extensively by fashion giant Zara (Inditex, 2025) for real-time inventory tracking, enabling them to know the exact location of every garment from the warehouse to the sales floor, which significantly optimises stock management and ensures product availability) and smart cameras (for traffic analysis) informs the CRM about which products are frequently picked up, tried on, or remain stagnant on shelves. This insight helps retailers optimise store layouts, product placement, and visual merchandising to improve customer flow and conversion rates.
    - **Enhanced Customer Service:** Store associates equipped with tablets connected to the CRM can access real-time data from RFID tags to quickly locate products for customers or view a customer's online browsing history (with consent) to offer tailored assistance. Retailers like Nordstrom have explored using IoT data to empower sales associates with more informed customer interactions.
    - **Post-Visit Re-engagement:** If a customer spends significant time in a particular section or interacts with certain products (tracked by beacons/cameras) but does not make a purchase, the CRM can send targeted follow-up emails with offers or additional information about those items after they leave the store.
- **Impact Statistics:**
    - **Inventory Accuracy:** The implementation of RFID, as used by Zara, is reported to improve inventory counting efficiency by approximately 80-90 %, leading to highly accurate stock levels and reduced discrepancies (RFID Label, 2025).
    - **Conversion Rates:** Retailers using beacons for targeted promotions report a 40% increase in sales conversions and a 65% boost in customer engagement (Global Growth Insights, 2025).

- **Customer Satisfaction and Retention:** Retailers with advanced digital capabilities, including IoT integration, report 40% higher customer satisfaction scores and 30% better retention rates compared to competitors with basic digital capabilities (Number Analytics, 2025b).

These case studies demonstrate how strategically implementing CRM systems can transform large companies' operations, leading to improved customer relationships, enhanced efficiency, and a competitive market advantage.

5. Conclusion

The integration of Internet of Things (IoT) technologies into Customer Relationship Management (CRM) systems fundamentally reshapes how businesses engage with their customers, offering unprecedented opportunities for enhanced personalisation and proactive service. As revealed by the research conducted and illustrated through the examined case studies in the automotive, smart home appliance, and retail sectors, IoT significantly impacts CRM by transforming traditional data collection methods into real-time, actionable insights.

This paper has demonstrated that IoT enables a more accurate and timely understanding of customer needs and behaviours, moving CRM from a reactive to a highly proactive approach. The analysis of various IoT data types, such as product usage, environmental conditions, and behavioural patterns, facilitates the construction of a comprehensive customer profile, crucial for advanced personalisation strategies. Case studies, including those of connected cars (e.g., Tesla, Ford, General Motors with OnStar), smart home appliances (e.g., integrated with Amazon Alexa, Google Home), and retail applications (e.g., Macy's with beacons, Zara with RFID, Amazon Go with sensors), explicitly show how IoT provides the granular data necessary for predictive maintenance, personalised offers, optimised operations, and seamless customer experiences.

Ultimately, the research indicates that IoT integration into CRM not only enhances operational efficiency by optimising processes like inventory management and sales forecasting but, more importantly, plays a critical role in fostering stronger, more meaningful customer relationships. By leveraging IoT-driven insights, businesses can provide tailored experiences, from personalised product recommendations to proactive customer support, leading to increased satisfaction and stronger brand loyalty. This data-driven transformation empowers organisations to anticipate needs, personalise offerings, and gain a significant competitive advantage in a rapidly evolving market. The ongoing evolution of IoT promises even more sophisticated and integrated CRM solutions, further driving growth and deepening customer loyalty.

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