# Towards a Reference Enterprise Application Architecture for the Customer Relationship Management Domain

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Abstract: The work presented in this paper, focus on a first step towards a Reference Application Architecture, for the CRM domain. A Reference Architecture is a way to approach usual occurring problems through good architectural design patterns. To reach a Reference Architecture, we analyzed the features of five CRM market solutions, to get the industry best practices. The chosen CRM solutions were: SugarCRM, Microsoft Dynamics CRM, Sage CRM, Siebel Oracle CRM and Salesforce CRM. From these solutions we extracted fifty-three common features from the systems datasheets. These fifty-three features are grouped into ten modules (namelly: Sales module, Marketing module , Service module, Reporting module, Calendar module, Integration module, Document module, Workflow module, Mobile module and Security module), with all these modules being part of the CRM system. We arrived at these modules through the groups that already existed in CRM's datasheets. With the proposed Reference Architecture we expect to help architects by providing guidelines and knowledge about the CRM domain, with focus on CRM market solutions which targeted primarily small and medium businesses.

## 1 INTRODUCTION

Companies given the complexity of integrating the CRM with their business processes and IT, need to know and analyze their actual state and define the strategic direction they want to follow.(op't Land et al., 2009) Enterprise Architecture(EA) helps to solve these requirements, since they are part of EA objective, as stated by Mark Lankhorst: "An enterprise architecture tries to describe and control an organisation's structure, processes, applications, systems and techniques in an integrated way."(Lankhorst, 2005)

In the EA domain, there is an important type of architecture, the Reference Enterprise Architecture. A Reference Enterprise Architecture is important because it provides a way to approach usual occurring problems, by documenting good architectural design practices.(Cloutier et al., 2010) The work we present in this paper is how we defined the Reference Enterprise Application Architecture for the CRM domain, based on the industry best practices, in this case five CRM solutions. The chosen CRM solutions were: SugarCRM, Microsoft Dynamics CRM, Sage CRM, Siebel Oracle CRM and Salesforce CRM. We chose these CRM solutions based on a list of mid-market CRM suites from (Buttle, 2009) and a list of Top Software from (Barrish, 2014). This paper begins by the EA theme in section 2, highlighting the Enterprise Architecture Framework we use to represent our model in section 2.1 and what is a Reference Enterprise Architecture in section 2.2. Then in section 3 we present the CRM theme, introducing the features of five known CRM market solutions in section 3.1, and in section 3.2 we illustrated and explained the view of the Application Architecture proposed. In the end of section 4 we took the conclusions of the work presented.

### 1.1 Research Methodology

The research methodology followed in this work, is the Action Research Methodology from (Baskerville, 1999). This research is composed by five steps:

- **I. Problem Definition:** define the problem, to draw a scenario of what to be done;
- **II. Information/Data Gathering:** gather and organize information about the problem, to create a theoretical and practical basis;

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- **III. Data Analysis and Creation of the Proposal:** create the solution based on the previous information;
- **IV. Proposal Validation:** validate the solution with a case study;
- **V. Proposal Evaluation and Analysis:** evaluate and analyse the previous solution, to draw a conclusion about the proposal;

In this paper, we only present a part of the first three steps of this methodology, the last two steps are future/ongoing work.

## 2 ENTERPRISE ARCHITECTURE

The EA can be interpreted as an instrument to define the future direction of the enterprise, and also the mechanism that coordinates the actual transformation of the enterprise. EA handles the requirements that business performance needs, which are an integrated design of the enterprise and all that is related with it, e.g.: people and their competencies, organizational structures, business processes, IT, finances, products and services and its environment.(Greefhorst and Proper, 2011) So EA can be considered a connector of the business strategy and the IT strategy, and also the essence of enterprise informization planning.(Minli Jin, 2010) We now present some EA definitions to help get a clearer view of this theme.

The IEEE Standard ISO/IEC 42010 states that an architecture is: "The fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution." (Iee, 2000)

Mark Lankhorst defines EA objective by stating: "An enterprise architecture tries to describe and control an organisation's structure, processes, applications, systems and techniques in an integrated way."(Lankhorst, 2005)

The Gartner Group defined a EA concept as: "Enterprise architecture (EA) is the process of translating business vision and strategy into effective enterprise change by creating, communicating, and improving the key principles and models that describe the enterprise's future state and enable its evolution." (Lapkin, 2008) In the next section, we explain what Enterprise Architecture Framework we used to represent our proposed solution. Following the context we introduce important definitions of key concepts for EA and which we use during this work:

**Design Pattern:** "A design pattern systematically names, motivates, and explains a general design that addresses a recurring design problem in a system. It describes the problem, the solution, when to apply the solution, and its consequences. It also gives implementation hints and examples. The solution is customized and implemented to solve the problem in a particular context".(Gamma et al., 1995)

**Models:** "a purposely abstracted and unambiguous conception of a domain" . (Lankhorst, 2005)

**View:** "A representation of a whole system from the perspective of a related set of concerns".(Iee, 2000)

**Viewpoint:** "A specification of the conventions for constructing and using a view. A pattern or template from which to develop individual views by establishing the purposes and audience for a view and the techniques for its creation and analysis".(Iee, 2000)

In the next section, we explain what Enterprise Architecture Framework we used to represent our proposed solution.

### 2.1 Enterprise Architecture Framework

An Enterprise Architecture Framework is, as stated by (Lankhorst, 2005): "a conceptual structure of what an EA should contain and how to create it, i.e. models, principles, approaches, standards that guide the development of enterprise architectures". For the representation of the EA, there are several numbers of different EA frameworks, which distinguish several architecture layers and views.(R. Winter, 2010) The notation that we used to represent our architecture solution in section 3.2 is the Archimate Framework notation, represented in Figure 1. We chose the Archimate, because it offers in a detailed and comprehensive way the representation of the Application layer and its relation with the Business architecture and the Information architecture that are going to be an important step of the future work.

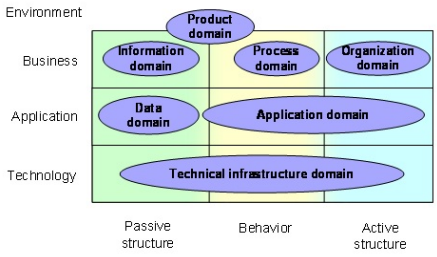


Figure 1: Archimate Framework from (Haren and Publishing, 2009).

Following is the explanation of what is done in each layer present in Figure 1:

- **Business Layer:** "offers products and services to external customers, which are realized in the organization by business processes performed by business actors."
- **Application Layer:** "supports the business layer with application services which are realized by (software) applications."
- **Technology Layer:** "offers infrastructure services (e.g., processing, storage, and communication services) needed to run applications, realized by computer and communication hardware and system software."(Haren and Publishing, 2012)

In this paper we only focus on the Application Layer, which is illustrated in section 3.2. Next we explain what a Reference Enterprise Architecture is.

### 2.2 Reference Enterprise Architecture

A Reference Architectures capture the essence of existing architectures, and the vision of future needs and evolution to provide guidance to assist in developing new system architectures.(Cloutier et al., 2010) The Reference Enterprise Architecture primary objective is to direct and constrain the instantiations of solution architectures. Another important aspect, is that a Reference Enterprise Architecture is considered an organizational resource, established by the four facts below:

- Provide common language for the stakeholders;
- Provide consistency in implementation of technology to solve problems;
- Support the validation of solutions through the prove Reference Architecture;
- Encourage adherence to common standards and patterns;(of Defence, 2010)

## 3 CUSTOMER RELATIONSHIP MANAGEMENT

In recent years, companies have acquired CRM technology to expand their markets clearly. The CRM technology brings with it, the creation of marketing opportunites, the rise of customer value and customer satisfaction, in order to achieve business excellence,(Fardoie and Monfared, 2008) with the main purpose of gaining loyal customers.

Kenneth C. Laudon and Jane P. Laudon defined CRM systems as a way to: "capture and integrate customer data from all over the organization, consolidate the data, analyze the data, and then distribute the results to various systems and customer touch points across the enterprise." (Laudon and Laudon, 2012)

The CRM software provide solutions for three major areas(Laudon and Laudon, 2012):

- **Sales Force Automation:** "is the application of computerized technologies to support salespeople and sales management in the achievement of their work-related objectives."(Buttle, 2009)
- **Marketing Automation:** "is the application of computerized technologies to support marketers and marketing management in the achievement of their work-related objectives."(Buttle, 2009)
- **Customer Service:** "provide information and tools to increase the efficiency of call centers, help desks, and customer support staff. They have capabilities for assigning and managing customer service requests."(Laudon and Laudon, 2012)

There are three major technologies components in CRM(Fardoie and Monfared, 2008):

- **Collaborative Technologies:** can be interpreted as the customer touch points. In other words, the collaborative technologies are the different channels that the customers use to interact, such as email, phone call, fax, website pages, and so on.
- **Operational Technologies:** are all the processes and functions related to the three major areas: sales (account management, territory management and others), marketing (campaign management, email marketing and others) and customer support (case management, contact center and other).
- **Analytical Technologies:** correspond to the processing of the sales information, marketing and customer support and its transformation in information for reports and analytics. This can be used, for example, as a diagnosis of customer relationship management.

In the Reference Enterprise Application Architecture proposed these three technologies are taken into account, but the Operational technologies are the main focus of the proposed architecture. Next we present the analysis and identification of the functions that we made on some CRM market solutions, to get the best practices of the industry.

### 3.1 Customer Relationship Management Features

To specify the Application functions of our CRM Reference Architecture, we extracted the features of five

known CRM solutions and compared what features were common between them. We based the choice of these CRM solutions on: the list of mid-market CRM suites from (Buttle, 2009) and the list of the Top CRM Software from (Barrish, 2014).

Merging the two references referenced above we arrived to the five CRM chosen: SugarCRM, Microsoft Dynamics, Sage, Oracle(Siebel) and Salesforce. The common features between them, were the features chosen to be the functions of the Application Architecture of our CRM Reference Architecture. We considered the common features between the five CRM solutions as the most importants, because if the major part of the CRMs provide those features, is by the fact that they are essential for the CRM domain. We didn't consider the costs of the features.

We introduce below the tables with the features of each CRM, to verify what features were common between them and also the explanation of each feature. For the identification of the features that are present in the tables, we made a clustering of the features from the features present in the datasheets of the chosen CRM solutions. To give an example of the clustering made, in the SugarCRM datasheet there were two features: lead capture and lead scoring, routing and assignment, we clustered these two features in a feature by the name of lead management, because in the other CRM solutions existed a feature by the name of lead management, which covered these features as one, in other words, lead management is a more comprehensive feature. The features are presented in groups, in accordance with clustering of these features by the datasheets of the CRM solutions. Only in the case of the "Other important features" where we cluster the common features that weren't specific of an area, as were the features from sales, marketing for example.

Table 1: Sales Features Table.

| Sales Features | Sugar CRM | Microsoft CRM | Sage CRM | Siebel CRM | Salesforce CRM |
|---|---|---|---|---|---|
| Account Management | X | X | X | X | X |
| Activity Management | X | X | | X | X |
| Approvals | X | | | | X |
| Competitor tracking | X | X | X | X | X |
| Contact Management | X | X | X | X | X |
| Contract Management | X | X | | X | X |
| Sales Literature | X | X | | | |
| Lead Management | X | X | X | X | |
| Opportunity Management | X | X | X | X | X |
| Product Management | X | X | X | X | X |
| Quote Management | X | X | X | X | |
| Sales Forecasting | X | X | X | X | X |
| Territory Management | X | X | X | X | X |
| Order management | X | X | X | X | |
| Quota Management | X | X | | X | X |
| Sales Pipeline | X | X | | X | |

Description of the Sales features(Oracle, 2007c; Microsoft, 2008d; Salesforce, 2012; Sage, 2012; SugarCRM, 2014), illustrated in Table 1:

**Account Management:** offers sales representatives and managers a complete view of the customer relationship including contacts, contact history, completed transactions, current orders, shipments, enquiries, service history, opportunities and quotations.

**Activity Management:** keeps sales representatives and managers aware of all activities, whether complete or pending, related to an account, contact or opportunity, by establishing to-do lists, setting priorities, monitoring progress and programming alerts.

**Approvals:** manage success with flexible approvals processes for deal discounts, expenses, and more.

**Competitor Tracking:** maintain detailed information on competitors associated with opportunities.

**Contacts Management:** includes tools for building, sharing and updating contact lists, making appointments, time setting, and task, event and contact tracking.

**Contract Management:** enables representatives and managers to create, track, progress, accelerate, monitor and control contracts with customers.

**Sales Literature:** create, manage, and distribute a searchable library of sales and marketing materials, including brochures, white papers, and competitor information.

**Lead Management:** allows companies to create, assign and track sales leads. Leads either expire or convert into qualified opportunities.

**Opportunity Management:** enables representatives and managers to create an opportunity record in the database and monitor progress against a predefined selling methodology.

**Product Catalog and Management:** enables work with a full-featured product catalog that includes support for complex pricing levels, units of measure, discounts, and pricing options.

**Quote Management:** allows representatives and managers to quote for opportunities. This may be part of a broader order management capability.

**Sales Forecasting:** offer sales representatives and managers a number of qualitative and quantitative processes to help forecast sales revenues and close rates.

**Territory Management:** allows sales managers to create, adjust and balance sales territories, so that

sales representatives have equivalent workloads and/or opportunities.

**Order Management:** allows representatives to convert quotations and estimates into correctly priced orders once a customer has agreed to buy.

**Quota Management:** design quota plans that motivate your sales team while supporting your company's revenue goals.

**Sales Pipeline:** is the process of managing the entire sales cycle, from identifying prospects, estimating sales potential, managing leads, forecasting sales, initiating and maintaining customer relationships, right through to closure.(Buttle, 2009; SugarCRM, 2004; Salesforce, 2000; Oracle, 2007c; Microsoft, 2008d)

By analyzing Table 1, we consider that the most important sales features are: account management, activity management, competitor tracking, contact management, lead management, opportunity management, order management, product catalog and management, quote management, quota management, sales forecasting, sales analytics and territory management.

Table 2: Marketing Features Table.

| Marketing Features | Sugar CRM | Microsoft CRM | Sage CRM | Siebel CRM | Salesforce CRM |
|---|---|---|---|---|---|
| Campaign Management | X | X | X | X | X |
| Campaign Execution | X | X | X | X | X |
| Email Marketing | X | X | X | X | X |
| Newsletter Management | X | | X | | |
| Marketing Campaigns | X | X | X | | |
| List Management | X | X | | X | X |
| Lead Management | | X | | X | X |
| Web To Lead Capture | X | X | | | X |

Description of the Marketing features(Oracle, 2007b; Microsoft, 2008c; Salesforce, 2012; Sage, 2012; SugarCRM, 2014), illustrated in Table 2:

**Campaign Management:** define tasks, activities, and marketing materials for the entire campaign life cycle. Create budgets and define follow-up activities. Track responses to every campaign activity, monitor campaign results.

**Campaign Execution:** includes use of predefined system templates for future re-use in campaigns, or create new campaigns from scratch, schedule campaign activities to be performed immediately or at specific times in the future, and launch campaigns anywhere in the world with strong multilingual and multi-currency capabilities.

**Email Marketing:** Send email campaigns, merge customer data into personalized emails, insert conditional messaging based on recipient attributes, track delivery and response for each recipient automatically.

**Newsletter Management:** track responses to every campaign activity and convert email responses to leads or opportunities, qualify leads, and do much more.

**Marketing Campaigns:** marketing campaigns like Telemarketing, Internet marketing, Event-based marketing and Direct mail marketing, all except Email Marketing.

**List Management:** automatically create static or dynamic lists based on accounts, contacts, or leads.

**Lead Management:** track marketing campaign results across a variety of channels, from online ads to social media, to when leads come in, automated scoring and lead routing ensure that leads never fall through the cracks and always get to the right sales representative fast.

**Web to Lead Capture:** a way to allow visitors to your website or other online location to become leads.(Buttle, 2009; SugarCRM, 2004; Salesforce, 2000; Microsoft, 2008c; Oracle, 2007b)

By analyzing Table 2, we consider that the most important marketing features are: campaign management, campaign execution, list management, and email marketing.

Table 3: Service Features Table.

| Customer Service Features | Sugar CRM | Microsoft CRM | Sage CRM | Siebel CRM | Salesforce CRM |
|---|---|---|---|---|---|
| Case Escalation and Notification | X | | X | | X |
| Case Routing and Queuing | X | X | | X | X |
| Contact Center | X | X | X | X | X |
| Case Management | X | X | X | X | X |
| Customer Self Service Portal | X | X | X | X | X |
| Email Management | X | X | | X | X |
| Knowledge Base | X | X | X | X | X |
| Customer Information | | X | X | X | X |
| Service Contracts | | | | X | X |

Description of the Service features(Oracle, 2007d; Microsoft, 2008b; Salesforce, 2012; Sage, 2012; SugarCRM, 2014), illustrated in Table 3:

**Case Escalation and Notification:** ensures that issues get escalated according to internally determined rules.

**Case Routing and Queuing:** Queuing and routing applications allow issues to be routed to agents with particular expertise and positioned in that agent's queue according to some criterion.

**Contact Center:** enables users to understand each customer as an individual, obtain all relevant customer information in a single view, and access that information when it matters from an incredibly fast, multi-channel agent desktop application.

**Case Management:** create, assign, and manage customer service requests across multiple channels, including phone, email, Web, in-person and emerging channels. Manage cases from initial contact through resolution and automatically associate incoming support inquiries with the appropriate case.

**Customer Self Service Portal:**allows companies to provide self-service capabilities to customers and prospects for key marketing, sales and support activities. Also allows non-technical users to create and deploy web-to-lead forms, enables users to log and manage support cases online, allows customers to update account, contact, billing and shipping address and gives users the ability to manage subscriptions to company communications in an automated fashion.

**Email Management:** maintain accurate account, contact and service history with automated tracking and response for customer email messages.

**Knowledge Base:** resolve common support issues quickly using a searchable knowledge base. Ensure that published information is complete, correct, and properly tagged using built-in review processes. Build and maintain a solution database that makes it easy for people to find appropriate solutions quickly.

**Customer Information:** manage accounts, contacts, calls, products, territory, activity and contracts.

**Service Contracts :** Service contracts are agreements between you and your customers for a type of customer support. Service contracts can represent different kinds of customer support, such as warranties, subscriptions, or service level agreements (SLAs).(Buttle, 2009; SugarCRM, 2004; Salesforce, 2000; Oracle, 2007d; Microsoft, 2008b)

By analyzing Table 3, we consider that the most important service features are: case routing and queuing, contact center, case management, knowledge base, customer self-service portal and email management.

Description of the Reporting features(Oracle, 2007a; Microsoft, 2008d; Salesforce, 2012; Sage, 2012; SugarCRM, 2014), illustrated in Table 4:

Table 4: Reporting and Analytics Features Table.

| Reporting and Analytics Features | Sugar CRM | Microsoft CRM | Sage CRM | Siebel CRM | Salesforce CRM |
|---|---|---|---|---|---|
| Custom reports | X | X | X | X | X |
| Dashboards | X | X | X | X | X |
| Sales Analytics | X | X | | X | X |
| Marketing Analytics | | X | | X | X |
| Service Analytics | | X | | X | X |

**Custom Reports:** easily build customized reports with wizard-based tools that do not require technical resources from IT.

**Dashboards:** insightful and focused dashboards for executives and top constituents that adeptly highlight key marketing metrics, key sales metrics and for service analytics.

**Sales Analytics:** generate and use reports, make data relevant and track pipelines to transform information into Sales Intelligence.

**Marketing Analytics:** is the application of mathematical and statistical processes to marketing problems. Exploratory applications of marketing analytics provide insights into, and understanding about, issues and problems.

**Service Analytics:** provides in-depth knowledge into service request activity, resolution trends, service revenue, costs, and customer satisfaction. (SugarCRM, 2004; Salesforce, 2000; Oracle, 2007a; Microsoft, 2008a)

By analyzing Table 4, we conclude that all the reporting and analytics features are important, not only because they are present in most of CRM solutions but also by the fact that one of the principal technologies of the CRM is the CRM Analytics and these features are part of it.

Table 5: Integration Features Table.

| Integration Features | Sugar CRM | Microsoft CRM | Sage CRM | Siebel CRM | Salesforce CRM |
|---|---|---|---|---|---|
| Email Integration | X | X | X | X | X |
| Social Networks | X | | X | X | |
| Integrated third-party apps | X | X | | | X |
| Web service API - SOAP | X | X | X | X | X |
| Web service API - REST | X | | | | |
| Computer Telephone Integration | X | X | X | X | X |
| Automatic Call Distributor | X | X | X | X | X |
| Microsoft Office Integration | X | X | | | X |
| Cloud Connectors | X | X | | | X |

Description of the Integration features(Oracle, 2007c; Microsoft, 2008d; Salesforce, 2012; Sage, 2012; SugarCRM, 2014), illustrated in Table 5:

**Integration Features:** all most common components that are integrated with CRM.

By analyzing Table 5, we consider that the most important integration features are: email integration, web services api-SOAP integration, CTI and ACD.

Table 6: Security Features Table.

| Security Features | Sugar CRM | Microsoft CRM | Sage CRM | Siebel CRM | Salesforce CRM |
|---|---|---|---|---|---|
| Role Based Security | X | X | X | | X |
| Advanced Password Management | X | X | | X | X |
| Audit Trail | | X | | X | X |
| Field Level Security | | X | X | X | X |
| User Based Security | X | X | X | X | X |
| Team Based Security | X | X | | | X |

Description of the Security features(Oracle, 2011; Roger Gilchrist, 2009; Salesforce, 2012; Sage, 2012; SugarCRM, 2014), illustrated in Table 6:

**Role based Security:** privileges are assigned to defined categories of users (known as roles) rather than to individual users.

**Advanced Password Management:** allows administrators to set up system generated passwords versus manually created passwords for new users, failed login lockout attempts, and configure the email templates used to send password information to users.

**Audit Trail:** automatically records changes made to fields within the application, ensuring data security and integrity across the organization.

**Field Level Security:** restrict access to high business impact fields to specific users and teams.

**User based Security:** authentication of users for security access.

**Team based Security:** Control what your users can access. Lock down sensitive data to specific teams (groups). (Oracle, 2011; Roger Gilchrist, 2009)

By analyzing Table 6, we consider that the most important security feature is: role based security, team based security, field level security, advanced password management and user based security feature.

Table 7: Other Important Features Table.

| Other Important Features | Sugar CRM | Microsoft CRM | Sage CRM | Siebel CRM | Salesforce CRM |
|---|---|---|---|---|---|
| Workflow Processes Automation | X | X | X | X | X |
| Document Management | X | | X | | X |
| Mobile Access | X | X | X | X | X |
| Offline Access | X | X | | X | X |
| Data Deduplication | X | X | X | X | X |
| Calendar Management | X | X | X | X | X |

Description of the other important CRM features(Oracle, 2007a; Microsoft, 2008a; Salesforce, 2012; Sage, 2012; SugarCRM, 2014), illustrated in Table 7:

**Workflow Processes Automation:** design and run any business process with point and click simplicity using Workflow.

**Document Management:** the Documents module is used to create and manage files to share with users and contacts.

**Mobile Access:** access customer data instantly on a mobile device.

**Offline Access:** allows access a subset of records using the same browser-based interface as the online system but without an Internet connection.

**Data Deduplication:** detect and remove duplicate records.

**Calendar Management:** allows users to easily schedule, view, and manage their activities (e.g. calls, meetings, tasks) in one place. (Salesforce, 2000; SugarCRM, 2004; Oracle, 2007a; Microsoft, 2008a)

In Table 7, are presented features that for themselves are a specific module, and which we decided to group in a unique table. Note the Mobile access and Offline Access are part of the same module, that in the CRM solutions datasheets goes by the name of Mobile CRM. All the features presented in the this table are important, because all are common to at least three CRM solutions. Following in section 3.2 we present the view of our Application layer from our Reference Architecture model.

## 3.2 Reference Enterprise Application Architecture Proposed

In this section, we present a view of the Application layer from our Reference Architecture model, which we defined through the features identified in the Tables 1-7 from the previous section. The view is illustrated in Figure 2.

The point of this view, is to present the Application layer that we defined, with the modules and the respective functionalities. We arrived to this model through the features that we identified and are presented in the Tables 1-7 of section 3.1. For the selection of the features from those tables, we chose the features that are common to, at least, three of the five CRM solutions (Tables 1-7, section 3.1). The common features are:

- **Sales Features:** account management, activity management, competitor tracking, contact management, contract management, lead management, opportunity management, product catalog and management, quote management, territory

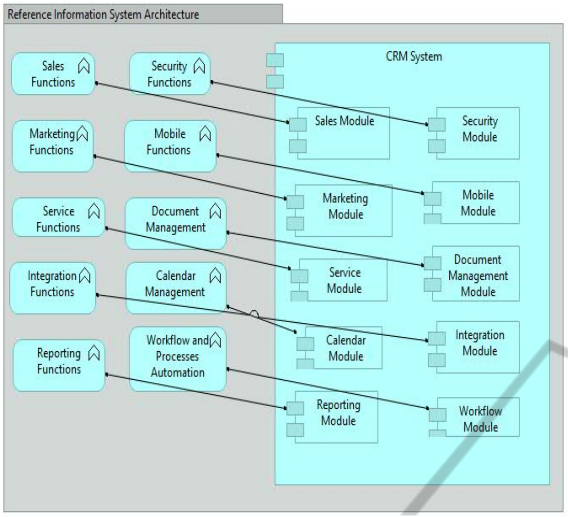


Figure 2: CRM Reference Application Architecture (Archimate notation).

management, quota management, order management, sales pipeline and sales forecasting.

- **Marketing Features:** campaign management, campaign execution, email marketing, marketing campaigns, list management, web lead to capture and lead management.
- **Service Features:** case escalation and notification, case routing and queuing, contact center, case management, customer self service portal, email management, knowledge base, customer view and service analytics and service contracts.
- **Report and Analytics Features:** custom reports, dashboards, sales analytics, marketing analytics and service analytics.
- **Integration Features:** social networks, email integration, web-services api - soap integration, microsoft office integration, automatic call distributor, computer telephone integration, cloud connectors and integrated third-party apps.
- **Security Features:** role based security, advanced password management, control data access, user based security, team based security and audit trail.
- **Other Important CRM Features:** workflow and processes automation, document management, data deduplication (this one related to technological layer), mobile and offline access and calendar management.

There are some features that are repeated, this is happens due the fact that each of modules interact between them and have some functions in common. This aspect will be resolved in future work with a CRUD matrix. These features were grouped into 10 modules. We arrive to these modules by analyzing the CRM datasheets. The features on those CRM datasheets were grouped in areas. Those areas we interpreted them as the modules in the CRM. For the in the other important CRM features we created a module for each one of them, because they weren't part of any specific area. The modules are the following:

- Sales module composed by the common sales features, Figure 3;

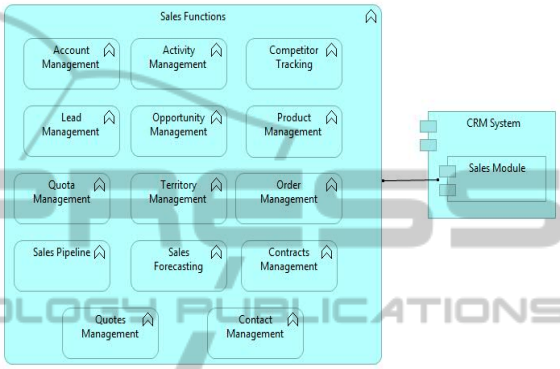


Figure 3: Sales Module.

- Marketing module composed by the marketing features, Figure 4;

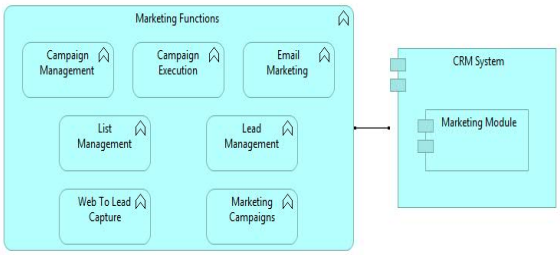


Figure 4: Marketing Module.

- Service module composed by the common service features, Figure 5;

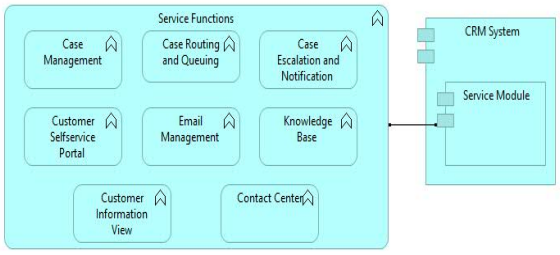


Figure 5: Service Module.

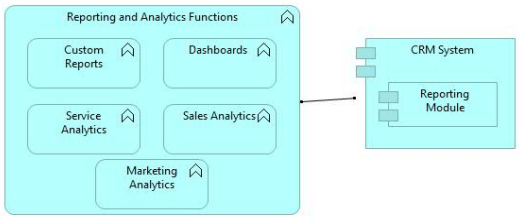


Figure 6: Reporting and Analysis Module.

- Reporting module composed by the common reporting features, Figure 6;
- Mobile module composed by mobile and offline features, Figure 7;

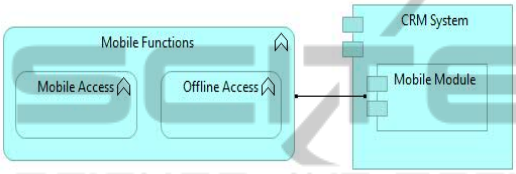


Figure 7: Mobile Module.

- Document module composed by document management feature, Figure 8;

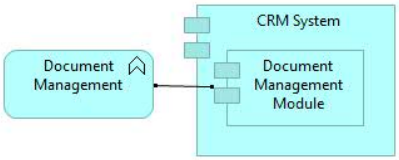


Figure 8: Document Module.

- Integration module composed by the common integration features, Figure 9;

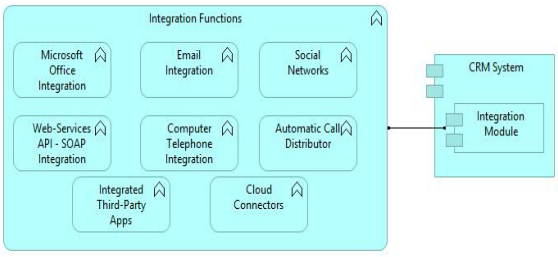


Figure 9: Integration Module.

- Security module composed by the common security features, Figure 10;
- Calendar module composed by the calendar management feature, Figure 11;

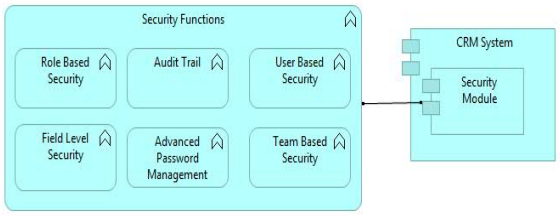


Figure 10: Security Module.

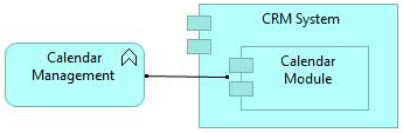


Figure 11: Calendar Module.

- Workflow module composed by workflow process automation feature, Figure 12;

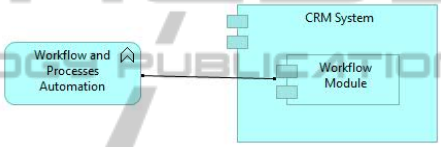


Figure 12: Workflow Module.

This solution is a first representation of a Reference Application Architecture for the CRM domain, based on the datasheets of five CRM solutions that we considered as the best practices of the industry.

## 4 CONCLUSIONS

The work presented in the paper focus on a first step towards a complete Reference Enterprise Application Architecture, with the goal to create a documented architectural design practice for the CRM domain. With this work, we provide a view of the CRM domain as a guideline, to help architects in this domain. The main achievements taken from this work are the analysis made to each of the CRM solutions datasheets and the representation of that analysis in the Application layer in Archimate. Thanks to the analysis made, we can take conclusions related to the CRM solutions, like: the SugarCRM is the most complete in terms of Sales domain, for the Marketing domain Microsoft CRM stands out as the CRM solution which provides more features, in terms of Customer Service the most suitable CRM solution is the Salesforce CRM , in the Reporting and Analytics field all the CRM solutions are all well equipped, in the Integration domain the SugarCRM solution is the solution

with the most integration capacity and, for the last, in terms of Security, the Salesforce CRM and Microsoft CRM are the solutions with the most features. Still in relation to the Application architecture proposed, an important part of the work made was the identification of the ten common modules of CRM solutions: the sales module with fourteen functions, the marketing module with seven functions, the customer support module with eight functions, the reporting module with five functions, the mobile module with two function, the document module with one function, the calendar management module with one function, the workflow module with one function as well, the integration module with eight functions and the security module with six functions. This is an ongoing research, that started with this paper by presenting an analysis on what are the principal features associated with CRM market solutions. The solution presented in this paper has some limitations, because the work presented only covers the functional requirements. We didn't present an evaluation, because its a first step composed only by the functional requirements, and with that we wouldn't have any interesting results to present. This is a work in progress towards a complete Reference Enterprise Application Architecture for the CRM domain. We started by presenting in this work, the main features of five CRM solutions and the modules that satisfy them. In the future work, we will identify the main information entities of these five CRM solutions. With the information entities and with the features identified in this work, we will reach a final Reference Enterprise Application Architecture, through a CRUD matrix. When we reach the Reference Enterprise Application Architecture, we will evaluate it with case studies from the Public Portuguese Administration, through some metrics to evaluate information systems.

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