Implementing N-Tier Architecture for Improvement in Customer Relationship Management "CRM"

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Abstract

Investing in the Customer Relationship Management (CRM) application is no different than any other business management software- weather you are looking for an enterprise level software application or department level solution we expect a quick and measurable return in our investment. To achieve such fast returns the most important aspect that matters is its underlying architecture. The implementation of a well designed architecture will accommodate future growth and adapt to business changes without affecting the performance of application or requiring the exhaustive re-implementation. The architecture we consider is an n-tier architecture used because of its flexibility, portability, scalability and extensibility. This paper describes the implementation of n-tier architecture in CRM and the benefits that the system awards.

Keywords: CRM, Extensibility, Scalability, Investing.

1. Introduction

Over last 10 years, many companies and organizations have implemented CRM systems. In most cases these system were designed to support call centre and e-mail channels, and more recently internet and mobile channels. An increasing number of companies are considering implementing CRM with advanced n-tier architecture systems to satisfy the growing expectation of customer service. These systems have unique advantage and characteristics that support customer business interaction that are linked into internal business processes and systems across different areas for operational and analytical purposes. It proposes a structure that is channel independent in sense that it uses one, company-wide set of data and one set of business rules to manage a customer interaction via any channel at any time. In practice, web technologies are used in most cases for process management and to provide representatives with information functionality. The use of n-tier architecture in CRM applications can in turn provide an overall better and more consistent customer experience, and also allows for increasing data collection and better customer personalization experiences. This in turn, all lead to increased profitability from customers and greater customer loyalty. Researchers further determine through their research that customer loyalty while partially impacted by use of n-tier architecture also is determined by a combination on online experience with things such as the quality of after sale service. The research further clarifies that the use of n-tier architecture by the business firms to build their brand identity is most. The research supports the claim that there is still ample room for companies to embrace broader CRM initiatives including a more customer-focused and useful online presence. In this architecture, the corporate data, the operations performed on that data and the user interfaces are built-in clearly defined layers that communicate using internet standards. This architecture is characterised by single server installation, thin client deployment, centralised administration, portable application, and architecture, and optimised performance on WANs. This architecture provides a superior performance over across all user deployment scenarios including disconnected access, internet access, dial-up access, and in office access. This paper indentifies the opportunities that the use of n-tier architecture in CRM applications provides to a business firm.

2. N-Tier Architecture

Definition: - N-Tier architecture is basically an industry-proved software architecture model, suitable to support enterprise-level "Client/Server" model, applications by resolving issues like scalability, security, fault tolerance etc.

In understanding the N-Tier architecture firstly we need to clarify the difference between two

terms:"Tier" and "Layer". Tier usually means the physical deployment computer. Usually an individual running server is one tier. Several servers may also be counted as tier, such server failover clustering. By contrast, layer usually means logic software component group mainly by functionality; layer is used for software development purposes. Layer software implantation has many not exactly match each other. Each layer may run in an individual tier. However, multiple layers may also be able to run in one-tier. A layer may also be able to run in multiple tiers. Let us consider the example of .NET, the persistence layer in .NET can include two parts: persistence Lib and WCF data service, the persistence lib in persistence layer always runs in the same process as business layers to adapt the business layer to the WCF data service. However, the WCF data service in persistence layer can run in a separate individual tier. Here is another example: we may extract the data validation in business layer into separate library (but still kept in business layer), which can be called by client presenter layer directly for a better client-side interactive performance. If this occurs, then data validation part of the business layer runs in the same process of the client presenter layer, the rest of the business layer runs in a separate tier.

Diagram1.N-Tier Architecture

2.1. 3- Tier Architecture

We introduce the 3-tier concept first so that we can understand other tier concepts later easily. The simplest of n tier architecture is 3-Tier which typically contains following software component layers listed from top level to low level: presentation layer, application layer and data layer, which are depicted in pictorial Diagram. This layer can access directly only the public components of its directly below layer. For example, presentation layer can only access the public components in application layer, but not in data layer. Application layer can only access the public components in data layer, but not in presentation layer. Doing so can minimize the dependencies of one layer on the other layers. This dependency minimization will bring benefits for layer development/maintenance, upgrading, scaling and etc. Doing so also makes the tier security enforcement possible. For example, the client layer cannot access the data layer directly but through the application layer, so data layer has higher security guarding. Finally, doing so can also

avoid cyclic dependencies among software components. In order to claim complete 3-Tier architecture, all three layers should be able to run in separate computers.

Diagram 2. 3-Tier Architecture

These three layers represented in the diagram are briefly described as below:

Presentation Layer: A layer that users can directly access such as desktop UI, web page and etc. It is also known as The Client Layer .

Application Layer: This layer encapsulates the business logic such as business rules and data validation), domain concept, data access logic and etc. It is also known as The Middle Layer.

Data Layer: The external data source to store the application data, such as database server, CRM system Application, ERP system, main frame or other legacy system and etc. For example we consider a database server, now for n-tier architecture, we need to use the non-embedded database server such as SQL server, Oracle, DB2, MySQL or PostgreSQL. The non-embedded database server can be run in an individual computer whereas, the embedded type databases, such as Microsoft access, dbase and etc, cannot run in an individual computer, and then cannot be used as the data layer of 3-tier architecture.

2.2. 1 and 2-Tier Architecture

1-Tier: All the layers can only run in one computer. In order to achieve 1-Tier, we need to use the embedded database system, which cannot run in an individual process. Otherwise there will be at least 2 tiers because non-embedded databases usually can run in an individual computer.
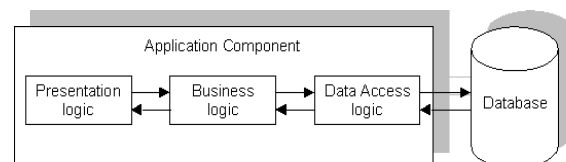

Diagram3. 1 Tier Architecture

2-Tier: Either presentation layer and application layer can only run in one computer or application layer and data layer can only run in one computer. The whole application cannot run in more than 2 computers.
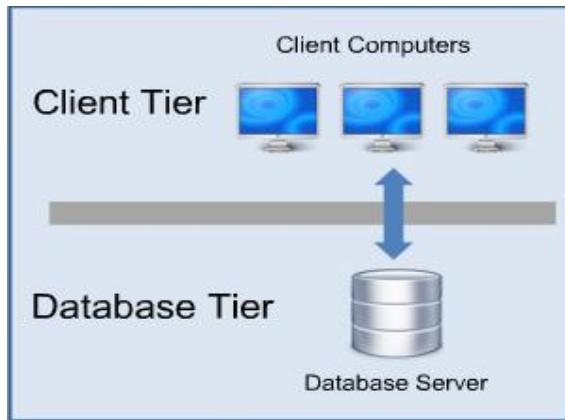

Diagram 4.2-Tier Architecture

Sometimes the number of tiers is able to be equal or more than 3, but client presenter layer, business layer and data layer cannot run in three separate computers. If we use the modem non-embedded database such as SQL server, Oracle and etc, these databases will always be able to run in an individual computer. Therefore, for this case in diagram1 the criteria of a 2-tier architecture is that presentation layer and application layer can run in only one computer; the criteria of a complete 3-tier architecture is that presentation layer and application layer can run in different computers. A complete N-Tier architecture has the same criteria as 3-tier architecture.

3. Introduction of N-Tier Architecture in Traditional CRM

The difference between traditional CRM and advanced CRM (a-CRM) are subtle, but important. They concern the underlying technology and its interfaces with users and other systems. Pourasghar(2007) did not think there are differences between CRM and a-CRM. He said considering the strategic perspective, no differences between CRM and a-CRM exist as both concepts have the overall goal of an increased Customer Lifetime Value, and aim to increase customer retention and decrease service costs but the process level, he said several distinction between the two concepts become observable. He mentioned further that while conventional communication processes are often time delayed, a-CRM allows organizations to always operate in real time and more than that interaction with customers are transparent so that organizations are able to draw conclusions on customer behaviour and measure

the success of activities. Unlike conventional CRM processes a-CRM processes imply high automation of interaction.

According to (pan et al.2003) a-CRM expands the traditional CRM techniques by integrating technologies of new electronic channels. a-CRM solutions support marketing, sales and service and with advancement of Web-based technology, market dynamics are driving companies to adopt a-CRM. a-CRM cannot be separated from CRM, it needs to be integrated and seamlessly cherished. However many organization do have specific e-CRM initiatives or staff responsible for a-CRM. Both CRM and a-CRM are not just about technology and databases, it is not just a process or a way of doing things, it requires in fact a complete customer culture. In a-CRM the application programs are written with back-end operations in mind; the emphasis is on data collection and the optimality of interface with the user pc (client).

Keywords: a-CRM (Advanced Customer Relationship Management): An architecture comprising the use of n- tier architecture in CRM.

4. a-CRM through Customer Life-Cycle

In today's world companies are encountering an increasing amount of sophisticated customers, with high level of expectations and demands for immediate service across multiple access channels. Customers feel that customer service should occur via the channel of communication that they specify to be communicated, or at least the channel through which the contact with company was initiated. Customers not only want to shop and get customer service through multiple communication channels, such as the telephone, web chat, electronic mail, and the web, they desire the ability to move seamlessly from one medium to another . a-CRM enables to serve customers online and cover the areas like content management, product and pricing models, customer service support, problem resolution and automated response agents and campaign management functions. In order for a company to provide unified customer communications at different customer interface points, it should be kept with a company through several channels. In view of multi-point contact with customers, a-CRM implementation requires organizations to have several devices and technologies in place such as e-,ail inbound/outbound support, chat/ browser control, voice-over internet protocol (VoIP), multi-language support; messaging, work-flow and web measurement devices. It embraces the front-office business functions of sales, marketing and customer services, and supports the back office

business and analysis operations spanning these functions, all in a web-centric fashion. The figure below illustrates how a-CRM functionality supports each of the five business components of marketing, sales, customer service support, e-commerce and electronic processes into the back-office analysis.
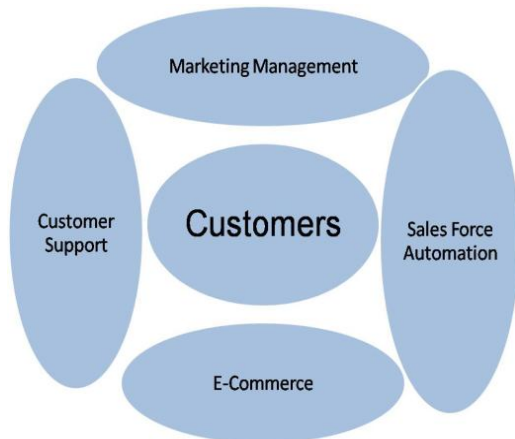

Diagram5. Customer Life Cycle

5. Benefits of Implementing N-tier Architecture in CRM (a-CRM)

Most organization invests in huge sums in defining and automating their core business process. No doubt they have benefited by standardizing the processes, yet there are several areas which remain unsolved where a-CRM can play effective role. The following benefits can be reaped by the proper implementation:

An effective a-CRM system enables a company to communicate with its customers using a single and consistent voice, regardless of the communication channel. This is because with the a-CRM software, everyone in an organization has access to the same transaction history and information about the customer. Information captured by an a-CRM system helps a company to identify the actual costs of winning and retaining the individual customers.

More effective marketing, having detailed customer information from an e-CRM system allows a company to predict the kind of products that a customer is likely to buy as well as the timing of purchases. In the short to medium term, this information helps an organization create more effective and focused marketing/sales campaigns

designed to attract the desired customer audience. a-CRM allows more targeted campaigns and tracking of campaign effectiveness. Customer data can be analysed from multiple perspectives to discover which elements of a marketing campaign ahead the greatest impact on the sales and profitability.

Automating customer data mining saves valuable human resources. Integrating customer data into single database allows marketing teams, sales forces, and other departments within a company to share information and work toward common corporate objectives using the same underling statists.

An a-CRM system provides a single repository of customer information. This enables a company to serve customer needs quickly and efficiently at all potential contact points, eliminating the customer's frustrating and time consuming process for help. a-CRM enabling technologies include search engines, lie help, multi linguistic support.

6. Conclusion

The Advanced Customer Relationship Management has evoked considerable interest about its effectiveness and risks amongst many organizations and researchers. It always remains a priority for the organizations even as economic conditions because IT budgets are to be scrutinized. This paper has show how Implementing N-Tier Architecture to traditional CRM and change trend. It is here to enhance the application CRM. This Paper mainly focuses on the technological aspects of the N-tier Architecture and Benefits of Implementing It. In addition, critical issues have been identified that companies need to consider while starting a-CRM implementation. In addition, Customer-Centric and corporate benefits of implementing the N-tier Architecture in CRM solution have been reviewed with the understating that a- CRM will only succeed when organizations make their customers win. It also offers an outstanding end to end Functionality – from lead generation to sales to support- while providing an architectural foundation unique in the industry, that add value both at installation time and for the life time of the business. Investing in an advanced CRM is a smart business decision which guarantees quick returns and future protection.

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