

Towards A Context-Aware Multi-Channel Messaging Model for African Banks: Preliminary Investigations

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Abstract: Technological advancements have provided Banks several means of sending messages to their customers. In the context of business-to-customer interaction, Single Channel Messaging (SCM) model is prominently used by most Banks in Africa. SCM is restricted to one communication medium and messages are not sent based on urgency or priority. The ultimate aim of this research study is to propose and implement a model for Multi-Channel Messaging (MCM) that addresses the weaknesses of SCM. However, in this paper we only present and motivate the proposed conceptual MCM model. Unlike SCM, MCM uses different modes of communication to pass on information to Bank customers. Depending on the importance of a message, MCM provides mechanisms for choosing a channel, amongst available options, that matches the message's urgency or priority. The suitability of the Service Oriented Architecture (SOA) as an implementation approach is highlighted as it offers a robust, loosely coupled and scalable strategy for realising the requirements of MCM.

Keywords: Multi-Channel Messaging, Web Services, Banking, Software Oriented Architecture, Banks, Framework, Platform, Single-Channel Messaging, Enterprise Service Bus.

1. Introduction

Technological advancements have provided Banks (i.e. financial institutions) with the opportunity to reach out to various customers in different ways. Messaging has been playing a significant role for information sharing between businesses and people. The different modes of communication available, such as Short Messaging Service (SMS), Instant Messaging (IM), Emails and Social Media messaging platforms (Twitter, Facebook, Whatsapp) and others can allow businesses to communicate critical and relevant information to their customers. Getting information at the right time and via the most reliable means at that time may determine the level of success or failure of the business or customer. According to [1], recent advances in Information Technology (IT) have created various opportunities by raising users' expectations, thereby necessitating businesses and customers to be in constant communication irrespective of distance, time, demography and geographical differences [2]. Businesses need to keep good relationships with their customers by ensuring an open and steady medium of communication [3]. Banks' customers are increasingly aware of the advantages of technology and messaging, hence businesses also need to match up with the customers' expectations with the different communication channels available. With these diverse communication means, it is

important for Banks to leverage on technologies that offer the best user experience in terms of communication to its customers.

The business of banking is trust [4] as they leverage on all the communications and analytical advantages of digital technology. Customers typically subscribe for different types of alerts on the transactions happening on their accounts e.g. access to the account via internet banking, password change, personal information number (PIN) request, remote or out of profile login to internet banking, transactional alerts, general information, product listing, features and promotional communication by the Banks to the customers. Most customers will want to be reached based on the urgency or nature of the message being sent. As a result of this, if a customer logs on to the internet banking application from a location other than a known one by the Bank's enterprise systems, the system may decide to confirm the identity of the customer by choosing the customer's preferred channel for information of this nature. Another case could be confirmation of a third party cheque by a customer. The Core Banking application may make its decision based on the customer's profile on the channel of communication for such. Each customer's preference is unique and may need to be profiled according to the type of message and the channel to be reached for delivery. There is a need for a unified messaging platform deployed by the Banks making use of the recent advances in technology to achieve this.

Business organisations have to sustain and accommodate technological changes in order to maintain profitability. Most Banks in Africa are currently running their messaging systems using only a single dedicated channel of communication e.g. Email or SMS only. There is no documented reference for this however this is a general knowledge within the financial space in Africa based on the products the Banks are currently offering their customers. Within the messaging and communication space there is still a lot that needs to be done to implement a system that can make the different communication channels available to each customer in a unified platform referred to as a multi-channel messaging system.

In [5] it is opined that Banks are currently experiencing problems inherent with single channel communication solutions. A survey of more than 1,000 American retail banking executives from more than 200 institutions revealed that only about two percent of Banks use Short Messaging System (SMS) to communicate with customers as one of their efficient communication strategies contrasting with 53 percent of the customers that prefer to receive text notifications. This suggests that same issues with SCM are currently being experienced in the developed countries of the world. The survey further revealed that most Banks still use agents to manually call, hence consumers are getting verbal phone calls instead of SMS messages and more than half still use direct mail to reach customer, despite having a slow response rate. This research addresses the issue of using single communication channels for message delivery to the customers by the Banks. Due to the different channels of communications available for use recently by customers in general, there is a need by Banks to leverage on this new communication channels to improve their customer relationship while maximizing the gains available technologically.

The rest of this paper is structured as follows: Section 2 highlights the research questions and objectives that motivate the research work. Section 3 discusses the research methodology used. Section 4 reviews the customer transaction alert messaging setup at the Banks using single channels messaging system. This fully answers the research question of understanding the disparate channels and the need to implement an MCM system. Section 5 discusses and reviews related work in MCM. Section 6 presents the proposed conceptual MCM model and preliminary implementation thereafter. Section 7 discusses MCM benefits to the Banks and Section 8 concludes the paper while motivating further work in the MCM field.

2. Research Questions and Objectives

This study is based on the main research question: “How can an integrated multi-channel messaging model be designed and used to implement an improved customer transactional alert messaging solution that can provide improved services for the Banks by being able to communicate in customers’ preferred methods?” Below are the Research Objectives

1. To understand the general requirements of a Multi-Channel Messaging Model.
2. To understand how the disparate channels available in a Multi-Channel Messaging model can be seamlessly integrated.
3. To develop a prototype for a customer alert messaging system using the proposed Multi-Channel Messaging model this objective is currently not addressed within the scope of this paper.

3. Research Methodology

Choosing a research paradigm is an important step within the research methodology phase. According to [6], a research paradigm is a shared way of thinking. Action Design Research (ADR) is used in this research. ADR paradigm aims to build innovative IT artefacts in an organizational context by providing explicit guidance for combining, building, intervening and evaluating a concerted research effort. According to [7], the ADR method is aimed at creating prescriptive design knowledge by building and evaluating ensemble IT artefacts in an organizational setting while grappling with two seemingly disparate challenges of addressing a problem situation encountered in a specific organisational setting by intervening and evaluating the problem and also constructing an IT artefact that addresses the class of problems typified by the encountered situation.

For the purpose of this research, the context of multi-channel messaging system implementations in Banks was investigated objectively to develop the conceptual model for MCM. Since this problem was an organisational problem with similar features to what ADR postulates. ADR techniques feature the identification of a problem in a business practice. The inputs for the problem have been formulated from the existing problem of using single channels for delivery of messages to the customers. According to [8] the problem formulation stage identifies and defines a research opportunity based on existing theories and technologies.

4. Single Channel Messaging System

The current transaction alert system implemented by most Banks in Africa is tailored towards a single channel approach of SMS and E-mails running independent of each other. Considering the approach implemented at most of the Banks in Africa, the following systems represent the model of the implementation of the current alert system by most Banks in Africa.

For example: The Nigeria Bank (TNB)¹, a bank in Nigeria with about 11 million customer accounts, 700 Branches network with assets in excess of \$6Billion, is currently using the SCM model for customer alert system. The system is implemented as listed below¹

- Customer Alert Profiling System
- SMS Alert Polling and Push System
- Email Alert Polling and Push System

Figure 1 depicts the relationship between the five systems integrated together to the Core Banking platform of the Banks for customer transaction.

¹ In accordance with best practices, we have made bank names fictitious to protect their identity.

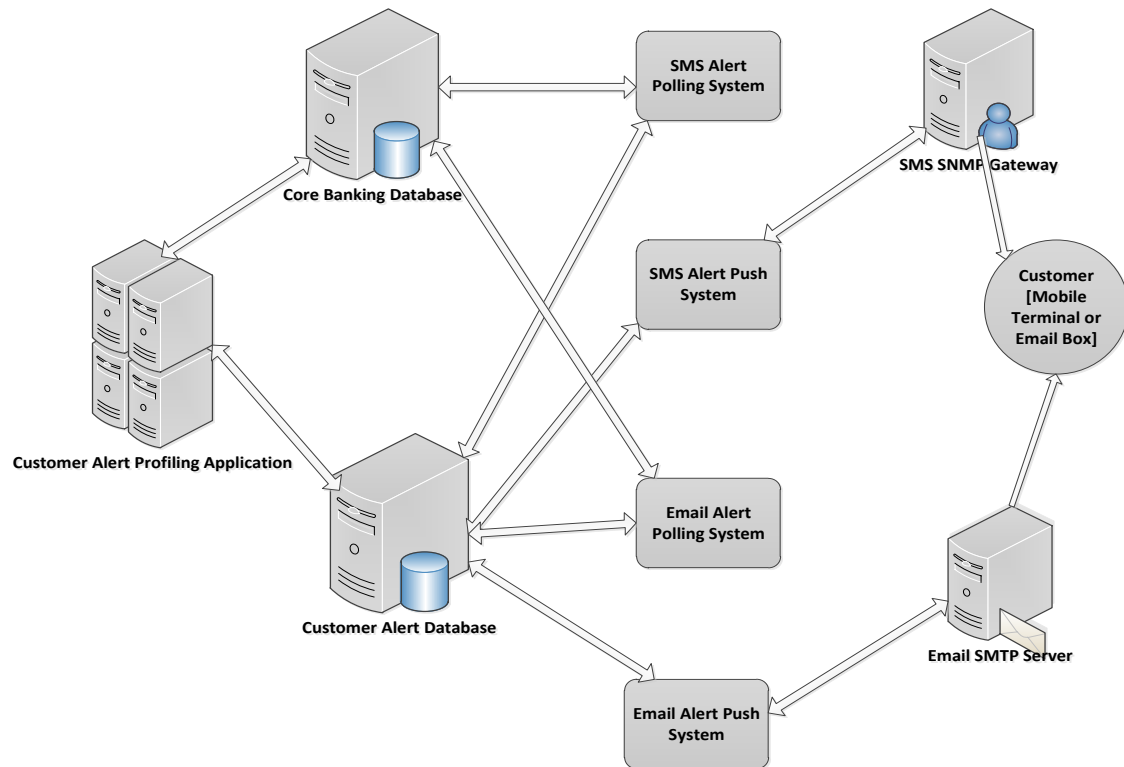


Figure 1: Current Customer Alert Model at The Nigeria Bank (TNB)

- **Customer Alert Profiling System:** This is a web application hosted on the Bank premises for use by Bank branches to profile prospective customers using the customer account number as the primary search criteria. This system pulls customer data from the Core Banking system and merges it with customer preference selected on the alert system.
- **SMS Alert Polling System:** This system is deployed as a service that connects to both the Core Banking system and the alert profiling database. It listens for transactions online real-time as they are consummated on the Core Banking database and instantly pulls all transactions at time "t" and sets a marker at this time so as not to duplicate the transactions being fetched. The pulled transactions are inserted into the alert system SMS database table.
- **Email Alert Polling System:** This system is deployed as a service that connects to both the core banking system and the alert profiling database. It listens for transactions online real-time as they are consummated on the core banking database and instantly pulls all transactions at time "t" and sets a marker at this time so as not to duplicate the transactions being fetched. The pulled transactions are inserted into the alert system Email database table.
- **SMS Alert Push System:** This system is deployed as a service that connects to the alert profiling database. It listens for transactions online real-time as they are inserted in the SMS database table and instantly pulls all transactions, composes messages based on a standard template and connects to the SMS gateway server for sending to the telecommunications company and then to the customer mobile terminals. It also updates itself with the status of delivery of the message based on the response received from the SMS gateway server. In case of failure, it has the ability to try up to a parameterised "n-number of times for retrials".
- **Email Alert Push System:** This system is deployed as a service that connects to the alert profiling database. It listens for transactions online real-time as they are inserted in the Email database table and instantly pulls all transactions, composes messages based on an Hypertext Mark-up Language (HTML) formatted template and connects to the Email

gateway server using Simple Mail Transport protocol (SMTP) for sending to the email address profiled for the customer. It also updates itself with the status of delivery of the message based on the response received from the SMS gateway server in case of failure it has ability to try up to a parameterised “n- number of times for retrials”

The major drawback of this SCM system is that each channel is implemented and operated independently of each other with no interface for interoperability. SMS and Email messages are pulled frequently by two independent services that may have drawbacks on the Core Banking database performance vis-à-vis memory consumption and CPU overheads.

It is worthy to note that a service delivery channel can change the customers’ perception of a service. When there is a free choice of bouquet of services rendered by the Banks, a customer could choose the channel that realizes the highest relative value in terms of high quality, accessibility, cost effectiveness, efficiency and flexibility. This requires that the service providers (e.g. Banks) implement its service processes and delivery channels in such a way that they are integrated instead of the current implementation they have that have dedicated channels running separately for e-mail and SMS delivery to the customers. Once the channels are integrated, the introduction of a new communication channel is not only a new channel but a way to improve the current service delivery; the perception to the users is more accessibility and flexibility in service delivery. The system is not context-aware as it not able to track or monitor the channel which the customer is most receptive to in terms of message delivery and prioritization in sending of messages

5. Related Work

An integrated messaging model is the core of multi-channel messaging alert system [9]. They [9] proposed an Integrated Multi-Channel Message model architecture that integrates the different channels of communication by providing a messaging layer that is flexible and adaptable. This was achieved using Extensible Mark-up Language (XML) translation and Extensible Style Sheet Transformation (XLST). The proposed system can either work as part of a system or an independent web service. They further created a messaging model that involves a tightly coupled decision making module layer that determines urgency of the message and a message-transforming module that makes use of XLST to transform the messages to the service layers be it instant messaging, Email or SMS. Limitations of this system include overheads incurred in the data translation using XLST with this approach due to drawbacks and redundancy in XML schemas and documents. Due to the drawbacks and slowness in performance noted for XML processing, this solution may not be suitable for the Banks to implement.

In [10], a normalization procedure for XML schemas with cyclic XML Functional Dependencies (XFDs) Extensible Mark-up Language was proposed. XFDs uses a language based on tree patterns [11] with XML schemas and XFDs to express a notation used in formal analysis of the properties of the XML in normal form as well as the base for developing transformation algorithms. Further, relationships between XML schemas and XML functional dependencies were expressed by [12]. Two generalized approaches with XML were implemented by [3] to provide a homogeneous framework for data processing and interchange without translation due to common data format shared by the different systems. This was aimed at solving the overheads incurred in data translation. They [3] further proposed a custom adaptor and integration broker approaches for systems that do not support XML for communication between each other. XML was initially used as a mark-up language to develop the rules for creating other industry and application specific mark-up languages [13]. In [10] it is further documented that the relational version of the XML schema cannot be structured in redundancy free and dependency preserving form.

Furthermore, Normalisation of Boyce-Codd normal Form (BCNF) may eliminate redundancy, but does not preserve the XML dependencies. This may not be suitable for the Banks to use as the redundancy in XML was eliminated while not preserving the message features and dependencies of the XML message structure which could lead to data losses in message translation and sharing between channels.

In [14], an application for alert system in the credit card transaction was implemented and the notice credit card payment system, which combines the credit card service of Banks with SMS of communication service providers by invoking a web service was designed. As documented by [15], they implemented an alert system according to the urgency of the process scheduler. They provided a scheduling algorithm and a multithreaded running of the processes so that they can execute processes in parallel without interfering with each other.

An alert system was implemented by [16] in the insurance sector that relies heavily on web services thereby ensuring that little modifications are done to the code base. When there is need for change this ensures that the system is highly scalable and adaptable in an enterprise environment where changes to application code and user requirements can be rapid and evolving with time. However, the proposed platform hardly detects some unexpected events that can happen within the system between service calls that results in failure or error.

6. MCM Conceptual Model

In this paper, we propose a model using JavaScript Object Notation (JSON), a lightweight data-exchange messaging interface used by web services for integration of disparate channels. An enterprise service bus (ESB) layer approach was adopted to develop the model to ensure that all channels are seamlessly integrated in to the Messaging Controller Layer. Figure 2 depicts the proposed model.

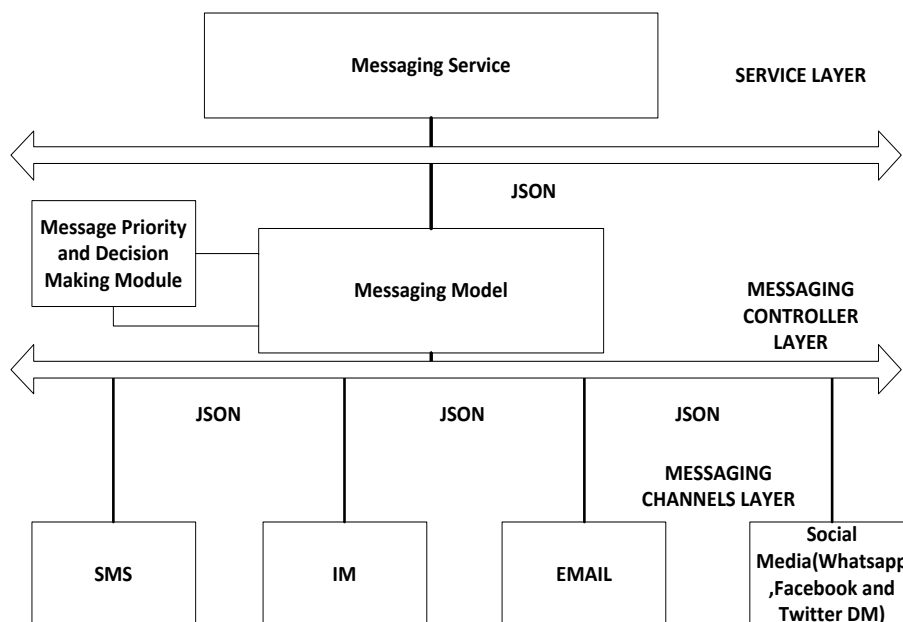


Figure 2: Proposed Multi-Channel Messaging Model

The model has a decision making module and message priority module; the former is responsible for the processing unit of the model that is used for analysing the message first and depending on the urgency chooses a channel to send the message through. Decisions can be artificial or automatic. In the artificial case, the administrator chooses one or multiple channels for delivering the message to the unit. This method is noted for high

reliability, however, it has low efficiency. In the automatic mode, system chooses the channel of sending the message based on the urgency of the message. Urgency of the messages is categorized into three main categories. The first category is normal, messages sent in this mode ask users for reply and notifies user that time is sufficient for response or retrieval, messages of this nature can be delivered via the email channel. The second category is urgent, it asks for reply and also notifies the user that the time is short, messages of this nature can be sent via the Instant Messaging (IM) channel. The third category is very urgent, it asks for reply at once and notifies the user that time has expired; messages of this nature can be sent by SMS or an Automated Voice Call/Response system or via all the channels for delivery implemented all this can be profiled based on customer's request on the platform as well.

In relation to the example about the customer remote/out-of-profile login on internet banking, assuming the customer has chosen SMS as his preferred messaging channel; however, he is not available in his home country or roaming to receive the One-Time Password (OTP) sent to authenticate him by the Core-Banking Internet Banking System via SMS. The Internet Banking system after waiting for the expiry time of the OTP and does not receive any response from customer will initiate the message to the next available channel including the one tried with failure when the customer re-initiates the transaction

Grants Bank of Nigeria (GBN)² implemented a system using an integrated MCM system with Email, SMS and Twitter Direct Message of the customers, the system is able to route non urgent messages like product campaign messages to Customer's email addresses or Twitter Direct messages while urgent information like security information like OTP used for transaction authorization of transactions above a set threshold. The individual polling service issue was also resolved by using a single polling service with a single adapter to the messaging channels. However customer pre-determined preference for message delivery is not considered with context-awareness in this implementation rather the Bank's categorization of the message type to be delivered.

Choosing a framework for the implementation of an MCM system may be difficult since there is no one way approach to solving the issue of integrating multiple and disparate channels. We propose an implementation of the proposed model with the Software Oriented Architecture (SOA) concept that supports the implementation of a suite of disparate channels integrated as services with its own processes and communicating with lightweight mechanisms in this case JSON, a lightweight Hypertext Transfer Protocol (HTTP) resource Application Programming Interface (API). These services will be built around business capabilities and fully deployable independently. This is in contrast to a monolithic approach of a single unit as in the case of SCM model in which any changes to the system involves building and deploying a new version of the server-side application.

MCM systems are not limited to use or applications in the Banks alone, the solution can also be applied to a customer interfacing application as in the case of a Customer Insurance System, Customer Care Solutions by the telecommunications companies for telemarketing and resolving customer related enquires and issues and Credit Underwriting application systems.

7. Business Benefits

If implemented correctly, a multi-channel messaging system can deliver unlimited value to the business (banks) and customer. By using an integrated messaging channel approach Banks may derive improved customer relationships and better communication of their brand messages, leading to mutually beneficial outcomes for both parties.

² In accordance with best practices, we have made bank names fictitious to protect their identity

MCM system can allow the Banks to have a consistent brand, product and price promotions sent across to customers using all the channels implemented on the platform. It can also enable the Banks to have a 360-degree view of customers and able to target personalized and targeted promotions using data integration and analysis. Furthermore, the framework for MCM middle-ware services supports the addition of new channels easily with minimal impact on other Channels. On the customer side, MCM benefits include ability for the system to route messages to customers based on urgency and importance, the system can also switch between channels based on preference and interaction levels thereby increasing the efficiency of message delivery.

8. Conclusions

In this paper, we investigated the problems of Single Channel Messaging systems and proposed a conceptual model for the implementation of a Multi-Channel Customer Alert Messaging system. This model introduces a light data-weight exchange interface using JSON that allows the Banks integrate multiple disparate channels using Software Oriented Architecture (SOA) that allows Banks to profile users and message delivery priority. This model can be used by the Banks to implement an MCM Customer Transactional Alert System that supports both transactional alert messages and non-transactional messages by the Banks to their customers. Using the MCM approach the Banks have a robust system that is capable of adapting to newer messaging channels and also able to provide several options to their customers on message delivery. Service offering is key in any business most customers will be delighted to have an option to choose from a bouquet of service offerings.

At a more mature stage of our research, we aim to conduct a pilot run of a prototype implementation of our framework using a case study of a bank in Africa. Lessons learnt from the pilot run will be used to enhance our model and its implementation, whilst motivating new and interesting research challenges in multichannel messaging. In the implementation stage, specific attention will be given to the impact of channel availability for message delivery and trade-off between quality, cost and service negotiation between channels. Another area is in the design for failure when implementing using SOA, the consequence of using services as components must be considered and the design's tolerance for failure of services, service calls could fail due to network or other related issues and client's ability to gracefully respond to service call errors and failures. This is to ensure that the customer has a seamless experience across any of the messaging channels chosen on the Bank's platform for message delivery.

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