# A Responsive Knowledge Management System for Organizational Reuse

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## ABSTRACT

*In this article, a solution-driven model for organization reuse purposes was developed and tested. The model involves a process that would lead to experiential solutions. Some selected literatures were reviewed to elicit processes of knowledge management. The necessity for a model was non-inclusion of collaboration in some literatures reviewed and a need for structured model for knowledge development. A case study approach was adopted. Two firms were observed as case studies. Furthermore, the authors designed an algorithm that would showcase the process of problem and solution activities. The results of the observation included that the case studies were: both identify problems and solutions that will be useful, they dependently and independently rely on each other for information; schedule of work was segmented into unit; they experienced new problems but used old similar solutions as solution and lastly, most problems and solution are partly solved through communication.*

**Keywords:** *Model, Experience, Solution, Process, Case Studies, Knowledge development.*

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## 1. INTRODUCTION

Every problem on earth today is being solved through a solution. Solution-driven approaches are precipitated from full understanding of the problem. Problem emanates from a process directly or indirectly. A clear understanding of a problem and solution gives knowledge [1]. Knowledge is attained if a problem is solved. The reason for this is because processes are involved. Knowledge is attained from a source, whether formal or informal in an organized or unorganized manner, through a process. Knowledge management involves processes/stages such as identification, acquisition or collection, organization or representation, sharing, storage and retrieval. Each of these stages involves people, society, context, and processes [2]. [3] submitted that knowledge management is neither a product itself nor a solution bought on a shelf. It is a process implemented over a period of time which must involve four stages namely: knowledge gathering, knowledge structuring, knowledge refinement and knowledge distribution.

From the opinions of [2] and [3]: it could be deducted that knowledge could only be achieved if and only if an experiential approach is attained, [4]. Knowledge could only be achieved when people are involved, a context is involved and a process and society are actively involved in the creation of knowledge. The processes identified sometimes enable a user to explore his/her inborn knowledge (Tacit) through outermost skills (Explicit) [5].

All over the world and most especially in the field of computer science, the place of knowledge management cannot be omitted. It allows user including companies, industries, and academics to build new approaches, solutions, skills, methods, concepts, innovations and impacts from useful and outdated ones. Practically, the technological world is gradually changing its course to new ones from existing old ones. The only major difference is that knowledge management differs in domain, but the approaches and methods remain the same. The concept of knowledge management has been helpful in knowledge base, retrieval of records and solutions, expert system, reasoning, cognitive development and lots more.

In most organizations in Nigeria today, questions like what can you do? How can you do it? What experience have you got often arise from most interviewers or people who are willing to be part of the organization, customers/clients and even members of the public.

Today, the issue of individual knowledge versus collaborative knowledge which knowledge management permits is a major context in the methodologies used for any objective delivery. This is feasible in sectors like engineering, health, industries, politics and academics; a focus for this article.

The process of knowledge management should be a process that would identify, organise knowledge and then effectively use the knowledge for a competitive advantage. A good knowledge base or knowledge management system has procedural steps of development through a model. Models are an abstraction of realities [6]. [7] stated that a model is not the real world but merely a human construct to help us to understand the real world system. Models in knowledge management system are conceptual types. They are used to connect real world systems and solution paths. Most approaches used by participants in solution processes are not model-driven [8]. A model-driven approach must involve all stakeholders in any boundary before a real-world solution

is designed and implemented. The major objectives of article include: to review some related literatures on knowledge management creation and to develop and apply the model for knowledge management using relics from two related departments.

## 2. REVIEW OF RELATED LITERATURES

One of the models of reusing a knowledge built and stored in knowledge management system is through the use of Case-Based Reasoning (CBR). A CBR, among other models of Knowledge management systems links problems to similar solutions through indexing. The CBR matches and indexes solutions from a source for similar solutions. Most times, the CBR works similarly to what is obtainable in Google (linking past and present similar solutions to a queried problem). [9] posited that a target problem is represented as a new case and then searched in a source case, retrieved similar solution from a close distance in a pool of source cases (similar/stored cases) which are raised by experts before retaining it in a data warehouse (case base).

The $R^5$ model is an extension of $R^4$ model created by [10] as discussed by [9]. The model was used to present the needed steps to be taken in any case-based development, with emphasis on process and sub-processes. The model laid emphases on representing the stages of knowledge management using a target problem and case base as an example. Likewise, [11] developed a Model that solved problems using explicit past documentaries as evidences and solutions. The steps described by [11] states that the problem is inputted first, followed by description of the problem, use the problem as target problem, check historical evidences or cases for possible solution, if it matches, a new case and solution is formed. Both [11] and [9] did not lay emphasis on collaboration or partnership.

We believed that problems are domain based and solutions are of different peculiarities, so, solutions should come from domain of experts with their uniqueness. [12] believed that the process of knowledge creation should evolve through a replacement of existing contents of organizational tacit and explicit knowledge. Their argument was organizational based but it must be submitted that before a complete change of approach or evidence is done, the position of [13] must be considered. [13] believed that a structured validation must be done and coopted by experts in that field or domain before accepting the solution as a right solution. The Value

Chain developed by [13] answers all questions that may arise on '*the right solution.*'

They believed that developers must determine the strategy and policies to solving a problem, determine the type of knowledge needed to solve the problem, share knowledge on the problem and then, apply the knowledge shared. These stages were grouped into four stages, namely: *determine strategy, determine knowledge, share knowledge and apply knowledge*. Furthermore, [22] used design software known as *Product Lifecycle Management System (PLMS)* to capture knowledge and its usage for engineering purposes. This software, according Hugh was used as a tool to overcome loss of information and recovery tool. Hugh opined that the implementation involved in communication among staff which includes sharing of information via electronic memoranda, emails, proposals and the likes can be created with a tool called Oracle Collaboration Suites.

In his explanation, Hugh gave a distinct explanation of how knowledge can be created, the first approach being *identification of knowledge structure, data form and processes.* Moreso, [14] used Small and Medium-Sized Enterprises (SMEs) in Iceland to investigate the strategies of relating to customers between two companies: Company Alfa and Company Beta (as computed). They used Case Studies presented in the form of semi-structured interviews with managers and some selected employers to elicit responses. According to [15] in [14], the process of knowledge creation is in three classes. These classes corroborate the idea of [22], who identified identification of knowledge as the first step of knowledge creation. As seen in SMEs, the process of identifying knowledge is in hierarchy, classification of duties, relationship and communication ([16], [17] in [14]).

Also, [18] defined knowledge itself as a resource that makes a successful company. [18] used knowledge to investigate how knowledge is shared or used in a Supply Chain Enterprise. Arguably, for any development process in knowledge management, one can not overlook the importance of collaboration and relationship as they help grow fruitful deliberations that yield results, innovations and objectives monitoring. [19] revealed that a knowledge management can be used for solving organizational problems through an architectural layout which includes processes, people, objectives and data analysis. Just as [5] explained, a good knowledge management is a process that has four stages: socialization, externalization, collaboration and internalization. [19] Opinion that a

knowledge management is a process corroborates that of [5]. From the views of different literates discussed, it could be deduced that a major advantage of knowledge management in any organization having used a model and tool for actualization is that it results to intellectual capital [23], implementation of objectives [24] and collaboration [20].

## 3. THE RKMS MODEL IN DISCOURSE

The RKMS stands for *Responsive Knowledge Management System* Model. A model is responsive if it has the ability to recognize the need for change and to effect the change in an effective manner [21]. In knowledge management, just like [21] listed, the model that would be used must interact with three components; the drivers (the things that bring about a change); course elements (things that can be changed) and the team (agents to mediate the change). Why the Responsive Knowledge Management System (RKMS) Model? The RKMS stands for *Responsive Knowledge Management System Model.* It is responsive because it involves a timely, feedback approach of proffering solutions to target problems or problems from one end to another. Also, it would instil the act of extensive discussions among literates and experts who are saddled with the responsibilities of proffering solutions to problems. Further, it supports collaboration among experts who validate every purported, supported and unsupported solutions through an agreed metric or metrics.

The RKMS would be known for its robustness in critique and constructiveness in solution-driven activity among experts especially when it comes to providing solutions to new problems. It is believed that a new problem may be an old problem for an expert while it may be relatively unknown to another expert. We designed four stages for the model, namely: problem searching stage, matching/indexing stage, collaboration stage and acquisition stage. The problem searching stage is a stage where a user looks for the latest workable solution or solutions to a target problem. In an organization for instance, the target problem may be a process involved in getting a technical work done, it could a software update or reuse, it could be an application problems, a document-based problems and the likes.

At this stage, a user may intend to find out more solutions or new solutions to any of the problems identified. A problem may be identified and represented either with an Entity Relationship diagram (E-R) or with the use of

Ontology. Most E-R diagram is used to represent information structure using entities, attributes and relationship. The Ontology software e.g. Protégé is used to show class, subclass, domain and characteristics of identified solution or problem. The second stage of the Model is Matching/Indexing stage. A problem will be weighed with similar problem with similar weight; an old solution's weight will be weighed with new solution's weight. The indexing style follow the D Algorithm discussed below. The third and last stage is collaborative and acquisition stage. These stages are for experts and users; it could be for experts and experts too. They discussed and provide technical solutions to technical problems.

### 3.1 'D' Algorithm for RKMS
*Match target problem to a pack of solutions (Case Base)*
*Where*

$$T=Target\ problem$$
$$M=Matching$$
$$S=Solution$$
$$B=Case\ Base$$
$$C=Collaboration$$
$$N=New\ Solution$$

$S \leq B\ \forall T\ where\ S \rightarrow B;\ N := T = S < B$

$where\ S \rightarrow C;\ N := T \geq S \geq B \leq C$

### 3.2 Explanation of 'D' Algorithm
The D algorithm stands for *Discussions to Yield Solution Algorithm.* It was adapted from [20]. The algorithm was deployed to produce solutions from experts to be stored in a data warehouse (Case Base) where a solution to a target problem is not seen. The Algorithm follows the principles of matching a problem in a solution base. Else, it is discussed by experts.

T represents Target problem
M= Matching
S= solution
B= Case Base

Technically,    *For Matched Solution*
   N := T = S < B…………………………Solution
Pathway 1
*For Collaborated Solution*
N := T ≥ S ≥ B ≤ C…………………………..Solution
Pathway 2

## 4. A COMPARATIVE STUDY BETWEEN ICT OYSCATECH SOLUTIONS AND ROUTEL SOLUTIONS CONSULT LTD: AN APPLICATION OF RKMS MODEL.

The Information Communication and Technology Unit of Oyo State College of Agriculture and Technology, Igboora had been an integral part of the college. This unit is saddled with the responsibilities of providing internet oriented needs or resources for staff, students and other external users. The unit relies heavily on her available resources such as networked computers, a very large internet service provider and security facilities. The unit has over 350 computers, Ethernet facilities, intranet and extranet facilities, a mast and other ICT enabled facilities. The mode of operation here is such that an up-down approach system of administration is used. For instance, information disseminates from the Rector to the lowest in cadre officer.

The head of the unit is a director and in that hierarchy. The unit acquires information from the registry (as being observed) through memos, official calls, mails and physical method of passing information. Mostly, the unit solves staff, students and external problems. The problems are in this order: registration and course form, payment, transcripts, clearance, staff update and Joint Admission Matriculation Board issues (such as connection to Abuja server, electronic security/monitoring). The method of addressing these problems is done through a process. The process includes the following: troubleshooting, case notes, updating and collaboration.

The troubleshooting process includes the following:
1. An official complaint/technical issues
2. Verifying the source of the problem
3. Check for infrastructural disorder/facilities breakdown
4. Check error reports/ discuss errors
5. Check for similar problems from case notes (daily reports)
6. Check for similar solutions
7. Apply solutions

The case note method is a direct application of solution. The ICT personnel simply checks daily report of activities done in the past. This is a document that contains past event in the unit. The OYSCATECH unit has several

units. These units work independently and dependently. For instance, there is a complaint office, payment office, server room, technical room and a laboratory. These units have diverse and different responsibilities but they interact to achieve a common goal. Each unit writes its own report on daily basis. These are evidence of daily occurrences and records can be traced for reusable purposes. The technical unit is saddled with the responsibility of updating daily records and events in the central data warehouse or database. From here, required information could be retrieved.

The collaboration unit relates with the college department, JAMB and other resource unit outside the college or ICT partners. One of such partners is Routel Solutions Consult Limited, Ibadan. Routel Solutions Consult Limited is an indigenous, independent private ICT firm in Ibadan. This firm is headed by Felix Omotayo Fapohunda, a graduate of Ladoke Akintola University of Technology, Ogbomoso. This company had been in existence for the past 17 years [25]). The company provides CP/IP applications, ranging from Network setup, routing, to IP applications, Internet Service Provision, IP Telephony, VOIP, IP Paging system, IP Surveillance System, and host of other applications have been handled for Individuals, Corporate, and Government agencies [25].

The method adopted by the company is a direct contact with her client to solve challenges through questioning, observation and hand-on experience. The two identified case studies use the process of engagement to solve identified problems. Firstly, they identified problems, identified the processes that may be involved, discuss problems which partly analyzes a problem and partly solves it, discuss/identify facilities that will be used, identify the people that will be involved and not forgetting, they take note for reusable purposes. They also have similar hierarchy; the only difference is that one is private while the other is public. The two firms have a documentary of all occurrences either independent of any activities done together.

## 5. DISCUSSION

The process of developing a knowledge management for reusable purposes involves many processes. These processes include identification, selection, application and documentation. The process of knowledge developed and applied for one problem could be used for other related problems. Most importantly, these processes evolved from a collaborated effort between a unit, department and partners for a generalized solution. These processes are activity-like events or occurrences that must be documented for application in the nearest future.

## 6. CONCLUSION

In this article, we engineered a responsive model that could be used to reuse knowledge developed through a process and which had been developed using adapts from Case-Based Reasoning Techniques. Related technical works were reviewed on the premise to solving a problem encountered in any organization. A firm and a department were used as case studies. An observation method was employed to observe the approach taken to solve identified problems. The model developed was used to elicit the process of problem solving and how the knowledge gotten out of the processes was developed and stored.

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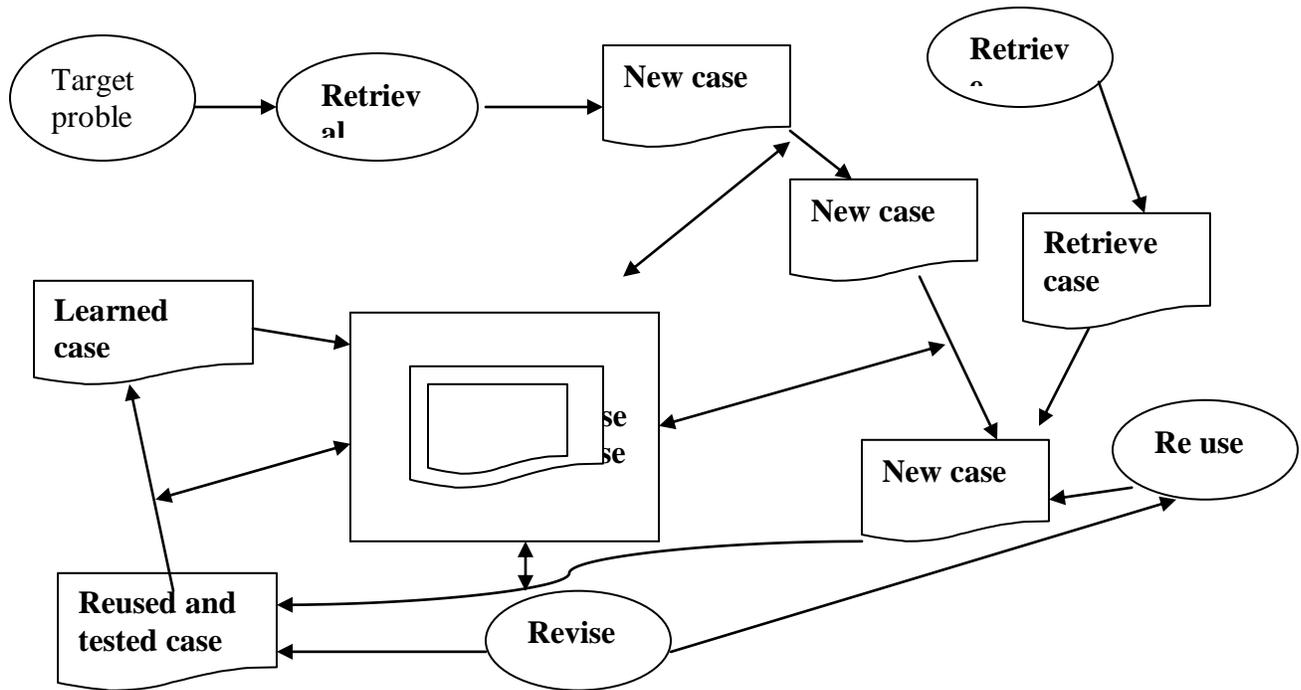
Figure 1. *R$^5$ CBR Cycle*. [Adapted from Negny, Riesco and Le Lann 2010].

**Experts Discussion**

**Searches for knowledge on a**

**Problem**

**Ma** **Index**

**Retrieva l Stage**

**Acquisiti on Stage**

**Solution not found**

**Data Warehouse**

**Sends solutio** **warehouse as**

**Validation/Representati**

**Experts' Collaborated solutions**