

AN INNOVATIVE APPROACH TO BANKING INFORMATION TECHNOLOGY: AN IDEF ANALYSIS

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ABSTRACT

This research paper attempts to accomplish a comprehensive investigation on Banks in particular and financial institutions in general which take far-reaching advantage of information technology however, these financial institutions are risk-avoiding and reluctant to innovative information technology adaptation. Therefore, they are sluggish to accept new technological innovations for implementation in financial systems. This research paper discovers how the IEDF model of object oriented investigation and design can be utilized to strengthen, secure, faster and smoothing the financial institutions and banking by utilizing information technology. In addition, similarities and resemblances are recognized among the diverse financial instruments which are utilized by financial intuitions & banks and then to explore these comparisons in a proposal for an object oriented approach to banking information Technology. This study shows how this transition can be utilized flawlessly for adopting the new information technology in financial intuitions and its vital modules at a minimum business risk.

Keywords: Bank, Financial Instruments & Tools, Information Technology, Object Oriented Analysis & Design (IDEF), Perceived Risk, Technology Acceptance

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1. INTRODUCTION

Financial institutions such as banks is a business of confidence assurance and information. To be successful, It is the prime responsibility of the financial institutions to accomplish both functions accurately (Centeno, 2004).

Financial institutions as an outcome of integrated users of information technology to preserve their sensitive clientage information and they are making use of such resources since long (David Clark, 2014). Although banks are very sensitive about their customer satisfaction and they avoid to take the risk of losing customers trust. Therefore, they mitigate risk free information technology (Sainsbury, 1993). It makes them less welcoming to new regime and they prefer to use the authenticated old technology although old technology has many drawbacks (Carolina Martins, 2014). This is the reason why financial institution are much hesitant to adopt new information technology as compared to other trade sectors (Stair Ralph M 2014). This paper reveals that the research has main focus on banks although it is also applicable to other financial institutions as well (Oluwagbemi Oluwatolani, 2011).

The focus of this paper is to explore the new horizons based upon the objected oriented analysis and design (IDEF) to facilitate the banking information technology (Sabah Abdullah Al-Somali, 2009). As the different parts of banking information technology apply the same foundation, so it is vital to find out the similarity among the financial tools used by banks to grasp the matter (F Losavio, 2003). Subsequently, proposing a more robust approach to make an improved information system significantly and these similarities can be used effectively (Jacobson, 1994). It seems more feasible to first review the present scenario prevailing in banking industry (Payam Hanafizadeh, 2014). So, three approaches will be presented which can be utilized in different mixtures to address broad domain of financial tools (Wiener, 1996). Later these three original proposed approaches can be used to make new information system based on object oriented design (Sainsbury, 1993). Finally we will discuss the banking transition planning keeping in view the non-tolerance to risk bearing (Normalini, 2012). It will also explore how the banking risk aversion policy affects the object oriented design (Irwin Brown, 2003).

2. Existing Scenario

At present mainframe computer are used to run banking legacy applications to support banking operations (Mohammadi, 2015). Traditionally, these legacy application systems support only

specific banking tool. Accordingly, separate legacy systems need dedicated main frame that are required for every application (Mentzas, 1997). To present a cumulative picture of a transaction, extra systems are used which manipulate the information from every legacy application. Because each mainframe computer is dedicated to a specific legacy application which is by tradition backed by a specific reserved information system when bank desires to introduce a new banking tool, at that point it has to create new information system and mainframe computer (Fethi Calisir, 2008). In response to the current nature of banking tools, everything is necessary to be created from scratch. Fresh coding is written for data structuring specifically and already known similarity in banking tools cannot be used expressively. The main reason not to use already written code is the absence of integration in banking tools although majority of tools share the great extent of similarity.

At present, there are financial institutions which are trying to resolve this drawback through dedicated projects separate from normal technology which is effectively in practice in this current scenario. Some banks developed a computer interface which expedite transactions by producing a combined interface of applications in one place based on object oriented design approach (Townsend, 1998). The drawback of this strategy is that each financial tool is still being managed on separate system and mainframe but it is presented to the user in a single integrated interface. Although this integration allow the bank to check the mutual link between all type of accounts of a client. On contrarily, the information system developed under original object oriented approach makes the bank capable more responsive to the newly developed financial tools (Wiener, 1996). The information system build on the perspective of object oriented approach permits the less expenditure for future banking tools (F Losavio, 2003).

3. Review Of Financial Tools

By analyzing the banks scenario, financial tools are involved in generating cash flows which reveals that these tools should be explained and reviewed by these banking CF tools. There are many types of financial tools based upon their nature of functioning. The cash flow of one tool is already known upon the event of its creation e.g. deposit certificate. While, on the other hand cash flow is unpredictable e.g. saving account because the varying amount of deposits which are completely unpredictable (Handa, 2004). But still later group have some uniformity

regarding its cash flows because its fraction obey some rules e.g. profit rule on saving account is predefined and thus it is always calculated on the basis of this formula(Olaisen, 2012). It's one part is unknown i.e. the amount that the customer will deposit during a certain time period but its other part i.e. interest rate is known. On the other hand, there are such tools whose cash flow is completely undetermined e.g. stock dividend because it depends upon the overall performance of the bank.

The amount available in the account is also responsible for cash flow which is also based on some fixed rules e.g. lump sum amount deposited for a specific time period during which it will not be withdrawn. So, in this context the future cash flows are predictable given that there will be no cancellation of the facility before its expiry.

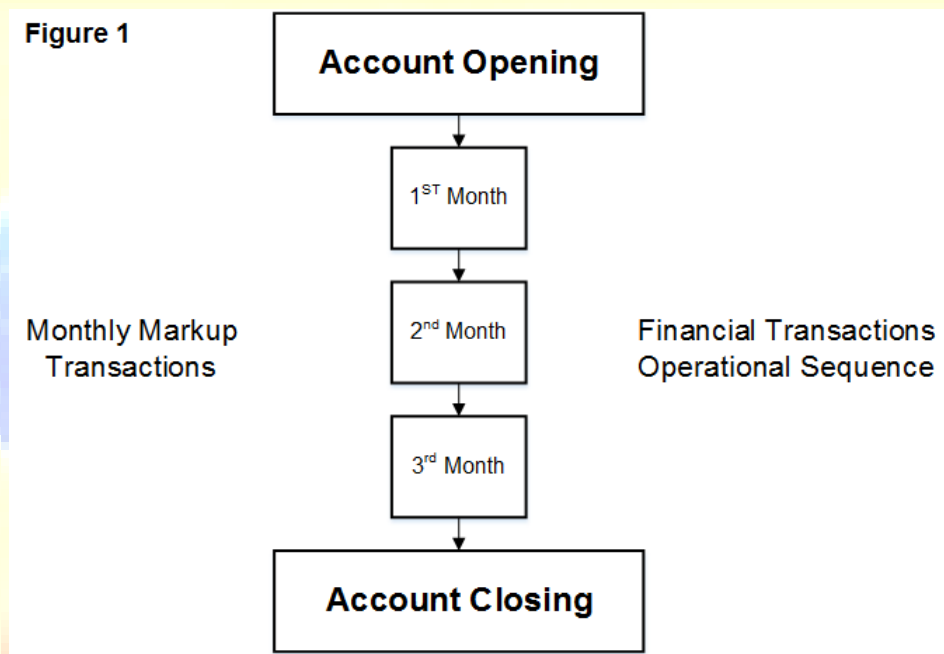
All financial instruments should be capable to track the record of all past cash flow and can predict future expected cash flows. Banks should be able to forecast and compare all these cash flows for decision making on entire investments of the bank. Regarding decision making of management of concerned bank, different types of statement are needed which should analyze and synthesize the past and future cash flow. Furthermore, it should also subdivide main cash flows on subcategories for more clarity to define what factor is critical and more affecting the main cash flow. Based upon the discussed context, we can propose the construction of information system focused on three major parameters; cash flow, series and instruments (A. Martin, 2014).

Cash Flow:

Cash flow is generated by financial transactions and it is used to transfer within accounts. This is the typically accounting definition of cash flow which is always posted in two accounts with the same amount thus always be in balance. Suppose, the amount deposited is for saving purpose then it means that this cash flow involves auxiliary accounts, means there will be one account in general ledger and the other auxiliary account will be for profit payment(Ying-Ju Tsaia, 2014). All cash flows possess an originating and destination accounts and all cash flows must be marked in terms of currency and amount(Dahl, 2012).

Cash Deposit Operational Sequence of Account

In the Figure 1, cash flow is depicted by arrows. First arrow at the upper left corner represents the opening of the account by the client. Typically this is a saving account so, it is generating the cash flow due to the monthly addition of interest. The direction of the arrow shows the direction of the cash flow. Therefore, it is showing that cash is deposited by the client and subsequently bank is performing additions due to the monthly interest accrual. Finally by adjusting all the outstanding payable liabilities, these available surplus amounts can be withdrawn by the client.



Based on date, all cash flow possess three date structure; first cash flow generation date; second cash flow due date and third is cash flow actual date. The first date type is generation date which is the date when accrued interest amount is calculated. The second is due date which is date type when cash flow is planned to occur. Thento conclude is actual date which is the date type when cash flow actually happened. Here we examine the cash flow due to activity of a banking tool in which monthly interest payment date is 30th of each month and thus in each month there will be two types of cash flow. The first cash flow cover the period from 20th to the end of the month and second will cover the period from first of month to 20th of the month. In the earlier, the generation date will be the last day of the month. The due and actual date would be 20th of the month. In the second scenario all three types of date would be counted as 20th date.

In practice, due and actual date always remains the same at whatever time bank wants to generate cash flow. Sometimes, the cash flow is generated due to the customer's activity which changes the pattern. For example, customer delays the payment of interest on the specified date then the customer will also pay an additional amount as a fine imposed by the bank's regulations. Sometime, customer pays the principle amount because the customer wants to redeem the debt so in this scenario, the date's pattern would be changed accordingly.

Series: In banking, there are circumstances when some cash flow is happening on predetermined calculations on regular or irregular basis which is called as series. Such cash flows have uniformity and similarity in occurrence based on time period and further have the same formula. Banking financial tools have certain way of functioning by following special regulations which always generate the same outputs and thus such cash flow is denoted by series.

One example of series is accrual of monthly interest payment because customer has to pay on monthly basis and its calculation is also based on a predefined formula. By analyzing this, we know that number of days every month are counted on the same pattern and interest rate is also accruing on the basis of fixed formula. Therefore, this is a typical example of a series. Banks have the regulations that customer will maintain a minimum balances in their account otherwise customer have to pay a fee called as service charges which is also example of series because this is the fixed same amount. There are many types of series e.g. when an account is opened or closed, it also generates cash flow series although its occurrence is only once. Because whenever account is opened, customer has to pay minimum account opening deposit and when account is closed then it should be relinquished. Figure 1 also represents three types of cash flow series i.e. cash flow which is incurred due to the account opening activity, the cash flow due to the markup payment by customer and the cash flow happened due to repayments.

Instruments: There are certain responsibilities regarding the cash flows between the bank and clients and when these responsibilities are officially mutually consented then this process is called instruments. Instruments clarify the responsibilities binding on each party and it can also involve a group acting as a single entity. The expected cash flow occurring on the basis of this

agreement, includes all possible cash flows e.g. markup and principal amount. As in the banking business, the bank is a money lending institution and in return it is assumed that client will pay the mutually agreed interest on a specific time interval. It is also expected that client will repay the principal amount on a specified time. On the foundation of this lending instrument, bank is awarded the right to debit or credit the customer bank account based on some rules and regulations.

There are plenty of these financial tools and they have the varying nature depending upon the factors such as; total principal amount granted to the customer; the extent of markup and the method of its calculation; the way of principal amount awarded and repaid and the collateral offered by the customer to the bank and so on. There are some major types of financial instruments in which each confer the special right at each party end e.g. current deposit account, saving bank account and certificate of deposit etc. Financial instruments include many types of series and every series is composed on many cash flows. As Figure 1 is already discussed which is basically a Cash Deposit (CD) account and it comprises on three types of series; initial deposit necessary to open the account; monthly payments of markup incurred and this amount is treated on different ways depending upon the nature of the CD account; and finally the withdrawal of amount from CD account.

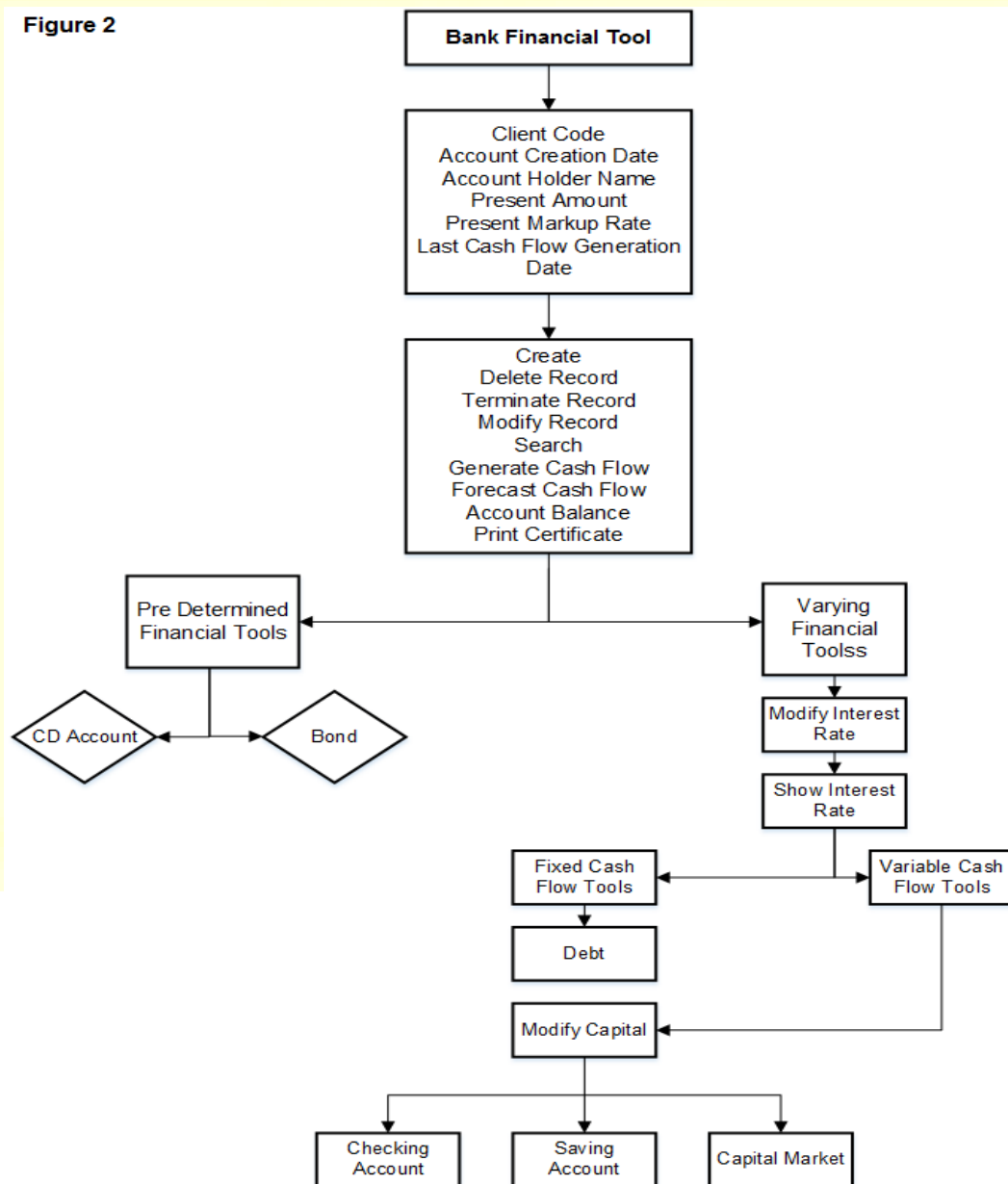
There is also another example of saving account. This type of account have some similarities with the CD account in terms of its operations but it is different significantly. Saving account has four cash flow series in which two have the exact matching behavior as CD which are initial deposit series for account opening and account closing withdrawal series. Then the markup payment series which although has some similarity with CD but it is not exactly the same. Because monthly markup is calculated on the average balance of the account which commonly fluctuates throughout the month. In addition, there is also expected a cash flow series due to any penalty imposed by the bank or account balance showing below the minimum balance requirement.

These are the examples of some financial tools and their general behaviors but here it is not possible to express all the operational sequence of these financial tools. Furthermore, it is also

not permissible to apply these constructs to all banking tools because it is about the general mode of transactions of financial tools to develop a common consensus of the banking operations.

4. Object Oriented Analysis and Design

Now we have find out the original components of any banking tool which are commontherefore, we can utilize this system of information to make an object oriented system for bank to effectively manage its operations. For the diagram, we will use the Yourdon & Coad's Object Oriented Analysis and Design (OOA/OOD) notation (A. Martin, 2014).



In Figure 2, we showed the hierarchical setup of the Financial Banking Tools by the use of Generalization Specialization (Gen-Spec) Relationships. Lower level classes and objects are inheriting the characteristics and attributes from the higher level classes which are also objects and classes. As it reflects in the diagram, this is the universal banking instruments which carries all the common attributes and methods and thus can be used for generalization. The specific attributes are essential elements and vital components for a financial tool to function properly whose absence make it impossible to execute the function perfectly. For example, in banking sector, the common such attributes are client account number, account opening date, interest rate on loan and customer special code etc. There are also some financial instruments which have some additional attributes that are not common e.g. minimum deposit required in saving account to waive the monthly penalty.

There are many banking tools which have the similar way of action but their execution environments are entirely different. In this object oriented approach, they will be given the same name for uniformity and centralizations. To address the challenging and changing environment of each tool, such method will also be redefined at the lower level to tackle their local level requirements. Here is an example of current deposit account which is created by the specific data which will not be the same exactly as the data required for creation of saving account although there will be a lot of similarities but still some data is different. This is because some attributes are only needed for current account which are not required for saving account at all. Each financial instrument has its functioning parameters which is called as its operations and these operations depend upon the formulae which are integral part of the tool.

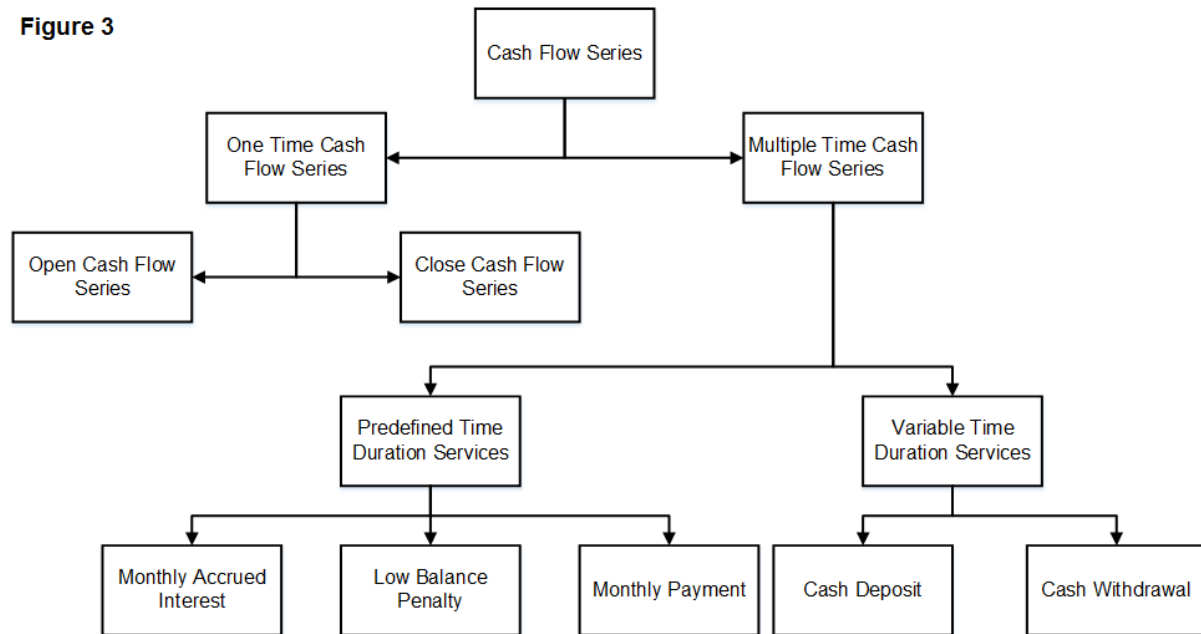
Generally, fundamental operations of a tool is to create, delete, search, terminate, generate cash flow, balance inquiry, generate print and forecast expected cash flow. The mentioned attributes perform their respective assigned operations as it is clear by the name e.g. create means to create record; modify means to modify an earlier created record. Some operations are a little bit complex e.g. delete means to delete an error and it will be carried out in the light of the principles of accounting; cash flow generate is the process of calling a series action to create a due cash flow; and forecasting cash flow is same as generate cash flow expect that it will not

entered in the cash flow database. Balance will show the balance of the account and print will print the desired certificate.

The behavior of some financial tools is determined at the time of their creation, and on the other hand, the behavior of some tools fluctuate from time to time thus unpredictable. More precisely, the operational parameters of CD account and Bond accounts are completely known and fixed and the time of their generation which remained same except in special exceptional circumstances. On contrarily of the above, there are some tools whose behavior can be fixed at the time of their creation e.g. saving account because they undergo several unpredictable spontaneous changes. Saving account interest rate is in use to fluctuate from one financial period to another and its account balance is also used to change for the reason that the cash withdrawal is by the client. Hence, in this scenario some additional financial tools also needed to handle these situations.

Although financial tools have volatile behavior but still there is similarity which can follow the procedure to make subclasses for a perfect objected oriented design. Some tools has repetitive cash flow transactions at a fixed time interval but the amount of transactions cannot be fixed and thus this behavior also qualify for series terminology. This is more comprehensible by loan account whose payments dates are fixed at the time of loan awarded to client but the interest amount is not predictable because it depends upon the varying factors of interest rate. This similar methodology is also applicable to the saving account thus it is feasible to make groups of such changing behavior financial tool which has at least some similarity and resemblance. Such accounts have varying markup rates and predetermined repayment date but still account debiting and crediting by customer is not fixed. To address such issues, additional methods are also compulsory, particularly for customer's end debits and credits.

Figure 3



In Figure 3, Generalization Specialization (Gen-Spec) Relationships is applied for highlighting an object class “series”. Series is the one pivotal basic component in banking and its effects are already discussed. For the measurement of cash flow in series, formulae are required for volume of the cash flow to be measured. As it is already discussed that series are involved everywhere in banking transactions. For the measurement of magnitude of the cash flow for series object class, a formula will be compulsory; and for the due date calculation, a separate formula will also be required. In this context, both formula will be different significantly and the both formula will be available in the whole construct of object oriented design. This depicts in this object oriented approach, when one formula is defined then it will be applied and utilized globally and it will not be necessary to define it again as it is prevailing in existing methodology (Egwali, 2010). For the calculation of monthly markup series for CD account, this formula is applied ($CD\ Interest = Days\ of\ the\ month * Interest\ Rate * Principal\ Amount / 360$). This proposed banking information technology design is based on object oriented approach and it will also include two object classes called as Account Holder Name and Cash Flow (Linda K., 1990). The object class Account Holder Name also have subclasses such as Trust rating, Corporate or Individual account.

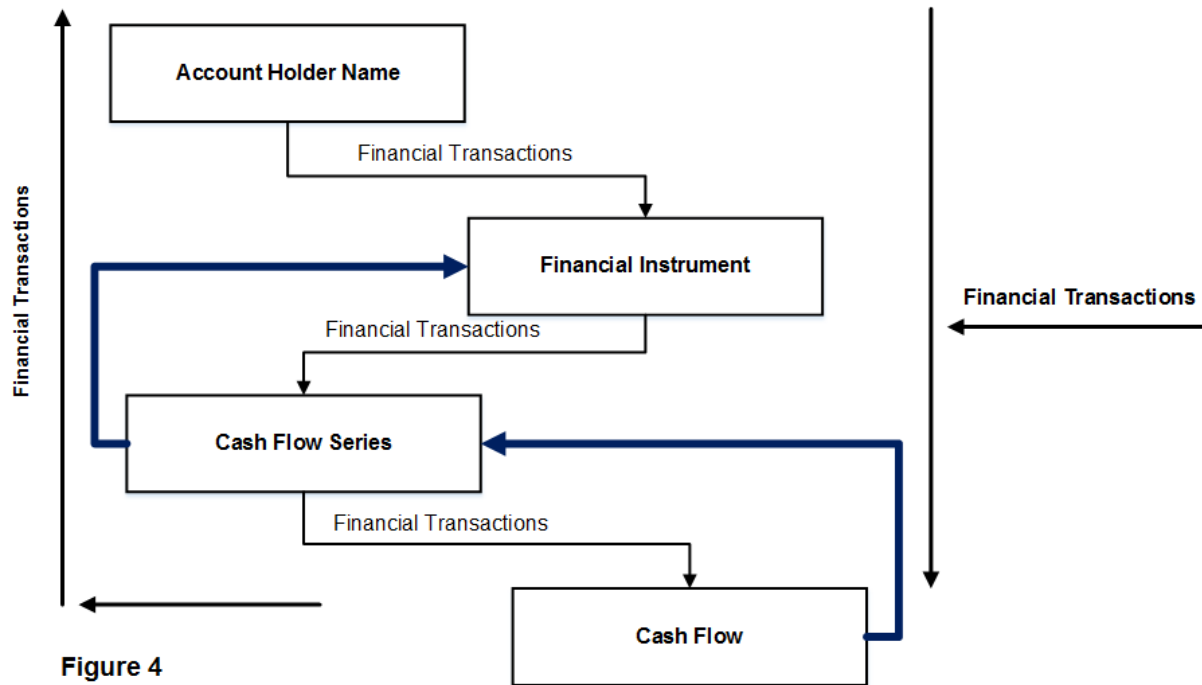


Figure 4

To reflect the interrelationship of four fundamental construct object classes, Figure 4 has been drawn. The account holder owner object class is interlinked with banking financial instrument by engaging several instance association linkage. While this is the most likely to happen that many account holders have many banking instruments and may be each instrument is owned by many entities. In this entire part setup, Banking Financial instrument is getting the preference on all other object classes whereas banking instrument is an assembly of various expected series. Every series is also the sum of various expected cash flows.

This approach also shows the service linkage between these objects. Interest calculation is a vital element for banking system and is shown in this diagram because at the month end, system will have to calculate the interest payable for the eligible accounts. Consequently, for fulfilling this purpose, calculation of interest technique will be initiated on the instrument. Then the tool will invoke advance time procedure on the relevant series which is the month end interest series. Afterwards, the object class series will generate a signal to cash flow object for the creation of required cash flow.

This new proposed object oriented design will streamline the process of providing the required data for running banking instruments more efficiently and centrally (Al-Ahmad, 2006). As discussed earlier, presently banking information system is scattered which is the cause of many financial and functional burden but this new object oriented approach will remove these obstacles. State of the art computer hardware is available and can accommodate this construct easily. In this design, new banking instruments can be introduced very easily with less computer coding. New instrument will utilize its inherited attributes and then there will be need just to create its links with series and cash flows which are already defined.

5. Shifting Planning To New Regime

As it is obvious that object oriented design is a strong technique to build banking information technology. But banking business is a business of trust and confidence and this is the major reason that banks are hesitant and reluctant for applying new techniques because banks cannot afford to shut down their business even for a single day. Plenty of new resources will be essential to new regime e.g. staff training and financial resources.

Therefore, it is obvious that banks are extremely vigilant for choosing new information system to minimize their risk level, they should select shifting approach from old to new methodology (Webster, 2003). After the shifting time, bank will completely shift on new information technology. Instead of replacing its all old systems at once, bank can replace them one by one. During the shifting time, any transaction which will generate any type of financial effect will also create the same effect on each old and new system. This will be done by the linkage of both old and new information systems to make bank capable to check the new system safely. During this trial time period, bank can check the efficiency of new information system as well.

6. CONCLUSIONS

Although, shifting to the new information system is risky but bank can get a competitive edge over its competitor because new information system will provide faster and more effectiveness which is not available in the old systems (F Losavio, 2003) Adopting new financial instruments

will be more rapid and maintenance of this new centralized system will be more easily instead of old scattered system(Peter Coad, 1990).

It will be more permissible for banks to start specialized projects for this object oriented design within their resources(Al-Ahmad, 2006). In this situation, the bank will be more the diversified and it will develop more complex system to address all its financial transactions. The banks which develop this system earlier will have more competitive edge and other competitors in the market place and those banks who will delay it, they have to face loss in the long run(S. Phongthanapanich, 2006).

Such mega projects will take many years to mature therefore, bank should have patience to wait because its development and implementation is not possible within months. Bank's higher management strong support will be mandatory to make it applicable.

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