Development of Reward Mechanism for Proxy Marketers Engaged in E-Commerce Platforms

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Abstract—A reward model/mechanism for proxy marketer-based e-commerce/e-shopping system was developed in this work. The system comprised of two modules, the shopping module which has an online shop and virtual warehouse; and the reward module. The online shop and virtual warehouse are used to manage the products on the e-commerce system, the reward mechanism is used to manage the reward paid to the proxy marketer. Proxy marketers have been introduced into online shopping to extend their market reach and increase their market share. The proxy marketers are organized in a unilevel multilevel market structure. The work offers three types of rewards: transaction reward which is paid to three generations from the proxy marketer who made the transaction; trust reward which is based on the trustworthiness rating of proxy marketer for a transaction; and turnover reward which is paid for transaction that is up to the amount stipulated for the reward. The various levels of reward were designed to total fifty percent of the profit made per transaction in order to attain sustainability of the network. The work proves that with a sustainable reward mechanism, proxy marketers can be incorporated into an e-commerce platform in a way that better the profitability of such e-commerce platforms as compared to standalone e-shopping ones.

Index Terms—Reward Mechanism; Proxy Marketers.

I. INTRODUCTION

In recent years, there has been widespread adoption of internet across the globe and in respect of this other technologies and applications have equally emerged particularly, e-commerce platforms and e-transactions. Some e-commerce platforms also have their offline shops to extend their market reach. There is still a limit to their online-offline reach because their offline approach presently involves franchise shops and to set this up some infrastructure is needed. In other to fast-track the widespread of e-commerce market reach, proxy marketers are introduced. The proxy marketers do not need infrastructure except for their internet access to access the online platform or offline platform.

The e-commerce-proxy marketer synergy relies on the formation of cooperative social networks among members who play the multiple roles of product consumers, sellers and distributors all at the same time [1]. Expanding such networks, recruitment of newer members, otherwise called downlines, is needed. To facilitate this recruitment, a reward is offered for each successful referral of the product to other prospective buyers. Furthermore, to encourage potential customers to buy and to give referrals to influential people, indirect referrals – a direct referral linked to the buyer through other direct referrals are also rewarded [2].

In a unilevel Multilevel Marketing (MLM), there is no limit to the total number of recruits that can be managed by a member and these recruits (marketers the marketer brought into the market network) can be positioned as immediate downlines in one and the same level. A participant’s reward depends not only on his own contribution; but also on the contributions made by his referrals/down lines. The reward mechanism of an MLM scheme affects the distribution of rewards, growth, sustainability and profitability of the system [3]. Regarding an MLM network growth/expansion, consideration of too many levels/generations for indirect profit from a particular transaction will keep some marketers unmotivated to source for more recruits. In scenarios like this, the network can keep expanding no doubt, but with increasing overhead on reward and lower profit. Ultimately, the network rapidly approaches unsustainability, a point where rewards can no longer accompany transactions.

There is also the concern of that the use of the reward system for proxy marketers, otherwise advantageous, can at the end of the day create either of two negatives: a situation where a network-incorporated online shop makes less profit than one without because the reward cost eclipses increase brought on by use of proxy marketers; or a case where products are well above market value to compensate for the overhead of proxy marketers, consequently driving down patronage. Therefore, this paper focuses on the careful modeling of reward mechanism that will ensure MLM network expansion by setting a reasonable limit on indirect reward beneficiaries; and prove comparative advantage of incorporating proxy marketers onto an e-commerce platform by computing rewards based on profit generated by the proxy marketers alone.

II. REVIEW OF RELATED LITERATURE

In [4] the possibilities and limitations of Incentive Trees was investigated using an axiomatic approach by describing a set of desirable properties that an Incentive Tree mechanism must satisfy. An Incentive Tree mechanism is an algorithm that determines the structure of the solicitation tree, and also the amount of reward each participant receives based on all the participants’ contributions. The sum of rewards paid by the mechanism to all participants is linear in the sum of their total contribution. This work also presented a mutual incompatibility result which proved that there is no Incentive Tree mechanism that simultaneously achieves all the properties of an Incentive Tree mechanism. Furthermore, two novel families of Incentive Tree mechanisms were
presented. The first family of mechanisms failed to protect against a strong form of multi-identity attack, but achieved all other desirable properties; the second set of mechanisms failed to give participants the opportunity to achieve unbounded reward but achieved all other properties, with the strong multi-identity protection inclusive. Given the impossibility result, these two mechanisms were effectively the best they hoped for. Finally, their model and results generalize recent studies on multi-level marketing mechanisms.

In [5] is reported the physical examination of the internet’s ability for social mobilization. The Defense Advanced Research Projects Agency (DARPA) organized the DARPA Network Challenge. In the challenge, competing teams were asked to locate 10 red weather balloons placed at locations around the continental United States. Using a recursive incentive mechanism, the Massachusetts Institute of technology (MIT) team was able to find all 10 balloons in less than 9 hours, thus winning the Challenge by both spreading information about the task and incentivizing individuals to act. Next, the theoretical and practical properties of this mechanism were analyzed and compared with other approaches.

The mechanism’s success can be attributed to its ability to provide incentives for individuals to both reports on found balloon locations and at the same time participating in the dissemination of information about the cause. When an individual finds a balloon, the individual can either report the balloon to us, to other teams, or attempt to find the other nine balloons and win the DARPA prize directly. In practice, it is unlikely for an unprepared individual to find other balloons (and if they replicated our mechanism, their delayed start would always leave them behind). This work’s results were based on limited and predictable number of reward beneficiaries, but more accurately speaking the number of transactions and growth of a multilevel marketing network are not limited. With this sustainably rewarding marketers becomes a problem.

Analyzed in [6] are two types of MLM network architectures—the unilevel and binary, in terms of growth behavior and earning potential among members. It was shown that network growth decelerates after reaching a size threshold, which is different to the claims of unrestricted growth by MLM recruiters. The work also found that the earning potential in binary MLM’s obey the Pareto “80–20” rule. This implies an earning opportunity that is strongly biased against the most recent members. On the other hand, the unilevel MLM do not exhibit the Pareto earning distribution and earning potential is independent of a member’s position in the network. Their analytical results agree well with field data taken from real-world MLM’s in the Philippines. The authors presented the analysis as generally valid and can be applied to other MLM architectures.

III. RESEARCH METHODOLOGY

The reward model for proxy marketer-based e-commerce system developed in this work incorporates and manages proxy marketers on an e-commerce platform. The reward model computes the reward for the proxy marketers. The Iterative Development Model was adopted for the development of the reward model for proxy marketer-based e-commerce system. The development involved—requirement engineering, designing, coding and testing. Each unit level of development produces an increment.

A. Requirements Engineering

The requirements engineering functions that were conducted include: requirements elicitation, requirements analysis, requirements specification and requirements validation. Fig. 1 shows the requirements engineering process model used.

In elicitation, requirements sources were: the operational environment, the organizational environment and the stakeholders. The operational environment which the requirements were derived from is Uyo metropolis in Nigeria. The organizational environment which the system supports is a multilevel market. This involves proxy marketers who refer other proxy marketer and so on forming different networks whereby they get rewarded for the transactions made. From the operational environment and the organizational environment, the stakeholders were gotten which are: e-commerce platform operators, potential proxy marketers, potential clients, consumer protection agency and corporate affairs commission. The elicitation technique used to elicit the requirements from the sources was the observational technique. The interaction of users with existing systems and with each other were observed.

The requirements elicited were then analyzed to detect and resolve conflicts between them. They were classified based on the users which are the proxy marketers and clients. Also, the conceptual model which is a scenario-based model was developed as shown in Fig. 2.

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As requirement specification, the reward system will feature the following:
1) Facility for registering participants.
2) Form creation where proxy marketers can register and create their profile.
3) Create a form for registering of clients.
4) Facilities needed for e-commerce transactions.
5) Computation of proxy marketer’s reward in particular, direct reward and indirect reward for each transaction.
6) The system should compute the trust reward based on the trust rating for each transaction.
7) The system should compute the productivity bonus for every transaction.
8) The system should provide the total amount of the reward and the amount available for withdrawal.
9) The system should allow for cashing out of the amount available for withdrawal by the proxy marketer.

B. System Design

This section explains overview of the reward system as well the mathematical models behind the reward mechanism.

1) Overview of Reward Mechanism

Overview of Reward Mechanism: The reward model for proxy marketer-based e-commerce system was implemented in a web shopping application. The architecture for the system is shown in Fig 3. It has a relational database management system (MySQL) as backend, web server (Apache) and scripting languages (HTML, CSS, PHP and JavaScript) as middleware, and the system modules as frontend. The system was divided into three modules: transaction reward module, trust reward module and productivity reward module. These modules are described in detail in subsequent sections.

Fig. 3. System architecture.

The reward module computes the rewards of the proxy marketers. Also, the proxy marketers will be able to keep track of their reward and the amount available for withdrawal. Fig. 3 shows this work’s multilevel marketing (MLM) network diagram. As shown in Fig. 4, it is a 4-generation multilevel market of proxy marketers represented by their identification numbers which were randomly generated. To explain the tree structure in Fig. 4 whenever any proxy marketer makes a transaction, what accrues to him is transaction_reward which is 20% of the profit made. The proxy marketer’s referrer will be rewarded 10% of the profit (ref_reward) and where there is no referrer’s referrer, there will be no ref_ref_reward. Where there is a referrer’s referrer, the ref_ref_reward is 5% of the profit made from the transaction. The maximum reward given out from the profit made from each transaction is 35% (i.e. 20 + 10 + 5) where there are three generations of proxy marketers in a network. The minimum reward given out from the profit
made from each transaction is 20% where the proxy marketer has no referrer.

The reward is gotten from the profit made from each transaction. There are three types of reward for each transaction – the transaction reward, the trust reward and the productivity reward. These rewards and their different mathematical models as well as the reward model design will be discussed next.

2) Mathematical Models:

Mathematical Models: The mathematical models used for the computation of the reward module is described as follows:

**Profit:** The work is aimed at modeling a sustainable and economically competitive reward mechanism. In terms of the economic competitiveness, the reward mechanism makes sure that the proxy marketing-incorporated online shop does better than standalone online shops or at least performs at par. To achieve this, the various rewards will be based on profit accruing from the introduction of proxy marketing as opposed to total profit. Considered in this category are two proxy marketing related profit sources: profit got from products sold via the proxy marketers (proxy_profit) and profit from shipping (shipping_profit). As shown in (1), profit made from home delivery (shipping_profit) is the difference between shipping fee charged for all delivery transactions per month and the cost incurred in delivering goods (i.e. shipping_cost).

\[
\text{shipping\_profit} = \text{shipping fee} - \text{shipping cost}\]  

(1)

Therefore, as shown in (2), profit on which all the categories of reward will be based (or computed with) will be the sum of proxy_profit and shipping_profit.

\[
\text{profit} = \text{proxy\_profit} + \text{shipping\_profit}\]  

(2)

For times when free shipping is offered, profit will be the difference between proxy_profit and shipping_cost, as seen in (3).

\[
\text{profit} = \text{proxy\_profit} - \text{shipping\_cost}\]  

(3)

**Transaction Reward:** The transaction reward is gotten by proxy marketers for any transaction which they or their clients make. The transaction reward includes the reward for the proxy marketer who made the direct transaction (transaction_reward) and two generations or levels of the proxy marketer’s downline (ref_ref_reward and ref_reward).

\[
\text{ref\_ref\_reward} = 0.05 \times \text{profit}\]  

(4)

\[
\text{ref\_reward} = 0.1 \times \text{profit}\]  

(5)

\[
\text{transaction\_reward} = 0.2 \times \text{profit}\]  

(6)

Equation (4) shows the mathematical model for computing the reward for the referrer’s referrer (ref_ref_reward). The referrer’s referrer gets 5% of the profit made from each transaction. Equation (5) shows the mathematical model for computing the reward for the proxy marketer’s referrer (ref_reward). The proxy marketer’s referrer gets 10% of the profit made from each transaction. Equation (6) shows the mathematical model for computing the reward of the proxy marketer (transaction_reward). The proxy marketer gets 20% of the profit made from each transaction.

For example, following the MLM tree in Fig. 4, whenever the proxy marketer with identification number 200 makes a transaction, what accrues to him is transaction_reward which is 20% of the profit made. The proxy marketer with identification number 389 which is his referrer will be rewarded 10% of the profit (ref_reward) and being that he has no referrer’s referrer, there will be no ref_ref_reward. Where there is a referrer’s referrer, the ref_ref_reward is 5% of the profit made from the transaction. The maximum reward given out from the profit made from each transaction is 35% (i.e. 20 + 10 + 5) where there are three generations of proxy marketers in a network. This would be the case for transactions done by marketers 210, 212, 315, 216, 310, 311, and 312 (see Fig. 4). The minimum reward given out from the profit made from each transaction is 20% where the proxy marketer has no referrer. This would be the case for transactions done by marketer 389 (see Fig. 4).

**Trust Reward:** The trust reward is derived from the trust rating (tr) of proxy marketer for each transaction which is computed using (7).

\[
\text{tr} = \frac{\text{rw}}{4}\]  

(7)

where tr = trust rating per transaction, r = context-based trust rating and w = weight of transaction.

Proxy marketers cannot view the amount of their trust reward unless the transaction has been completed and their clients have carried out the trust rating.

\[
\text{trust\_reward} = \frac{\text{tr}}{100} \times \text{profit}\]  

(8)

Equation (7) shows the mathematical model for computing the trust reward. After the trust rating for a transaction is computed from (7), it is multiplied by the profit gotten from that transaction. The value gotten is then divided by a hundred. This is to say transaction trust rating, tr, gives a percentage of the profit payable as trust reward. The minimum value of the trust rating, tr is 1 while the maximum value is 5.

**Turnover/Productivity Reward:** The productivity reward is given to any proxy marketer who makes a profit of ₦42000 and above for any transaction.

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productivity\_reward = 0.1 \times 42000 \quad (9)

Equation (9) shows the mathematical model for computing the productivity reward. The productivity reward is 10% of ₦42000. What is considered in this work is a case study of a micro scale shop. The annual turnover or profit for a micro scale industry in Nigeria is at least ₦20 million, which means the monthly profit would be at ₦1.67 million with at least ten employees. With this number of employees, spreading ₦1.67 million over 10 employees yields a monthly profit of about ₦166,667 per employee. It is assumed that a proxy marketer averages four (4) transactions per month (i.e. ₦166,667 \div 4 = ₦42,000, approximately). Hence the productivity reward cap of ₦42,000.

IV. RESULTS

This section features algorithm developed from the reward mechanism mathematical models and its implementation in the online shopping application.

A. System Algorithm

The mathematical models discussed were used to develop algorithms with which the reward module on the online shopping software will be programmed.

1) Transaction Reward Module:

The flowchart for the transaction reward sub-module is shown in Fig. 5. After a transaction is made, the profit is gotten. In the first decision node, a check is made to know if the proxy marketer who made the transaction does not a referrer’s referrer (ref\_ref). If false, the referrer’s referrer (ref\_ref) is paid 5% of the profit made on that transaction; if true the next decision node is checked. Where the proxy marketer has a referrer (ref), the referrer (ref) is paid 10% of the profit made from that transaction. The proxy marketer who made the transaction is paid 20% of the profit made from the transaction.

2) Trust Reward Module

The trust reward was computed from the trust rating of the proxy marketer and the profit made from each transaction. This is described in Fig. 6.

3) Productivity Reward

When the profit for a particular transaction is up to ₦42,000, the proxy marketer is paid a reward of 10% of ₦42,000. In the case where the transaction profit is above ₦42,000, the proxy marketer is still paid a reward of 10% of ₦42,000 while the extra amount on the ₦42,000 profit is rolled-over into the excess–productivity reward account which was created for the proxy marketers to whenever the transaction profit is above ₦42,000. The excess–productivity reward account keeps the extras from each transaction until it sums up to ₦42,000 when the proxy marketer becomes eligible for another productivity reward. The working mechanism for this is shown in Fig. 7.
Fig. 7. Flowchart for productivity reward.

The algorithm for the computations in the entire reward system is shown in Fig. 8. It is a detailed step by step procedure showing the computation of all three reward types.

```plaintext
// COMPUTATION OF TRANSACTION REWARD //
Input Profit
If ref_ref = 0
    then ref_ref_reward = 0
else
    ref_ref_reward = 0.05 * profit
    update balance of ref_ref
End
If ref = 0
    then ref_reward = 0
else
    ref_reward = 0.1 * profit
    update balance of ref
End
If Marketer_ID_No. ≠ 0
    transaction_reward = 0.2 * profit
    Update transaction_reward
else
    transaction_reward = 0
End
// COMPUTATION OF CONTEXT-BASED TRUST RATING //
Input LEGEND
5 - Excellent
4 - Very Good
3 - Good
2 - Fair
1 - Poor
a = Input ('Availability rating: ')
i = Input ('Delivery TIme/sct: ')
Trust rating = (((2 * a) + (2 * i) + 1) / 5)
// COMPUTATION OF PRODUCTIVITY REWARD //
If (profit - 40,000) ≥ 0
    productivity_reward = 0.1 * (profit - 40,000);
    Excess_profit = profit - 40,000;
    Update productivity_reward balance of marketer
    Update excess_profit_reward balance of marketer
else
    productivity_reward = 0
End
Total_earning = transaction_reward + trust_reward + productivity_reward
Update Total earning balance of marketer
```

Fig. 8. Algorithm of the system.

B. System Implementation

After the system design for each module was completed, the coding for the module was done. HTML and CSS are used for presentation and styling of the content, PHP is used for the server-side while JavaScript is used for the client-side. For compatibility and responsiveness on mobile devices, a CSS framework called Bootstrap is used.

On the ‘My earnings’ page, all the earnings of the proxy marketer are displayed. These earnings are the transaction reward, trust reward, turnover reward and the excess turnover reward. Fig. 9 shows the direct earnings of a proxy marketer for a transaction. The indirect earnings for the referrer and referrer’s referrer are shown in Fig. 10 and Fig.
Fig. 9. Direct earnings for a transaction.

Fig. 10. Indirect earnings for referrer.

Fig. 11. Indirect earnings for referrer’s referrer.

Fig. 12. Direct earning with turnover reward.

V. CONCLUSION
The reward mechanism developed in this work manages the rewards paid to proxy marketers for transactions made in a unilevel MLM network. The genres of rewards considered were: transaction reward, trust reward and productivity reward. For the transaction reward, three generations of proxy marketers on a network get rewarded for transactions made. Transaction reward ensures expansion of the marketing network, while limiting that to three levels guarantees sustainability. The trust reward is based on the trust rating of a proxy marketer for a transaction made. In a case where a proxy marketer makes a profit up to or above the amount stipulated, a turnover/productivity reward is paid to the proxy marketer. The productivity reward was necessary to motivate marketers to go for high end transaction. This work achieved a system of increasing patronage and profit of online shops using sustainable reward structure for proxy marketers. It is a more competitive option to standalone online shops.
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