Multi-Level Marketing: An Example Case of Blockchain Smart Contract

A. Problem Statement

A product manufacturing company wants to make use of Blockchian technology for their Multi Level Marketing (MLM). The structure of MLM is as follows:

Anyone who is interested in MLM should first need to get approval from company's Marketing manager and can start marketing franchise. Company has fixed 500 Wei as franchise registration fee. The franchisee can build small groups for daily marketing purpose. To this end, franchisee can join members in the group. Also, the approved group members can also join anyone in it. For this, new member needs to pay 100 Wei as membership fee. If the new joiner is joined the group through franchisee then 100% membership fees is credited to franchisee account. Otherwise, 30% of the membership fee will be credited to franchisee and remaining 70% to the group member who joined the new member. The same share is applicable on the profits of the products sold by members. Further, to have control over the group, the maximum size of group is fixed to 25.
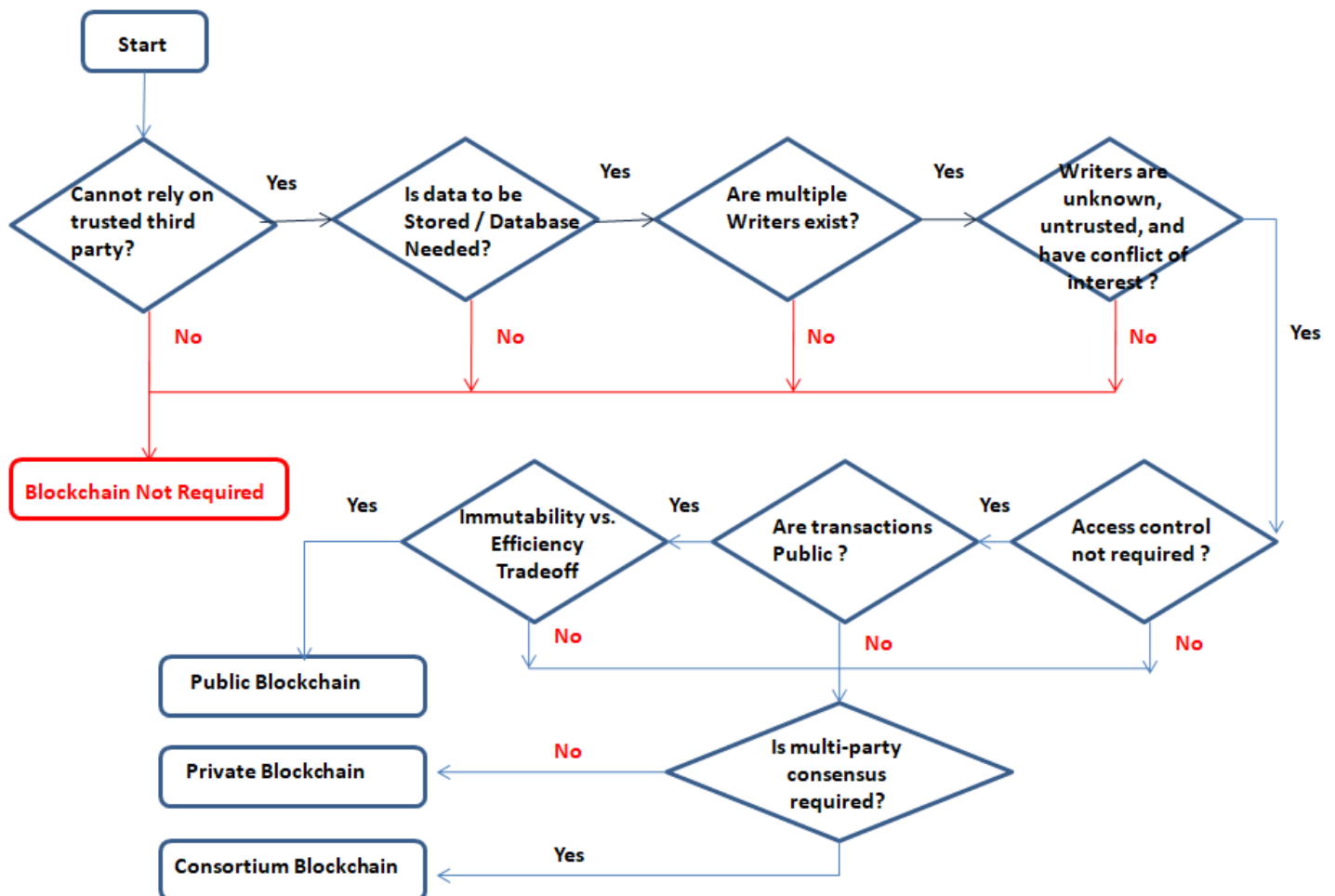
B. Selection of Blockchain

Figure 1: Flow graph showing selection of Blockchain

From the given case, it can be understood that, the marketing process is happening in a closed environment. It means this marketing group does not require a third party to monitor. Each participant in the network needs to have accountability of the amount they paid, company and franchisee both need to keep track of the fee. These transactions must be recorded for future reference for which database is needed. The marketing manager, franchisee owner, and members are the participants who write on the ledger. In general, the company issues a

franchise and franchise in turn maintains the groups. Here, group members are in no way related to the company, and it is the choice of the member to move from one franchise to the other or to start his/her own franchise. To this end, the participants in the network have conflict of interest, and they are completely unknown. Since, the entire activity is happening in a closed environment and to maintain trust in the system, only registered participants should have access to the transactions. It is possible when the transactions are private. Further, a shared ledger is needed to keep track of the updated transaction. Transaction made by member will be approved by franchise and request for franchise will be approved by the marketing manager. In both the approvals, only one authority is responsible for action. To this end, the suitable blockchain for application development is a private blockchain.

C. How to start with Blockchain Product?

Starts with small model (few users/features/functionalities etc.) slowly add new features to scale to large scale. (Spiral Model)
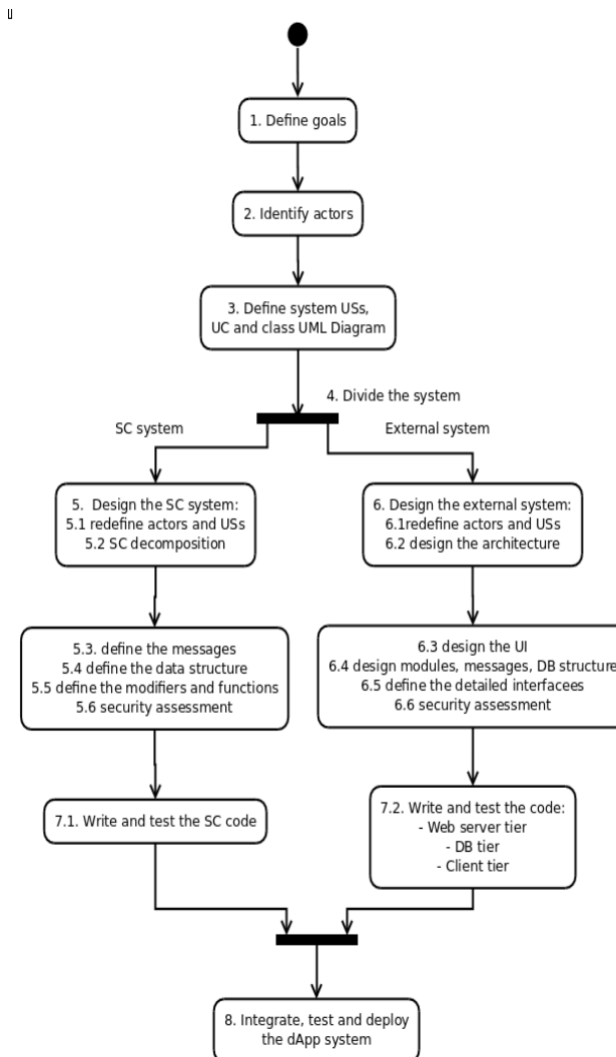
D. How to Understand the Business Problem?

1. What are the specific business problems / challenges that the first project will address?

Promotion and marketing are important activities to boost the business for any product manufacturing company. This is achieved in general using public advertisements and demonstration. Considering the marketing principle of people, product, place and price (4Ps) the most usual way of public advertisement may not be sometimes an

attractive model to reach the products to the common person level. To connect with the targeted customers and explain them about the company products a new marketing model is required. The multi level marketing (MLM) is a specialized marketing model in which non-salaried work force is utilized to promote and sell the products with incentives of pyramid shaped commission system.

2. What is the current way of solving the business problem?
    Understand current systems and areas for improvement
    - The current manual system lack trust and ethical practice
    - The proposed system is designed using blockchain such that the trust and ethical practices can be achieved.

3. Assuming the business problem is large, what specific aspects of this business problem will be addressed?

4. Who are the business network participants (organizations) involved and what are their roles?

There are four roles according to problem statement: 1) Company 2) Manager 3) Franchisee and 4) Member. And except manager everyone have their own account to hold fee and profit share. Discussion on each role is as follows

1) <u>Company</u> - It has an account in which the franchise registration fee will be deposited. It maintains a depositors list and deposited amount for auditing purpose. At anytime, company can view the Registration account balance and can also transfer the registration account balance (i.e, from Smart Contract Account) to its own address (i.e, Externally Owned Account). An additional provision has been made while paying the fee is that any excess amount other than franchise registration fee will be credited back to the applicant account. Company address is public and anyone can view it. Company recruits area managers according to pincode to approve the Franchise applications. Company can also change the managers of corresponding pincode. Also, company maintains the list of approved franchisee address, pincode to manager mapping, franchisee address to approved manager mapping and others. To support company tasks various bean (set, get, and is) functions are defined. The entire MLM contract can be destructed (kill()) only by company.

2) <u>Manager</u> – Each manager has an address and an associate pincode. Applications of franchise to a particular pincode will be processed by corresponding manager. Once a franchise is approved by manager, a new entry will be made in the franchise list with franchise information such as address, account creation, franchise size, member list, etc. At the same time, franchise application details are removed from the depositors list.

3) <u>Franchisee</u> – Each franchisee has an address and associated data such as member list, franchise size (or group size), franchisee account to hold membership share, and others. A franchise can destruct himself. While doing it, the left over membership share will be transferred to franchisee EOA.

4) <u>Member</u> – Each member has an address and associated data such as franchisee address, address of who joined him/her in the group, an account to hold membership share, and others. A member can destruct himself. While doing it, the left over membership share will be transferred to member EOA.

Separate mapping and data structures are maintained for accessing the details of franchisee and members. Once the destructor is called, the related entries are removed from the data structures. Anyone who is interested to join a franchise can directly apply for membership via mentioning franchisee address or known member address and by providing membership fee. If applicant uses franchisee address for applying membership the 100% membership fee will be transferred to franchisee account. In case of a member joins another member, 70% membership fee will be transferred to his/her account. And remaining 30% share will be transferred to corresponding franchisee account.

5. Who are the specific people within the organization and what are their job roles?

Understand the key users in a business network.

Understanding participants

    a. Who are the participants? How many types of participants?

    b. How will they access and interact with the blockchain?

    c. Will they be peer nodes?

    d. Do you need web or mobile apps?

    e. Are gateways (such as exchanges or data providers) needed?

    f. Do you need to integrate to external data sources?

    g. Who will operate the blockchain? Who will govern/regulate the blockchain?

    h. What is the value/incentive for each participant to join the network?

Participant's identities

    a. Do you need to know your users?

    b. Pseuo anonymous blockchain like bitcoin does not require use identities to be verified

    c. In most business use-cases, some form of identity is required
- In public blockchains, an identity oracle (linked to a trusted database) could provide such information sources
- Sources can come from governments, financial institutions or utility providers
- In private blockchains, a gateway or controller ensures identity is verified before credentials are issued to the user

Understanding Assets and Transactions

    a. What assets are involved and what is the key information associated with the assets?

    b. What are the transactions involved, between whom, and what assets are associated with transactions?
Understand under what business or contractual conditions assets are under as they transfer from one owner to another.

Defining Transaction

  a. What types of processes need to take place in your blockchain network?
    a. Invoke actions - add, delete, change, transfer (these are recorded on to the blockchain)
    b. Query
    c. Do you need to control access to these functions based on participant types or roles?

  b. What are the main steps in the current workflow and how are these executed by the business network participants?

c. What is the expected benefit of applying blockchain technology to the business problem for each of the network participants?

d. What legacy systems are involved? What degree of integration with the legacy systems is needed?

<u>Assessing Business value</u>

Cost benefits analysis? - Blockchain system is costly than regular centralized systems.

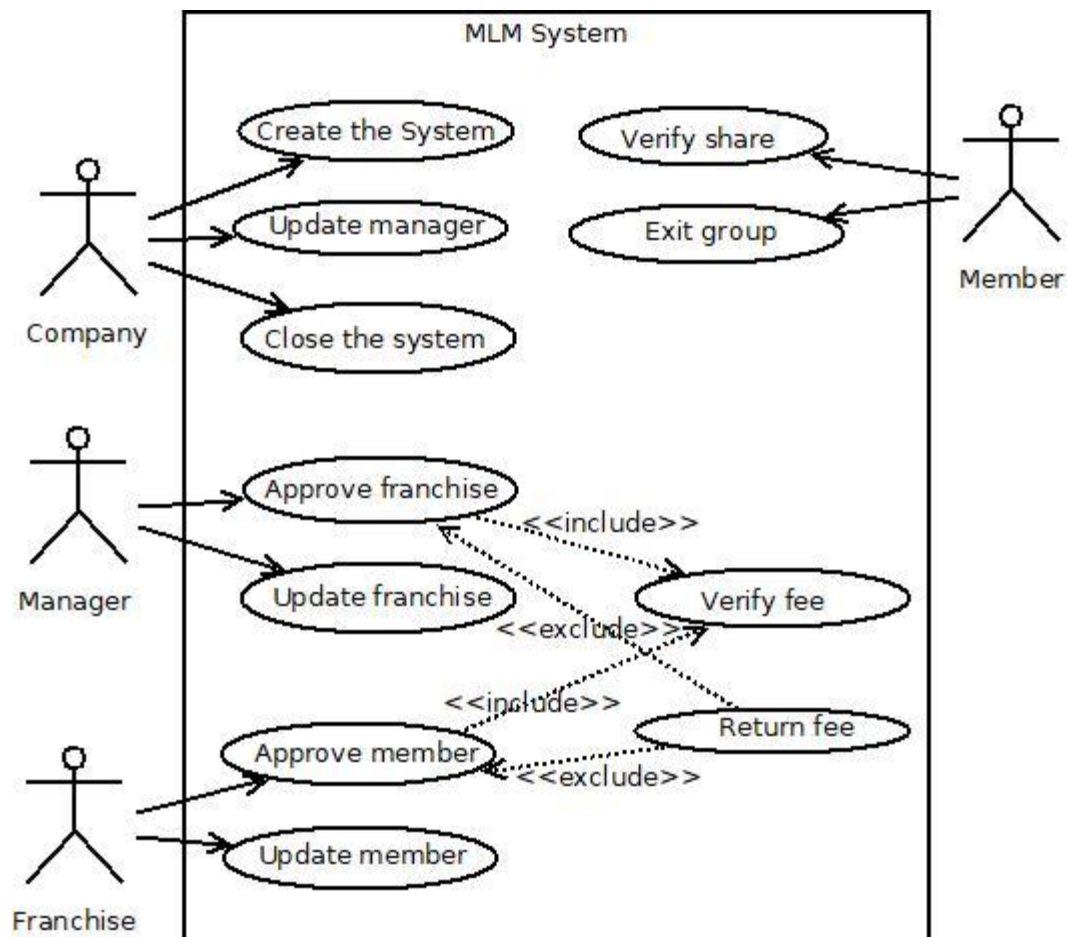Use case diagram – representing functional requirements.

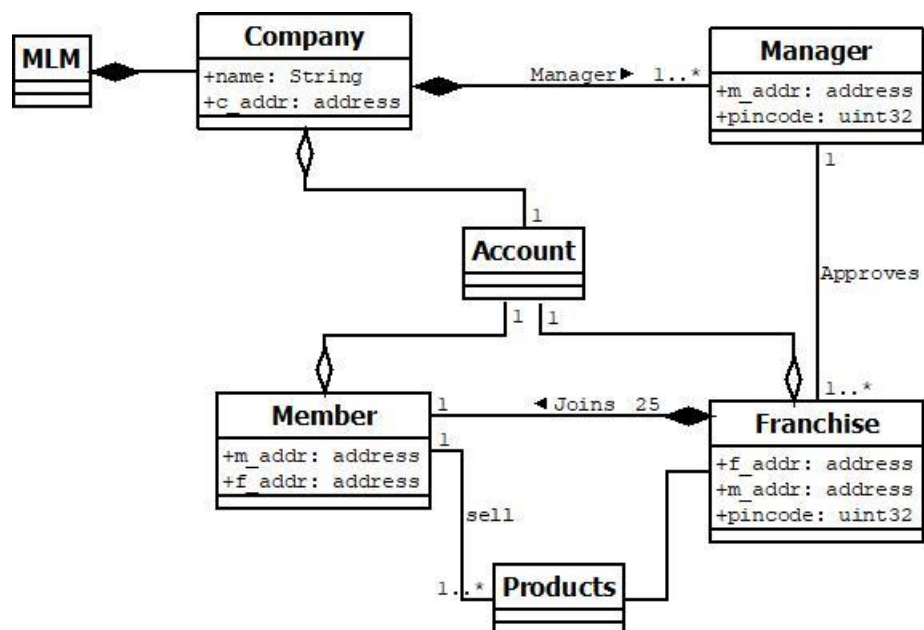**Figure 2: Use case diagram of the system specification**

Class diagram

Figure 3: Class diagram derived from use case

Modified class diagram

Stereotypes to be used for the Solidity programming language

| Sno	Stereotype	Description	Position in Class diagram
1	<<contract>>	It represents the contract structure.	First section in the class symbol
2	<<struct>>	It holds the data structure of the roles defined in the case. It will consists of functions.	First section in the class symbol
3	<<interface>>	This is a contract with function declarations	First section in the class symbol
4	<<enum>	This is the enumerated data containing values to be used in the program.	First section in the class symbol
5	<<library contract>>	It represents the contract used from predefined or user defined libraries.	First section in the class symbol
6	<<modifier>>	It is used along with the functions	Last section in the class symbol.
7	<<array>>	It represents the one-to-many relationships.	On the association.
8	<<map>>	It represents the mapping of one-to-many relation	On the association.
9	<<map[uint]>>	It represents the mapping of one-to-many relation with integer to value mapping.	On the association.
10	<<map[addr]>>	It represents the mapping of one-to-many relation with address to value mapping.	On the association
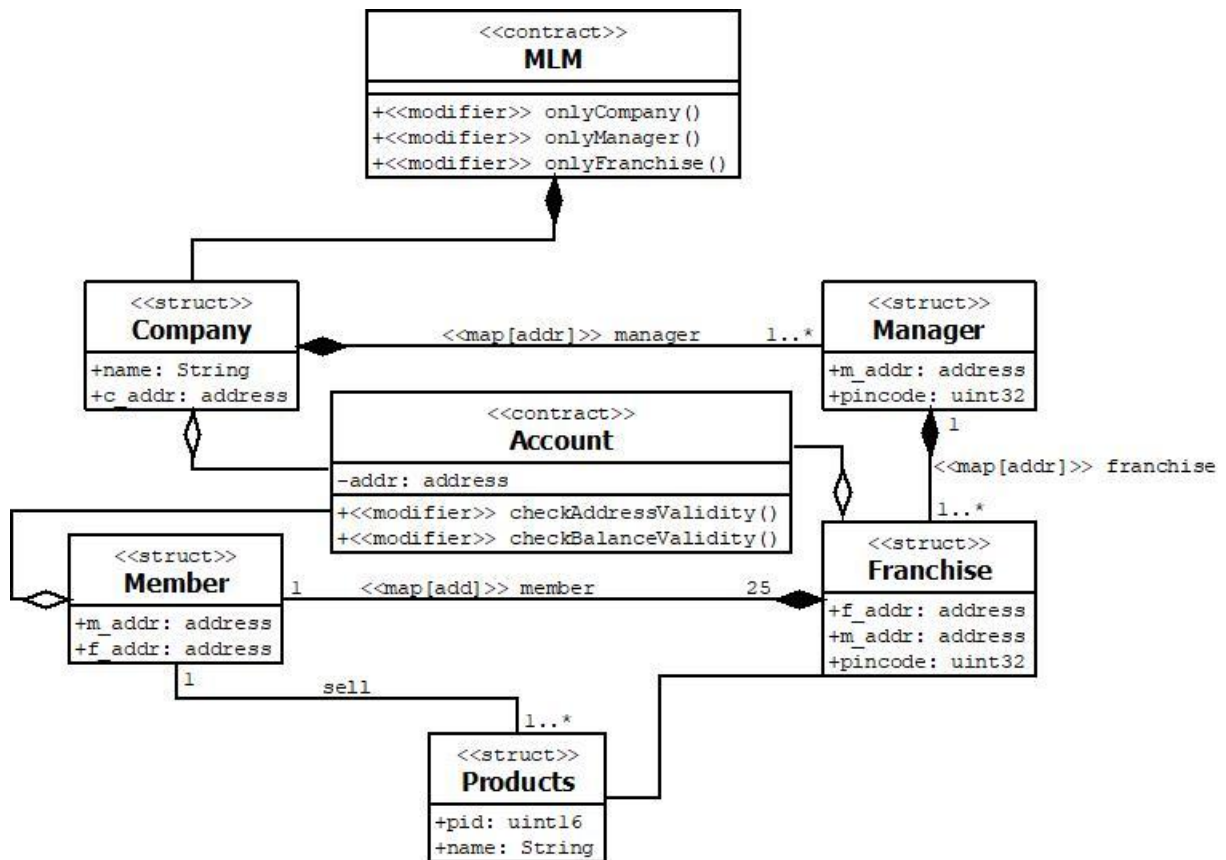
Figure 4: Modified Class diagram with Stereotypes

Off-chain activities

    a. Company initiate the smart contract
    b. Company updates manager data.
    c. Applying for Franchise
    d. Approving/Rejecting Franchise by Manager
    e. Applying for Membership
    f. Approving/Rejecting Membership
    g. Company can kill the contract
    h. Company can view Franchise List

On-chain activities

    a. Smart contract creation – noting the creators address
    b. Updating the manager information (data structures of manager)
    c. Depositing registration fee.
    d. Returning registration fee.
    e. Updating franchise information after approval.
    f. Verifying membership fee.
    g. Updating membership fee.
    h. Updating membership share.
    i. Settling member balance if member wants to exit.
    j. Settling Franchise balance if franchise wants to exit.
    k. Setting Company balances if company wants to close contract.
    l. Display member account balance
    m. Display franchise account balance
    n. Display company account balance