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New Generation Cooperative Financial Mathematical Model Preliminary Concept

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Abstract: Cooperative is a business arrangement that collectively owned by its member and focus on member needs. Cooperative have some problem such as: free rider member than often make chaos in decision making. There are scam, fraud and malpractices in cooperative investment, cooperative member do not really understand how did they get benefit and profit. New Generation Cooperative (NGC) is new kinds of cooperative that have secured membership and give more value in their service but new generation cooperative only have little information about its mechanism to give profit and benefit to their member. Technology strategy uses value chain analysis to map business procedure and function of the organization. This review will discuss about NGC financial mathematical model preliminary concept based on value chain analysis business process mapping to describe how the mechanism for cooperative member get their profit and benefit. NGC financial mathematical model preliminary concept can be implemented in NGC application architecture as part of NGC enterprise architecture.

Key words: New generation cooperative, technology strategy, value chain analysis, mathematical model, application architecture, enterprise architecture

INTRODUCTION

Cooperative is a business arrangement that collectively owned by its member and focus on member needs (Coltrain, 2000). Cooperative have some problem such as: free rider member than often make chaos in decision making, there are scam, fraud and malpractices in cooperative investment, cooperative member do not really understand how did they get benefit and profit. New Generation Cooperative (NGC) is new kinds of cooperative that have secured membership and give more value in their service. Currently there information about capital, investment, law and legal (Coltrain, 2000) but NGC only have little information about its mechanism to give profit and benefit to their member (Hackman, 2001). Technology strategy uses value chain analysis to map business procedure and function of the organization.

This review will discuss about NGC financial mathematical model preliminary concept based on value chain analysis business process mapping to describe how the cooperative members get their profit and benefit.

MATERIALS AND METHODS

New generation cooperative: Cooperative is a business arrangement that collectively owned by its member and focus on member needs (Coltrain, 2000). Hybrid between traditional cooperative and incorporated companies is called New Generation Cooperative (NGC) (Harris *et al*., 1996). NGC is a new kind of cooperative that have secured membership and give more value in their service. NGC has character of traditional cooperative and incorporated enterprise.

NGC was introduced in United State of America. NGC are adaptation of traditional cooperative structures to modern industries in 1999's (Schank and Fulton, 2015). NGC uses a system of delivery rights and obligations to encourage business loyalty and provide a form of vertical integration. NGC are particularly suitable to ventures involved in value-added agricultural processing and marketing. There are some key attributes of NGC that are consistent with all cooperatives: NGC are controlled by their membership using the principle of one member, one vote, earnings are distributed to the members based on patronage, the board of directors is elected by the membership.

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However, there are several characteristics of NGC that differentiate them from traditional cooperative: NGC may issue designated shares which carry delivery rights and obligations. Individuals may hold higher levels of equity through the purchase of investment shares. Membership may be restricted to designated shareholders. Some of NGC are applicable only to agricultural ventures (Schank and Fulton, 2015).

The process of industrialization has given life challenges to the cooperative. Cooperative tries to pursue competitive strategies to respond to environmental and structural changes in business systems including value-added processing and brand development. Cooperative organizations use innovation to adapt to industrialization to implement competitive strategies. Cooperative organizations innovation, namely: new generation cooperative, authorized capital plan, a subsidiary of the common partial ownership, trust preferred stock, seek equity joint ventures, equity capital plans permanent, limited strategic alliances between companies and cooperatives. Leaders, managers, institutions and organizational scholar is very interested in the formation and organization of this new capital.

NGC Model is another form of traditional cooperative structure that has closed membership. The right of ownership which can be trade between members was introduced by NGC Model. The right of ownership is restricted to members in a form of closed membership. Members are required to pay up-front investment. Supply is controlled by a marketing agreement.

Currently, there information about capital, investment, law and legal (Coltrain, 2000) but so little information about formal technical standards and formulation for NGC (Hackman, 2001).

RESULTS AND DISCUSSION

Technology strategy and value chain analysis: Technology strategy is the overall plans which consist of objectives, principles and tactics relating to use of the technologies within a particular organization (Floyd and Wolf, 2010). Such strategies primarily focus on the technologies themselves and people who directly manage those technologies. The strategy can be implied from the organization's behaviours towards technology decisions and may be written down in a document. Value chain (Porter, 1985) is one approach for strategic management.

Value chain (Porter, 1985) is a set of function of the organization that operating in a specific industry performs in order to deliver a valuable product or service for the market. This set of function can be converted to class of activity in the organization business process. Value chain will be the analysis tool for preliminary business analysis

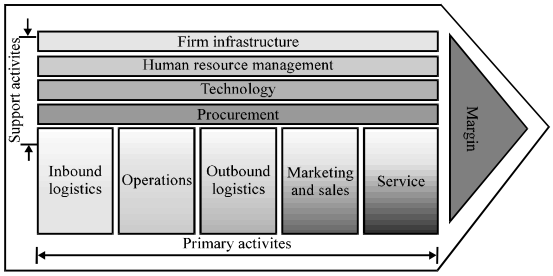

Fig. 1: Internal value chain environment

part of enterprise architecture planning (Walters and Rainbird, 2007). There are two kind of value chain environment and they are internal value chain environment and external value chain environment.

Internal value chain environment only describes business process mapping within the enterprise itself (Porter, 1985). Internal value chain consists of two kinds of activity that is primary activities and support activities. Primary activities or external activities are functions that deal with other entities and they are: inbound logistic that is process receiving input materials and store them in the material warehouse, operations that is process transforming input materials to finish output product and store them in the finish product warehouse, outbound logistic that is process distributing the output finish product from finish product warehouse to the place where they can sell and market the output finish product. Marketing and sales that is process to sell and to market the output finish product, service that is process supporting customer of the output finish product (Porter, 1985).

Support activities or internal activities are functions that deal with in the organization itself and they are: firm infrastructure that is the process to manage organization structure, firm structure and company culture. Human resource management is the process to manage personnel and employee. Technology that is product to support add-value internal activities and procurement that is process receiving input materials, supplies and equipment for internal activities. Technology strategy delivers strategic management for NGC. Figure 1 shows the structure of value chain (Porter, 1985).

New generation cooperative structure: Figure 2 describes new generation cooperative with organization structure based on Anthony Triangle (Anthony, 1965). This figure explained that Members (M1, M2, M3 and Mn) is both operational and collectively internal strategic part of new generation cooperative. The tactical part of the new generation cooperative will be explained by its internal value chain structure. Value chain (Porter, 1985) is part of strategic management that explain function and

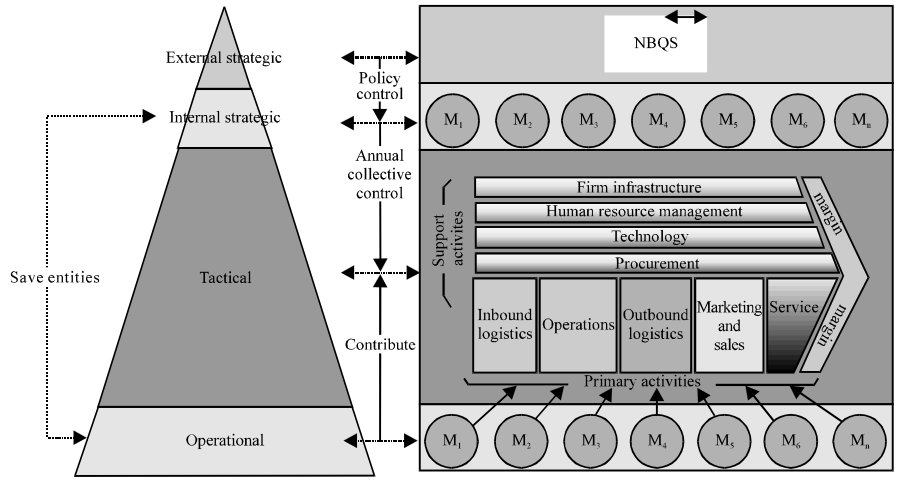

Fig. 2: New generation cooperative and Anthony triangle

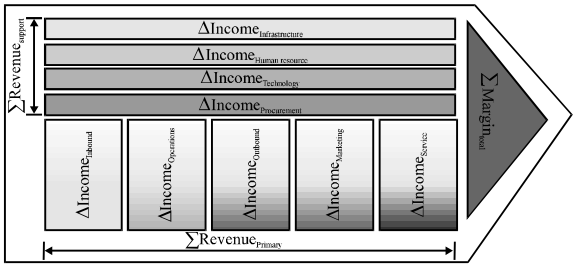

Fig. 3: Value chain mathematical variable map ($\Sigma Margin_{Total}$ $\Sigma Revenue_{Primary}+\Sigma Revenue_{Support}$; $\Sigma Margin = [\Delta income_{Inbound}+\Delta Income_{Operations}+\Delta income_{Outbound}+\Delta income_{Marketing}+\Delta Income_{Service}]+[\Delta income_{Infrastructure}+\Delta income_{Human\ resource}+\Delta income_{Technology}+\Delta Income_{Procurement}$

procedures of organization. The external strategic is the rule and legal that governs the new generation cooperative. Malaysia use blue ocean strategy (Kim and Mauborgne, 2004) for their economic development strategy including the cooperative.

Value chain analysis business function mapping: Value chain analysis can be used to map the business process classification and calculate margin of the enterprise by using cash flow in every part of the map. Every procedure segments will be considered as mathematical variables. Figure 3 shows the mathematical variable map of the value chain.

This equation shows the discreet mathematical model of the margin calculation from the value chain mathematical variable map above: total amount of margin ($\Sigma Margin_{Total}$) is the sum of primary activities revenues ($\Sigma revenue_{Primary}$) and support activities revenues ($\Sigma revenue_{Support}$). Total margin process describes strategic layer of the organization as result of management layer processes:

$$\Sigma Margin_{Total} = \Sigma Revenue_{Primary} + \Sigma Revenue_{Support} \quad (1)$$

Revenues of primary activities ($\Sigma Revenue_{Primary}$) are the sum of inbound logistic activities income ($\Delta Income_{Inbound}$) operation activities income ($\Delta Income_{Inbound}$) and outbound logistic activities income ($\Delta Income_{Outbound}$) and marketing activities income ($\Delta Income_{Marketing}$) service activities income ($\Delta Income_{Service}$). Revenues process describes management layer of the organization:

$$\Sigma Revenue_{Primary} = \Delta Income_{Inbound} + \Delta Income_{Operation} + \Delta Income_{Outbound} + \Delta Income_{Marketing} + \Delta Income_{Service} \quad (2)$$

Revenues of support activities ($\Sigma Revenue_{Support}$) are the sum of infrastructure activities income ($\Delta income_{Infrastructure}$) human resource activities ($\Delta Income_{Human\ resource}$) technology activities income ($\Delta Income_{Technology}$) and procurement activities income ($\Delta Income_{Procurement}$). Revenues process describes management layer of the organization:

$$\Sigma Revenue_{Support} = \Delta Income_{Infrastructure} + \Delta Income_{Human\ resource} + Income_{Technology} + \Delta Income_{Procurement} \quad (3)$$

All income is sum of all revenues reduce by all expenses. Income process describes operational layer of the organization:

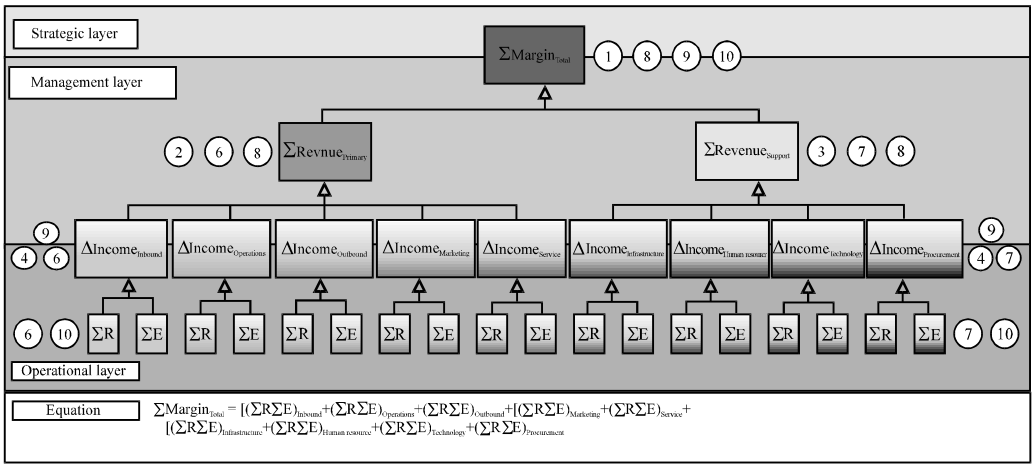

Fig. 4: Process of mathematical equation generated from value chain variable map, compared to the each equation number

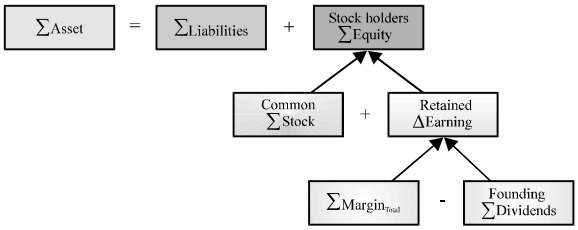

Fig. 5: Cooperative accounting diagram

$$\Sigma Income = \Sigma Revenue - \Sigma Expenses \quad (4)$$

To shorten the equation, a new variable will be given to the margin, revenues, incomes and expenses:

$$Margin = M;\ Revenues = R;\ Incomes = I;\ Expenses = E \quad (5)$$

By combining Eq. 2 and 5 into Eq. 4 then obtained new equation for all primary activities revenues Eq. 2 and 5 to Eq. 4:

$$\begin{aligned}\Sigma R_{Primary} &= (\Sigma R - \Sigma E)_{Inbound} + \\ &(\Sigma R - \Sigma E)_{Operations} + (\Sigma R - \Sigma E)_{Outbound} + \\ &(\Sigma R - \Sigma E)_{Marketing} + (\Sigma R - \Sigma E)_{Service}\end{aligned} \quad (6)$$

By combining Eq. 3 and 5 into Eq. 4 then obtained new equation for all support activities revenues Eq. 3 and 5 to Eq. 4:

$$\begin{aligned}\Sigma R_{Support} &= (\Sigma R\text{-}\Sigma E)_{Infrastructure} + \\ &\Sigma R - E)_{Human\ resource} + (\Sigma R\text{-}\Sigma E)_{Technology} + \\ &(\Sigma R\text{-}\Sigma E)_{Procurement}\end{aligned} \quad (7)$$

By combining Eq. 5 into Eq. 1 then obtained a shortened (Eq. 5-1):

$$\Sigma M_{Total} = \Sigma R_{Primary} + \Sigma R_{Support} \quad (8)$$

By combining Eq. 5, 2 and 3 into Eq. 1 then obtained new equation for total margin from every activity Eq. 5, 2 and 3 to Eq. 1:

$$\begin{aligned}\Sigma M_{Total} &= [\Delta Income_{Inbound} + \Delta Income_{Operations} + \\ &\Delta Income_{Outbound} + \Delta Income_{Marketing} + \Delta Income_{Service}] + \\ &[\Delta Income_{Infrsstructure} + \Delta Income_{Human\ resource} + \\ &\Delta Income_{Technology} + \Delta Income_{Procurement}]\end{aligned} \quad (9)$$

By combining Eq. 5-7 into Eq. 1 then obtained new equation for total margin from every activity revenues and expenses:

$$\begin{aligned}\Sigma M_{Total} &= [(\Sigma R\text{-}\Sigma E)_{Inbound} + (\Sigma R\text{-}\Sigma E)_{Operations} + \\ &(\Sigma R\text{-}\Sigma E)_{Outbound} + (\Sigma R\text{-}\Sigma E)_{Marketing} + (\Sigma R\text{-}\Sigma E)_{Service}] + \\ &[(\Sigma R\text{-}\Sigma E)_{Infrastructure} + (\Sigma R\text{-}\Sigma E)_{Human\ resource} + \\ &(\Sigma R\text{-}\Sigma E)_{Technology} + (\Sigma R\text{-}\Sigma E)_{Procurement}]\end{aligned} \quad (10)$$

Figure 4 describes process of the mathematical equation generated from value chain mathematical variable map and also its organizational hierarchy. Organizational hierarchy was taken from Anthony (1965)'s Triangle. Mathematical equations generated from value chain variable map also shows accounting process of enterprise resource planning.

Figure 5 describes how total operational margin fit into cooperative accounting. Total operation margin and

total external founding dividends are part of retained earnings. Retained earnings and total common stock are part of total stakeholder equity. Total stockholder equity and total liabilities are part of total asset.

CONCLUSION

New generation cooperative only has little information about its mechanism to give profit and benefit to their member. NGC financial mathematical model preliminary concept based on value chain analysis business process mapping to describe how the mechanism for cooperative member get their profit and benefit. There are several equations generated from this discussion. Those equations describe how discreetly financial operations give benefit to members. Those equations show that every business process classification has its own transaction. NGC financial mathematical model preliminary concept can be implemented in ngc application architecture as part of NGC enterprise architecture.

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