

CONSTRUCTING THE WORKING MODEL OF A 2-UP SYSTEM PYRAMID SCHEME

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Abstract: A pyramid scheme is a business model that is illegal in many countries. It works by recruiting members via promises of payments or services by enrolling more people in the scheme. In recent years, pyramid schemes have been expanding, and many people have fallen victim when the schemes collapse. In this study, the working model and formulation of the 2-up system pyramid scheme are studied to identify its fundamental elements and working mechanism. A model is constructed mathematically to visualise the system's profitability. To further prove that a pyramid scheme is unsustainable, the limitations of a 2-up system may lead to the collapse of the pyramid structure, and a simulation study on the probability of an individual losing money in a 2-up system is investigated. The method of investigation involved literature reviews and data visualisation. As no references are available on the 2-up system formula, the reading of research articles and websites became the primary source of study. Data visualisation is carried out to showcase the cash flow of profits in a 2-up system pyramid scheme. The fundamental element of the system is for one member to recruit at least three others to prevent a loss as profits from the first two recruits will be channelled to an upline member. According to the investigation of limitations, approximately 65.78% of the world population would need to join the 2-up system when the level rises to 21, where the pyramid structure is vulnerable to collapse. There is a possibility of pyramid scheme members suffering losses since there is a requirement to make a profit. Pyramid schemes are destined to fail in the long run as the possible returns of an individual is never guaranteed.

Keywords: Pyramid scheme, mathematical modelling, financial literacy, multilevel marketing.

Introduction

A pyramid scheme is an investment plan in which investors may benefit by recruiting new members. However, such schemes will eventually fail since they rely on geometric growth to maintain rewards for upline investors, and therefore, causing losses to recent members at the bottom. A pyramid scheme is similar to a Ponzi scheme, which relies on the recruitment of more investors to generate returns for initial investors, but it differs in that the number of recruits obtained by each investor is directly linked to their earnings. Multi-level marketing (MLM) schemes are a type of pyramid scheme that is legal in most countries. According to Tajti

(2021), pyramid schemes come in all kinds of complicated concepts and models, but the three most popularly used are the “8-ball” model, the “2-up” system and the simple pyramid scheme. These three schemes were built based on a fundamental framework with modifications, which at the end of the process, makes even take the shape of a MLM business.

With the growth of social economy, pyramid schemes have spread around the world by playing on human greed, and caused countless misery when they failed. They have also caused significant harm to the social business order as organizations that ran these schemes seem to show violent traits (James, 2021). Network

marketing has grown in popularity as the Internet has allowed a borderless world for operators to lure unsuspecting victims. Many governments have banned pyramid schemes due to the significant monetary losses and psychological harm they cause. The growth of pyramid schemes is not sustainable since they do not provide any value for their products or services and success is very dependent on the continued growth of down-line members. The economy of many countries may only sustain a certain level of business growth, and it cannot support the development of pyramid schemes. Hence, the threat to national security that such schemes posed. Feng, Gong, and Sun (2019) mentioned that 99.0% to 99.9% of those who participated in MLM businesses that applied a pyramid system were unable to make money as promised and instead, they ended up getting scammed and lost all their money.

In this study, we aim to construct a working model and formulation of a 2-up system pyramid scheme and investigate the limitations that may cause its collapse.

Literature Review

A pyramid scheme is a deceptive business technique that entails the creation of a network or “the pyramid” of investors, who pay money into the plan in hopes of making a large profit. The scheme has a hierarchical structure with a single person or business entity at the top, and an increasing base of investors beneath (Feng, Lu, Gong, & Sun, 2021). An investor pays to join the scheme, then recruits other investors, who then pays money to the investor who recruited them. Pyramid systems seldom offer a tangible product and rely entirely on the recruits’ desire to invest money in the programme. They are banned in most countries because they are considered a kind of corporate fraud.

In the real world, pyramid schemes can operate anywhere. In China, there was a platform called “RenRenGongYi” that offered a “consumption rebate” to consumers. It offered franchisees and consumers to contribute a

fixed amount of money to the platform, and the platform operators would gradually return the money to them in multiple amounts exceeding their initial investments. But what most people don’t realise is that the platform is actually a pyramid scheme, and most of its transactions have been revealed to be fraudulent. Many participants are lured into the scheme by the promise of high returns. There are reportedly 5,267 franchisees and 48,505 consumers involved in the platform, though it is believed that most of the franchisees were fake and the investors were mostly consumers. After operating a month, the amount collected by the scheme had reached 1 billion RMB (Shi, Li and Long, 2019).

Pyramid schemes can be very confusing when brought into the context of multi-level marketing (MLM), which focuses on direct-selling. Unfortunately, this legal business strategy may be manipulated to hide the operations of a “get-rich-quick” scheme (Aspalella A. Rahman, 2001). A study has compared the operations of legitimate MLM companies with a pyramid scheme to investigate the differences. It concluded that tight monitoring by the authorities is essential in MLM operations, besides raising consumers’ awareness about illegal pyramid schemes that misused the MLM strategy to create an unhealthy marketing and business environment.

However, many people are unsure how to differentiate between a pyramid scheme and MLM. Although both are similar, however, there is one big difference between them. Pyramid schemes have no products and will ask their members to invest a lot of money, and they must keep recruiting people to enjoy higher returns. In short, pyramid scheme investors need to pay first for the opportunity to recruit others and gain profits. From the perspective of economic experts, pyramid schemes are illegal as profits are deceptively gained by hustling new recruits rather than providing real goods and services. Most of the new recruits are forced to pay a huge sum in advance to obtain the non-refundable inventory. In MLM, an operation can only

be considered illegal once it displays similar traits to a pyramid scheme. Some examples of MLM companies are Amway, Mary Kay and Tupperware (Koehn, 2001; Bhadale & Borgave, 2012).

According to Tajti (2021), MLM became a popular business tool during the transition economy of many post-socialist European countries in the 1990s, especially in the Balkans. With little oversight by the financial authorities, many citizens who joined pyramid schemes disguised as MLM companies ended up losing their life savings in a short period. Those countries that joined the European Union later were forced to undertake the “4Finance UAB” test, which was similar to the “Amway Test” by the US Federal Trade Commission, to separate real MLM ventures from disguised pyramid schemes. This article discusses why regulators that are sensitive to consumer collective rights should pay greater attention to pyramid schemes, in addition to addressing the issues they cause and closing loopholes that allow them to operate.

MLM companies that sell low-value items and concentrate on member recruitment may be categorised as pyramid schemes. But it is difficult to tell the differences between a real marketing opportunity and fake schemes. Liu (2018) and Donovan (2014) also mentioned that people who are new to MLM usually start by recruiting close friends and family members because these people are likely to overlook their mistakes when the scheme collapses. People are not likely to join “new unbelievable businesses” that seem “too good to be true” if they were sold by strangers.

Although, network marketing is becoming popular, selling a product or service is not easy in this competitive age, as there are many things that need to be in place before a product can penetrate the consumer market. These include the cost, quality, function, pricing, marketing, and after-sales services. Good marketing may help to position products well among consumers, but it also causes the price to increase due to extra costs. So, to get around this problem, marketers are looking for alternatives

that cost less to market and promote products. Direct-selling is the oldest low-cost method and network marketing is the polished and expanded version of direct-marketing (Rani, 2019)

MLM companies have often attracted negative perception. People have criticised them for operating like pyramid schemes, fixing the prices of their products, requiring high start-up costs, and emphasising the recruitment of low-tier salespeople than actually selling their products. Their sales approach is considered manipulative as it uses personal relationships to recruit targets without concern on the welfare of the new members.

Madina (2018) highlighted the concern that pyramid schemes were not only affecting certain people, but attracting the whole community into their trap. Regardless of background, personal wealth and level of education, people are manipulated by greed to take part in these schemes that loosely promise financial freedom. The pyramid schemes are growing out of control to the extent that it is easy for recruiters to convince people to join their scams. The research found that the working mechanism of pyramid schemes have resulted in a greater market for fraudsters as communities will be addicted to the “easy returns” culture introduced by those schemes.

Scientifically, pyramid schemes have been proven to be losing model (Carter, 2002). As the scheme grows exponentially, with upline members earning a lucrative income, the number of recruits will gradually become limited due to environmental factors, and the scheme will collapse as soon as it runs out of funds to support payments to all members (Kotkovets, 2020).

Although we frequently hear news about pyramid schemes collapsing, however, there are still many people who fall victim. One of the factors is the poor knowledge and understanding about pyramid schemes. Furthermore, individuals who have poor self-control and cognitive ability are also vulnerable (Bosley, 2018). On top of that, affinity within the community will facilitate the expansion of a

pyramid scheme. Hence, the operators will prey on people with similar bonds, such as family, friendship, race, and religion. The perpetrators will exploit the trust between people in certain groups and persuade them to join their schemes (Fairfax, 2003).

Enforcement agencies are facing difficulties in clamping down on pyramid schemes. This is made worse when they turn a blind-eye to such activities or accept bribes to allow them to operate openly. Sometimes, operators may engage public figures to create legitimacy and credibility of their schemes, and the famous people will usually absolve responsibility once something goes wrong (Tuti Rastuti, 2019; Meithiana, Intan & Sukesu, 2019). According to a survey by the United States Federal Trade Commission, there are about 1.5 million people who fall victim to pyramid schemes each year. However, pyramid scheme victims are least likely to pursue justice or cooperate with law enforcement agencies to avoid scrutiny and shame. On top of that, pyramid scheme operators are known to employ strong-arm tactics to harass investors who want their money back (Matthews, 2020).

The development of information technology has also helped pyramid schemes to spread. Currently, the advent of information and technology makes it easier for unverified business activities to become well-known through social media platforms. Thus, it is now

more important for people to be cautious in investing and do not get influenced by greed.

Model Construction

Fundamental Elements and Working Mechanism in the 2-up System Pyramid Scheme

The basic component of the pyramid scheme starts with a mastermind on top of the pyramid, who gets people to recruit more members to the lower levels of the pyramid. The element that ensures the expansion of the pyramid is always related to so-called “commission” or “participation fees”. In this case, the promise of getting profits from this “business model” is basically being built on these fees that flow from the lower to upper level of the pyramid.

In the 2-up system, the participants are required to recruit at least 3 people to ensure that they will not suffer loss in this structure. This is because the “income” from the first two recruits will not go to the recruiter, but will be given to the upline member. Only with the recruitment of every third person that the recruiter will gain an income, hence its “2-up system” name. This unique mechanism acts as an incentive for participants to continue recruiting so they will not lose their initial “investment”. This type of pyramid scheme may be very attractive as the profits of upline members (people with many recruits) will grow exponentially when their down-line members recruit more people into the system.

Constructing the Profit Model of a 2-up System

	Description	Equation, $f(n)$	Relative Equation, $p(n)$
Step 1: Assumptions	Assume that each member in the system recruits exactly 3 people to avoid loss. An individual named A joins the system.	-	-
Step 2: Level 2 Profit	Only “investments” from a third person that A recruited will be given to him as returns. Let the third person’s name be B.	$f(2) = x$	$p(2) = 2^n x$

Step 3: Level 3 Profit	“Investments” from the first and second person recruited by B will be channelled to A. Let the 2 individuals recruited by B be named C and D, respectively.	$f(3) = 2x$	$p(3) = 2^1x$
Step 4: Level 4 Profit	“Investments” from the first and second person recruited by both C and D will be channelled to A. Let the person recruited by C be named E and F, while D recruits G and H.	$f(4) = 4x$	$p(4) = 2^2x$
Step 5: Level 5 Profit (Optional)	“Investments” from the first and second person recruited by all individuals E, F, G and H will be channelled to A.	$f(5) = 8x$	$p(5) = 2^3x$
Step 6: Profit Formulation	Let n be the number of levels to introduce n into the relative equation. Since earnings started from level 2, $n = 2, 3, 4$ and so forth.	-	$p(n) = 2^{n-2}x$
Step 7: Total Profit Formulation	In the interest of knowing the total profit $P(n)$ earned by A, we introduce a summation of $n = 2, 3, 4, \dots, i$.	-	

Visualisation of Profitability Up to Fifth Level

Figure 1 shows the visualised model of the 2-up system pyramid scheme up to level 5. The outline colours indicate that “investments” of that particular individual will go to individuals with their respective filled colour. For instance, individual A is black and profits from the first

two of recruits by A will go to the person above him. A will earn money contributed by a third recruit, which is outlined in black. Below him, all the circles with black outlines indicate that their “investments” will go to individual A. The logic of this working mechanism is the same for other circles.

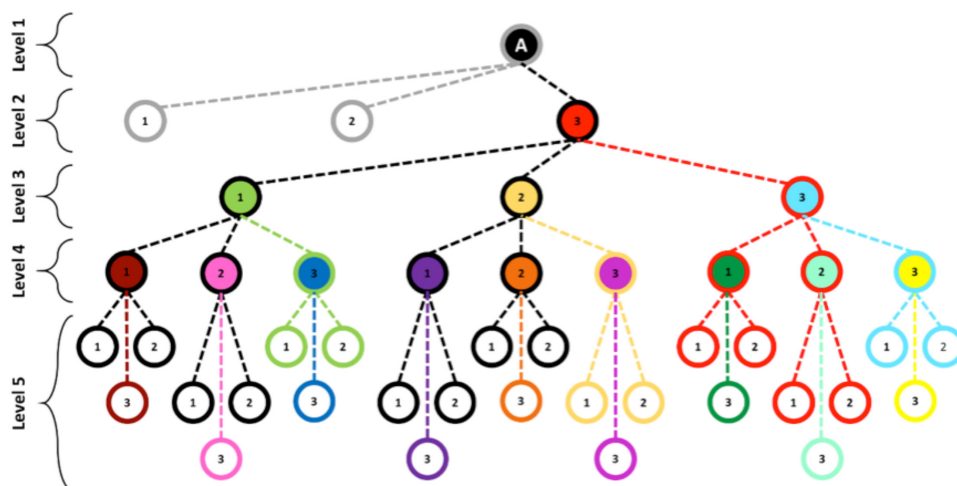


Figure 1: The 2-up system pyramid scheme profit model

Sustainability of 2-up System

The 2-up system is unsustainable as the recruitment is exponential and not feasible for

the long term. To illustrate how many levels of recruitment can be achieved in 2-up system, we will calculate it with the aid of Microsoft Excel.

	Description
Step 1	There are some assumptions that need to be made in the calculation. 1. The first level contains only 1 person. 2. Each person will recruit 3 persons. 3. The global population (carrying capacity) is 7,951,000,000 (rounded to million)

Step 2 Build a table that has levels and recruitment numbers until level 5.

Table 1: Number of levels and its recruitment number

Number of Levels	Number of Recruitments	Total Number of Recruitments
1	1	1
2	3	4
3	9	13
4	27	40
5	81	121

Step 3 Derive the formula of total number of recruitments at n level from the table.
Hence, the total number of recruitments can be denoted as
Total number of recruitment at n level
 $= \text{number of recruitment at } n \text{ level} + \text{total number of recruitment at } n-1 \text{ level}$

Step 4 Derive the formula of the number of recruitments at n level.
The number of recruitments will grow at power of 3 since each person is required to recruit 3 persons. The sequence of number is the geometric progression with $a_1=1$, $r=3$. The formula of geometric progression is shown below:

$$a_n = a_1 r^{n-1}$$

Substitute $a_1=1$, $r=3$ into equation above,

$$a_n = 1 (3^{n-1}) = 3^{n-1}$$

Hence, the number of recruitments for each level can be denoted as

Number of recruitments for each level $= 3^{n-1}$, n is the number of levels

Total number of recruitment at n level

$$= 3^{n-1} + \text{total number of recruitment at } n-1 \text{ level}$$

Step 5 Derive the formula of the total number of recruitments at n level
The summation of n terms by geometric progression when $r>1$ can be denoted as

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

From the table and the assumptions above, we can discover that $r=3$ since the number of recruitments grow exponentially at the power of 3 for every n level.

Substitute $r=3$ and $a=1$ into the geometric formula above.

$$S_n = \frac{1(3^n - 1)}{3 - 1} = \frac{3^n - 1}{2}$$

Since we need to find total number of recruitments at $n-1$ level, it can be modified from the equation above.

$$S_n = \frac{3^n - 1}{2}$$

The total number of recruitments at $n-1$ level can be denoted as

$$\text{Total number of recruitment at } n-1 \text{ level} = \frac{3^{n-1} - 1}{2}$$

Hence, the total number of recruitments at levels can be denoted as

$$\text{Total number of recruitment at } n \text{ level} = 3^{n-1} + \frac{3^{n-1} - 1}{2}$$

Step 6 To find the maximum levels of a 2-up system can possibly have.

Total number of recruitment at n level < global population

$$3^{n-1} + \frac{3^{n-1} - 1}{2} \leq 7,951,000,000$$

$$3(3^{n-1}) - 1 \leq 15,902,000,000$$

$$3(3^{n-1}) \leq 15,902,000,001$$

$$3^{n-1} \leq 5,300,666,667$$

To solve the equation above, logarithm has been applied in the equation.

$$n - 1 \log_{10} 3 \leq \log_{10} 5,300,666,667$$

$$n - 1 \leq \frac{\log_{10} 5,300,666,667}{\log_{10} 3}$$

$$n - 1 \leq 20.3813$$

$$n \leq 21.3813$$

Since the number of levels can only be an integer, the maximum levels of a 2-up system can possibly contain is 21 levels.

Step 7 To evaluate the percentage of population that is involved in 2-up system
Firstly, we find the population involved in the 2-up system when it has 21 levels.

$n = 21$, *Total number of recruitment at n level*

$$= 3^{20} + \frac{3^{20} - 1}{2} = 5,230,176,601$$

Then, we find the percentage of population involved in the system.

$$\text{Percentage of population involved in the 2-up system} = \frac{5,230,176,601}{7,951,000,000}$$

$$\approx 65.78\%$$

If there are 21 levels in the 2-up system, approximately 65.78% of the world population would have to be involved in the 2-up system pyramid scheme to ensure sustainable payments for all members, which is impossible to achieve. In reality, there are many uncertainties, such as the number of people required to recruit one person. As we all know, not every person that we recruit in the pyramid scheme will actively get involved in the 2-up system. Hence, it is

impossible to be able to persuade them to join after you recruit them. Although it sounds good to have 21 levels in the 2-up system, however, due to the factors mentioned above and the shrinking scale of recruitment, the pyramid's so-called "bubble" will burst even before reaching the 21st level.

The 2-up system is similar to other pyramid schemes and will collapse when there are not enough recruits to sustain the whole system. The

bottom-level (new) members will be frustrated by the loss of their money. On the other hand, top-level members will stop receiving “sales income” from members at the bottom level. But their losses may be less as they would have received a lot of payments from their downlines.

Hence, the 2-up system benefits only the top-level members and cannot be sustained. It will be disbanded once the rate of recruitment begins to slow down. A sample calculation on the probability of losing money in a 2-up system is as follows:

Description	
Step 1	Determine the number of persons losing money and the total person involved. The number of persons losing money can be denoted as <i>Number of persons losing money at level $n=3^{n-1}$, n=number of levels</i> <i>Total number of recruitment at n level $=3^{n-1} + \frac{3^{n-1} - 1}{2}$</i>
Step 2	Divide the number of persons losing money with the total persons involved $\frac{\text{Number of persons losing money}}{\text{Total persons involved}} = \frac{3^{n-1}}{3^{n-1} + \frac{3^{n-1} - 1}{2}}$
Step 3	Simplify the equation in Step 2 $\frac{3^{n-1}}{3^{n-1} + \frac{3^{n-1} - 1}{2}} = \frac{3^{n-1}}{\frac{2(3^{n-1}) + 3^{n-1} - 1}{2}} = \frac{2(3^{n-1})}{3(3^{n-1}) - 1}$
Step 4	Ignore the number “1” in the denominator $\frac{\text{Number of persons losing money}}{\text{Total persons involved}} = \frac{2(3^{n-1})}{3(3^{n-1})}$
Step 5	Ignore the number “3” for both numerator and denominator $\frac{\text{Number of persons losing money}}{\text{Total persons involved}} = \frac{2}{3} \approx 66.67\%$ In which the equation $\frac{2(3^{n-1})}{3(3^{n-1})} < \frac{2(3^{n-1})}{3(3^{n-1}) - 1}$ Hence, the probability of losing money is less than 66.67%.

Conclusion

A pyramid scheme is a business model where participants are lured by the promise of being paid or provided services for recruiting others into the scheme. As the scheme grows exponentially, it becomes impossible to find more recruits to maintain payments and most members will stop receiving profits. As a result, pyramid schemes are unsustainable and often illegal. In this study, the possible returns of a top individual in the scheme are described and the maximum carrying capacity is identified before going for collapse.

In the result and discussion, population capacity has been identified as a limitation in the 2-up system. The prediction of the situation is illustrated mathematically by setting 3 assumptions: the 1st level contains only one person; each person will recruit 3 others and the global population (carrying capacity) is 7,951,000,000 (rounded to million). For every level, the number of recruits will grow at a power of three since each member is required to recruit three people. The sequence of numbers is a geometric progression with a formula of $a_n = a_1 r^{n-1}$, with $a_1=1$ and $r=3$. The maximum level of a 2-up system is identified when the global

population becomes greater than the total number of recruitments at n level. With that, a possible level of 21 is determined as the maximum level with a percentages population of 65.78%. When the level increases to 21, the pyramid structure becomes vulnerable due to external and internal factors, such as the membership expansion, legislation issues and cash flow problems. Like other pyramid schemes, the 2-up scheme will collapse when there are not enough recruits to sustain it, and those at the bottom level will lose their investments.

The probability of people losing money in a 2-up system is part of our investigation. Since each person will need to recruit 3 people to prevent a loss and earn money, the number of persons in each level will increase 3 times as the level number increases by one. The probability of losing money is denoted as 3^{n-1} , where n = number of level, while the total number of recruitment at level n is noted as $3^{n-1} + \frac{3^{n-1} - 1}{2}$, where n = number of level. As a result, the probability of people losing money is less than 66.67%. The 2-up pyramid scheme system is therefore an unsustainable model and its members will face imminent loss. The constructed working model and formulation of the 2-up system pyramid scheme in this study may serve as a guideline for further research. Hopefully, these models and formulations may serve as a logical reference for those who wish to create awareness on the dangers of investing in pyramid schemes.

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