# Application of FMEA in Solving the Financial Inclusion Issue in India

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## ABSTRACT:

*Failure mode and effect analysis (FMEA) is an operational tool which systematically, proactively evaluates the method to spot where the potential failure might occur and identify the potential causes, which would help to reduce the relevant impact of various failures in the process.*

*Financial inclusion generally understood to mean the method of ensuring access to appropriate financial products and services needed by all sections of society including vulnerable groups at an economical cost. It's an immediate impact on the expansion of the economy of the country.*

*This paper analyses the effect of Indian citizen participation in financial inclusion and identifies issues faced by the individuals during investments in financial products. The paper is based on the primary data. Here, Failure mode and effect analysis (FMEA) is used to analyse the risk associated with the investment process which the general public will face while investing and eliminate or reduce the risk by providing solutions for the development of future processes or take appropriate risk mitigation methods. Hence the outcome of this research paper will be useful for financial institutions which are in need to optimize their resources for selling the financial products and spreading awareness about the same.*

# Application of FMEA in Solving the Financial Inclusion Issue in India

## 1.  Introduction to FMEA Model

Failure Mode and Effect Analysis (FMEA) was first developed by the aerospace industry within the year 1960s according to their obvious reliability and safety requirements. FMEA is employed for detecting & preventing system, process & product problems before they occur. It focuses on preventing problems, enhancing safety and increasing customer satisfaction. Ideally FMEA are conducted on stages of process development or New product design, although conducting an FMEA on Existing products or processes can also yield benefits. FMEA allows us to prevent system, product and process problems before they occur. It reduces costs considerably by identifying system, product and process improvements early within the development cycle. It prioritizes actions that decrease risk of failure.

*FMEA analyses:*

- Potential failure modes of product or machine

- Potential effects of failure

- Potential causes for failure

- Assesses current process controls

- Determines a risk priority factor

In this research paper we are going to use this operational tool to identify the area of risk causing the failure in the financial inclusion, priorities the risk and suggested the action points to overcome the risk in the Indian market.

## 2.  Literature Review

FMEA is an operational model and is not used in financial services. Here, we have tried to use this risk management model to analyse the risk associated to the investments in financial instruments. We have created this model by

taking responses from the Indian respondents. The questionnaire was generated according to the standard FMEA model requirements.

FMEA model was further studied by referring to the International Journal of Engineering Science and Innovative Technology (IJESIT) paper: "Analysis for reducing breakdown of a sub system in the life care product manufacturing Industry" by Rakesh.R, Bobin Cherian Jos & George Mathew. With the help of this paper we understood in detail how the FMEA model is used in the manufacturing industry for analysing risk to reduce the breakdown in the system. Apart from this journal we have even referred to the book: "Failure Mode and Effect Analysis" by D.H. Stamatis for understanding this model in detail. These details have helped us to understand the standard format of the FMEA model to identify the risk and prioritize them on the basis of their riskiness.

As this model is not so familiar in the financial service sector. Here, we have created this model considering few assumptions. We assure that these assumptions do not have a significant impact on the creation of the FMEA model. After creating this model, with the help of the book: "Research Methodology: Methods & Techniques" by C.R. Kothari, we were able to conduct dependency tests [ANOVA] on the sample data. These tests have been conducted to show the effect of biasness, if any, on the FMEA model due to certain age groups or income income groups.

We have found out that in case of the financial service sector not all the potential causes for the failure can be mitigated using this FMEA model. In this case the risk associated with the financial inclusion can be lowered by acting on the action points mentioned in this paper below but cannot be irradiated completely.

After successfully building the FMEA model for analysing the risk associated with the investments in financial instruments we believe that FMEA being an operational model can be used across other areas too.

## 3. Research Methodology

### i.     Research Process

#### 1. Material & Method

Tools for data collections: Primary and secondary data.

Primary Data: Questionnaire given to Individuals of India.

Secondary Data: Collected from research journals, Articles and online resources.

#### 2. Research Type

It's a Quantitative research, where a questionnaire is prepared to know the responses of the general public of India. Here Random sampling is carried out. Descriptive analysis is used to represent the outcome of study.

#### 3. Conceptual Limitation

a. Study is limited to India.

b. Data is collected from the general public in mainly urban populations of India.

c. Financial Literacy gauges through knowledge and understanding about the basic financial products.

### ii.     Objective of the Study

Following are the objectives of the study:

1. To find the reasons for not Investing in Financial products by Indian citizens.

2. To find out the basis of Investment Decisions made by Indian citizens.

3. To find out the delighting factors which the Indian citizens wish to have.

4. To identify the potential causes of incurring losses while investing in financial products by the Indian citizens.

5. Designing FMEA models to identify the potential failures of investments that arise due to various causes and rank them according to their risk priority (RPN). This ranking will help to identify the highest concerned potential causes for the failure in investment and will help to take actions

accordingly to minimize the effect of the causes and ultimately help the general public invest in financial products with minimum risk of losing money.

### iii. Hypothesis

**Ho1**:

There is no significant difference in the rating given by the respondent of different age groups with regards to the severity of the potential failure after investing in financial products.

**Ho2**:

There is no significant difference in the rating given by the respondent of different income group with regards to the severity of the potential failure after investing in financial products.

**Ho3**:

There is no significant difference in the rating given by the respondent of different age groups with regards to the potential causes for incurring loss after investing in financial products.

**Ho4**:

There is no significant difference in the rating given by the respondent of different income groups with regards to the potential causes for incurring loss after investing in financial products.

## 4. FMEA Description

Risk Management methodology consists of: Risk Identification, Risk Quantification (By Qualitative or Quantitative Analysis.). The next step is risk response strategy and the last step is Risk response implementation strategy. The risk Quantification through Qualitative Analysis can be done by FMEA. Here in the paper we are trying to identify the risk and trying to rank the risk in order to minimise the Risk Effect.

## i. Why FMEA?

FMEA model analyses and evaluates potential risk and their causes. Prioritizes potential risk and drives actions to eliminate or reduce their likelihood of occurrence.

FMEA provides a methodology for documenting this analysis for future use and continuous process improvement. It analyses, defines, estimates, and evaluates risk (product and process risks) by structured approach. It is a development tool with which the development and planning accuracy will be evaluated during the development and planning phase.

## ii. The FMEA Benefits

- Prevention planning
- Identifies change requirements
- Cost reduction
- Decreased waste and warranty costs
- Reduce non-value-added operations
- Systematic procedure
- Acknowledged procedure
- Knowledge transfer through departments
- Risk management instead of crisis management
- Quantified risk
- Determination of failure modes

## iii. Steps in FMEA Model Creation

The purpose of FMEA is to determine the potential failure modes of investment options and to eliminate risk as early as possible and avoid using improper methods as part of the processes. FMEA also provides solutions for the development of future processes.

 *Methodology followed for Model creation:*

*Step 1*: First of all, collect the processes/ option of the investment in the financial instruments. Then identify the process/option which needs to be improved.

***Step 2:*** Now determine the failure modes i.e. how often one can incurred loss, or getting return below expectations. Assign the severity ranking (S) to each failure according to the respective effects on the process.

***Step 3:*** Determine the causes of potential failures or Risk and estimate the likelihood of each potential failure that can occur. Give the rating of occurrence (O) to each failure according to the likelihood of its occurrence.

***Step 4:*** Make a list of approaches to detect the failures and determine the ability of the system to detect the failures prior to the failures occurring. Hence assign the detection rating (D) of each potential failure.

***Step 5:*** Calculate the risk priority number (RPN) and prepare the priorities for attention.

***Step 6:*** Take suitable actions to enrich the performance of the investment process resulting in reduction in RPN Number

***Step 7:*** Prepare FMEA report in a tabular form**.**

## iv. Objectives Achieved by the Institutions

In all after implementing the FMEA, it helps in achieving the following institutions objectives as well:

- Failure reduction & reduction in correction loops

- Avoiding time wastage

- Increased functional reliability and safety of the processes

- Reduced warranty costs

- Early identification and assessment of a potential product failure or process failure and the effects and causes of this failure

- Which can prevent or reduce the occurrence of failures

- Development and improvement of knowledge base within the institution.

## 5. Research Outcome

The outcome of research is as follows:

## 5.1 Occupation of Respondents

The primary survey was able to record 212 Responses from the general public. This survey consists of 67% male respondents and 33% female respondents out of which 46% were students, 40% were working in private sector, 6% were working in government sector, other 8% were: farmer, business man, doctor, housewife, shop owner, retired member & self-employed person (Figure 1).
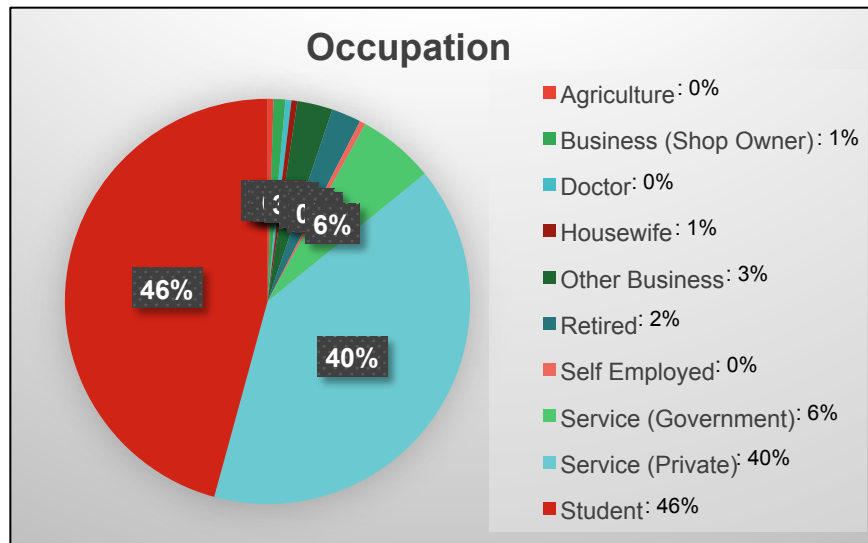


**Figure 1 Occupation of Respondents**

## 5.2 Age Group of Respondents

These respondents are having varying age groups; 58% belongs to the 21-25 age group, 25% belongs to the 26-30 age group and the other 17% belongs to the 31 and above age group (Figure 2). Hence the majority of the sample population is of younger generation who have high potential of investment in future. Hence, the majority of the sample population is of younger generation who have high potential of investment in future.
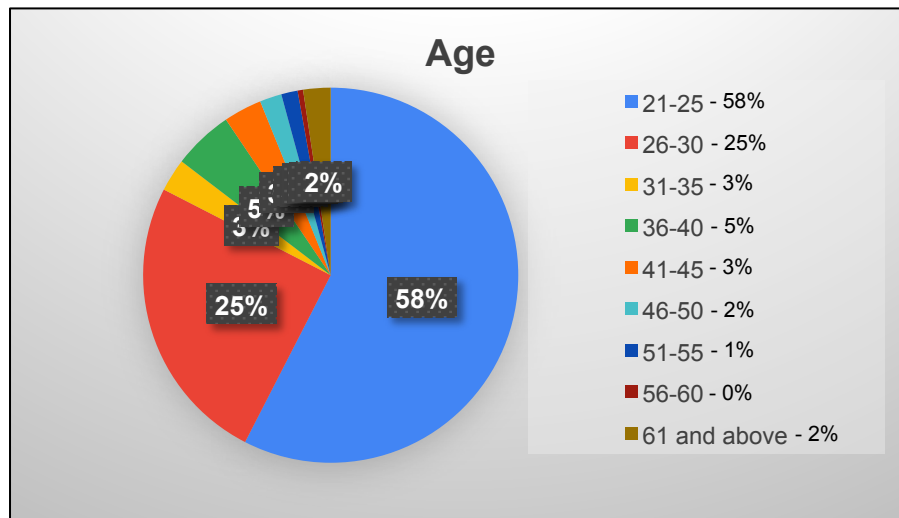
**Figure 2 Age Group of Respondents**

## 5.3 Reasons For Not Investing

This paragraph addresses the first objective of the research: "To find the reasons for not Investing in Financial products by Indian citizens". this survey it was distinctly identified those who invest in financial instruments and those who do not invest in some of the financial instruments or any of them. After asking the reason for not investing in some or all of the financial instruments it was found that there are majorly 4 reasons, i.e. lack of awareness/knowledge, lack of capital, lack of time & risk level of investment (Figure 3). Hence this shows that the respondents agree that the lower level of awareness is the major issue for not investing. This also indicates that the general level of understanding about financial products is low. Hence steps are necessary to increase awareness level.
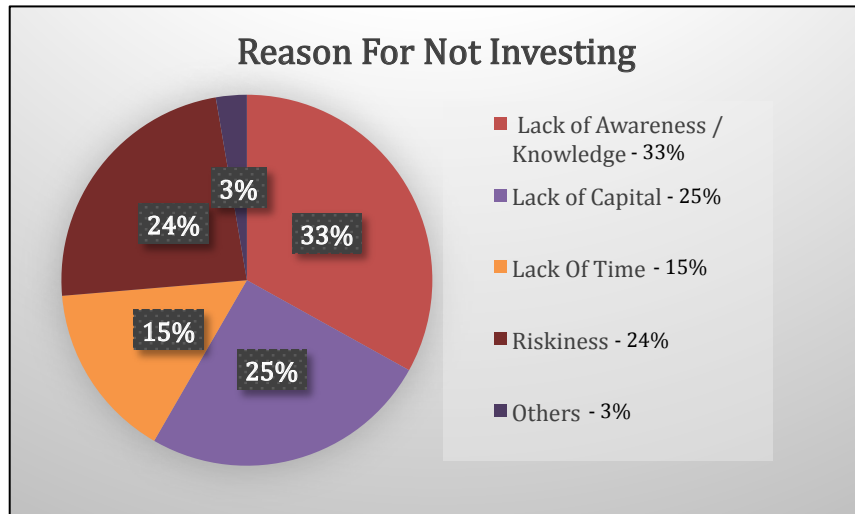
**Figure 3 Reason for Not Investing**

## 5.4 Investment Decision

This paragraph addresses the second objective of the research: "To find out the basis of Investment Decision made by Indian citizens". Those who invest in financial instruments take their decisions on the basis of various factors such as personal analysis, broker's advice, financial analyst advice, current price of the stock, investor's confidence, risk tolerance level & strength of Indian economy. The outcome of the survey states that 29% of the people take investment decisions on the basis of the personal analysis (Figure 4). Here you can see that even after people feel a lack of awareness is the major reason for not investing, people still believe in their personal analysis and do not go to any advisor. This shows the Indian mentality where people are taking the risk of investing based on personal prejudices which is not an effective way of investing. We need to make people aware that an investment decision taken with the help of financial advisor suggests and renders financial instruments on the basis of financial situation in the market which will help retail investor in reducing risk tolerance in the investment market.
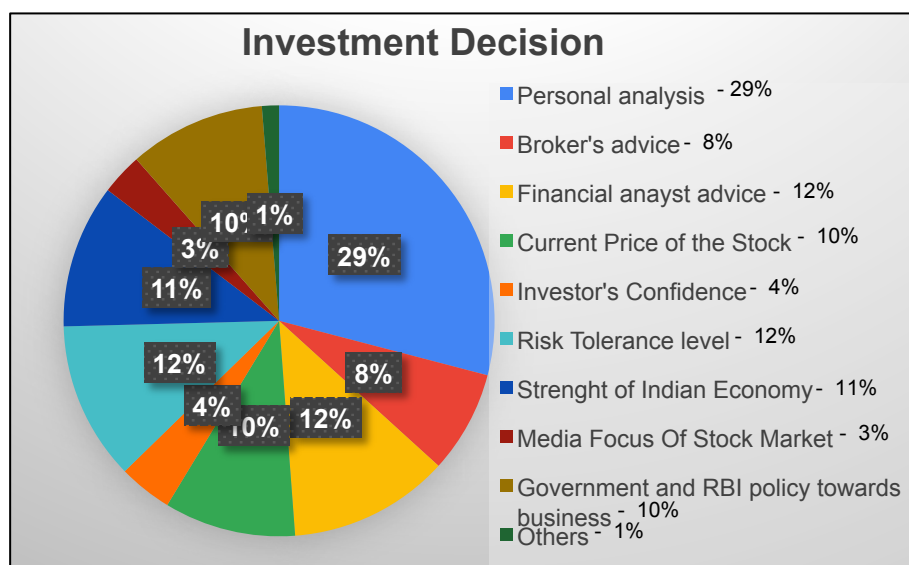
**Figure 4 Investment Decision**

## 5.6 Financial Products

Further we have checked the awareness about the various financial products for investments. The research outcomes are mentioned in following table:

| Financial Products | Total |
|---|---|
| Bank Deposits | 25.67% |
| Life Insurance | 18.49% |
| Mutual Funds/ SIPs | 16.34% |
| Equity/Stocks/Shares | 11.85% |
| Precious Metals (Gold/Platinum/Silver) | 8.44% |
| Real Estate | 7.36% |
| Post Office Saving Schemes | 6.10% |
| Pension Schemes | 3.95% |
| Debentures/Bonds | 0.90% |
| Company Deposits | 0.72% |

| Commodities Futures | 0.18% |
|---|---|
| **Grand Total** | **100.00%** |

**Table 1 Financial Products**

It has been observed that people are comfortable in investing in bank deposits (25.67%), Life Insurance (18.49%) & Mutual funds (16.34%) compared to other products.

## 5.7 Delighting Factor

This paragraph addresses the third objective of the research: "To find out the delighting factors which the Indian citizens wish to have". We have even asked for the factors if provided by the financial institutes which will delights the citizens in India such as;

o   You can afford foreign education for children.

o   You can afford Indian education for children.

o   You can afford a Big house in Upmarket place of your city/ village

o   You can afford a Normal house in your city/ village,

o   ROI more than 40%,

o   ROI more than 10%,

o   You can afford Child's Destination wedding,

o   You can afford Child's normal wedding,

o   You can afford best of the healthcare facility for your family members in Tier1 (well reputed) private hospital,

o   You can afford best of the healthcare facility for your family members in Tier2/ Government hospital,

o   You will be getting inflation adjusted returns of more than Rs. 1Lacs per months,

o   You will be getting inflation adjusted returns of more than 10000 per month,

o   You can afford a Luxury car like Mercedes, BMW, Audi.

o   You can afford a Normal car like Maruti, Hyundai

o   Others if they want to specify any.

The survey analysis (Figure 5) states that the financial institutes providing ROI of more 40% & the investments which will help individuals afford best of the healthcare facility for their family members in Tier1 (well reputed) private hospitals delights the most of all the other factors. Hence, we can say that as the world faces many endemic diseases now and then such as coronavirus, Sars, Swine flu etc. people want to increase their savings as early as they can to be able to provide better healthcare facilities in future.
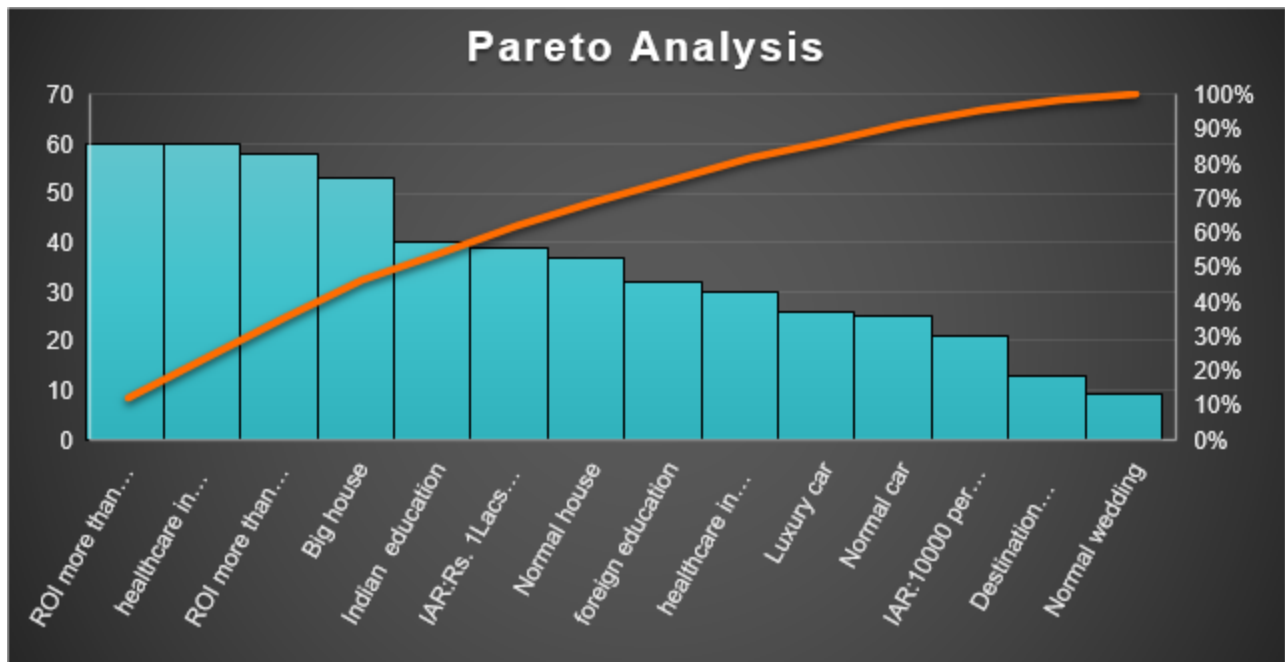
**Figure 5. Delighting Factor**

## 5.8 Causes of Failure

This paragraph addresses the fourth objective of the research: "To identify the potential causes of incurring loses while investing in financial products by the Indian citizens". People incur loss after investing money in the financial products. The causes due to which the such failure arises are listed below:

    o    Lack of knowledge.

    o    Economic instability.

    o    Political instability.

    o    Change in management of instrument investment.

    o    Technology change.

    o    Investment made on the opinion of non-experts/rumours.

    o    Institutional collapse.

    o    Change in taxation policy in the country.

    o    Others if any.

After analysing 212 responses from the general public it has been found out that 72% of the respondents says that lack of knowledge is the highest potential cause due to which they are incurring loss in investment followed by economic Instability being 61%. Hence educating the individuals with the financial inclusion knowledge by various modes should be the primary focus to reduce the losses while investing in the financial products.
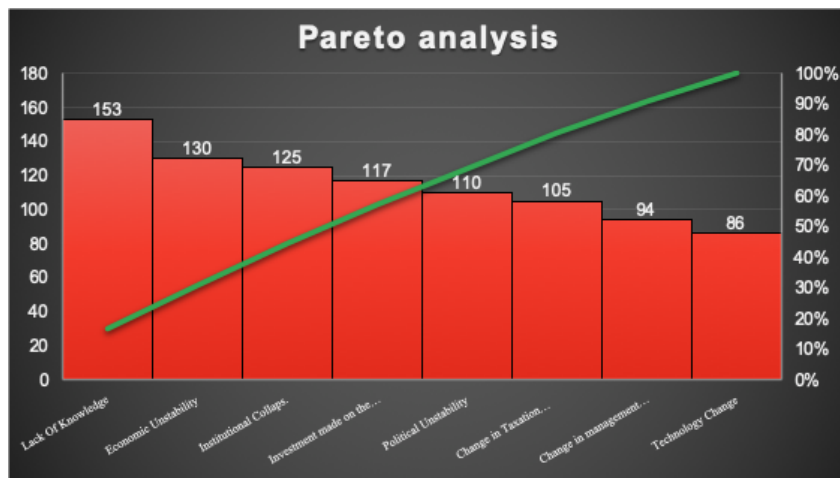


**Figure 6. Causes of Failure**

## 5.9 FMEA Model Development

This section addresses the fifth objective of the research: "Designing FMEA models to identify the potential failures of investments that arise due to various causes and rank them according to their risk priority (RPN). This ranking will help to identify the highest concerned potential causes for the failure in investment and will help to take actions accordingly to minimize the effect of the causes and ultimately help the general public invest in financial products with minimum risk of losing money". The model developed through calculating Severity, Occurrence & Detection in following:

### 5.9.1 Risk Assessment Factors:

- **Severity (S):** A number from 1 to 5 is selected, depending on the severity of the potential failure mode's effect:

  - 1= no effect
  - 5= maximum severity

| Rating | Description | Definition |
|--------|-------------|------------|
| 5 | Very High | Always loses money |
| 4 | High | Mostly loses money |
| 3 | Moderate | Sometimes loses money |
| 2 | Low | Rarely loses money |
| 1 | Very Low | Never loses money |

**Table 2. Severity Rating**

The Severity rate for both the potential failure (Loses whole money & Return below expectation) are calculated on the basis of the answer from the respondents for the following questions:

1. How often one can incur loss after investing in financial instruments?
2. How often do you get a return below your expectations?

- **Detection (D):** A number from 1 to 5 is selected, depending on how unlikely it is that the fault will be detected by the system responsible:

> o   1= nearly certain detection
>
> o   5= impossible to detect.

In our case we have assumed that the failure is certainly detectable. Being these are financial instruments the loses and profit can be easily noticed through online as well as offline systems.

- **Occurrence (O):** A number from 1 to 5 is selected, depending on the likelihood of the failure mode's occurrence:

> o   1= very unlikely to occur
>
> o   5= almost certain to occur

In our cases probability of occurrence is calculated by finding the percentage of respondents who feel the potential causes are of very high concern for the failure.

for e.g.  72% of the respondents of India says that lack of knowledge is the potential cause for the failure of the investment. So, the occurrence rate for this cause is calculated as:

$$O = 5 * 0.72$$

$$O = 3.6$$

The Occurrence rate for both the potential failure (Loses whole money & Return below expectation) are calculated on the basis of the answer from the respondents for the following questions:

1.  Following are the possible reasons for " incurring loss" after investing in financial instruments. Rank the reasons on the basis of the riskiness you feel:

    i.    Lack of Knowledge

    ii.   Economic Instability

    iii.  Political Instability

    iv.   Change in management of instrument investment

    v.    Technology Change

    vi.   Investment made on the opinion of Non-Experts/Rumours

    vii.  Institutional Collapse

2.  Following are the possible reasons for " incurring loss" after investing in financial instruments. Rank the reasons on the basis of the riskiness you feel:

    i.      Lack of Knowledge

    ii.     Economic Instability

    iii.    Political Instability

    iv.     Change in management of instrument investment

    v.      Technology Change

    vi.     Investment made on the opinion of Non-Experts/Rumours

    vii.    Institutional Collapse

● **Risk Priority Number (RPN):** RPN is the indicator for determining proper corrective action on the failure modes. The failure mode's risk is calculated by the formula RPN = S x O x D. RPN = Severity x Probability of Occurrence x Probability of Detection. RPN will be a number between 1 (virtually no risk) and 1000 (extreme risk).

## 5.9.2 FMEA Model

| Process | Potential Failure | Potential Failure | S | Potential Causes | O | D | RPN | Action points | Revised occurrence | RPN |
|---------|-------------------|-------------------|---|------------------|---|---|-----|---------------|--------------------|-----|

| | mode | | | | | | | | rate | |
|---|---|---|---|---|---|---|---|---|---|---|
| Investment In the financial Instruments | Incur Loss after investing | | | Lack of Knowledge | 3.6 | 1 | 11 | Including basic education of finance in curriculum (for e.g. in 10th& upto 12th in all the branches) | 2.2 | 7 |
| | | | | Economic Instability | 3.1 | 1 | 9 | Through stable monetary and fiscal policy. | 1.8 | 6 |
| | | | | Political Instability | 2.6 | 1 | 8 | NA | 2.6 | 8 |
| | | Loses whole money | 3.1 | Change in management of instrument investment | 2.2 | 1 | 7 | NA | 2.2 | 7 |
| | | | | Technology Change | 2.0 | 1 | 6 | Including basic education of disruptive technology in curriculum (for e.g. in 10th& upto 12th in all the branches) | 1.2 | 4 |
| | | | | Investment made on the opinion of Non-Experts/Rumours | 2.7 | 1 | 9 | Financial education | 1.6 | 5 |
| | | | | Institutional Collapse | 2.9 | 1 | 9 | Through stable monetary policy & | 1.8 | 5 |

| | | | | | | | enforcing proper governance over the financial institutions. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Return Below Expectations | 3.0 | Lack of Knowledge | 3.3 | 1 | 10 | Including basic education of finance in curriculum (for e.g. in 10th& upto 12th in all the branches) | 2.0 | 6 |
| | | | | Economic Instability | 3.1 | 1 | 9 | Through stable monetary and fiscal policy. | 1.9 | 6 |
| | | | | Political Instability | 2.6 | 1 | 8 | NA | 1.6 | 5 |
| | | | | Change in management of instrument investment | 2.5 | 1 | 8 | NA | 1.5 | 5 |
| | | | | Technology Change | 1.9 | 1 | 6 | Including basic education of disruptive technology in curriculum (for e.g. in 10th& upto 12th in all the branches) | 1.2 | 4 |
| | | | | Investment made on the opinion of Non-Experts/Rumours | 2.6 | 1 | 8 | Financial education | 1.5 | 5 |

| | | | | Institutional Collapse | 2.7 | 1 | 8 | Through stable monetary policy & enforcing proper governance over the financial institutions. | 1.6 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Change in Taxation Policy in the Country | 2.5 | 1 | 7 | Through stable monetary and fiscal policy. | 1.5 | 4 |

**Table 3. FMEA Module of Potential Failures in financial investments**

**Note: S*: Severity, O*: Occurrence, D*: Detection, RPN*: Risk Priority Number**

For the investments in the financial instruments two potential failures have been found out; loses entire money & gains return below expectations. For these two potential failures we have identified three major causes lack of knowledge (RPN-11), investment made on the opinion of Non-Experts/Rumours(RPN – 9) & Economic Instability (RPN-9).The average risk priority for all the potential cause is 9 , after taking the required action (as shown Table 3) the average risk priority number can be brought down to 5 (Note that we have assumed for all the potential causes after taking action the reduction in occurrence rate will approximately reduce by 35%). Here the failure causes such as Political Instability & Change in management of instrument investment have no control measures which the government, financial institutes or an individual can take.

## 5.10 Hypothesis Testing

### i. Ho1:

There is no significant difference in the rating given by the respondent of different   age groups with regards to the severity of the potential failure after investing in financial products.

**Input Data:**

## Severity Index

| Age | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51-55 | 56-60 | 61 and above |
|---|---|---|---|---|---|---|---|---|---|
| Loses all money | 3.09 | 3.12 | 3 | 2.81 | 3.14 | 3 | 3 | 3 | 3.8 |
| Return below expectations | 2.99 | 2.97 | 4 | 2.81 | 3.42 | 2.75 | 3.33 | 3 | 3.4 |

**Table 4. Age Groups Vs Potential Failures**

**Output:**

After conducting Anova: Single factor test on the 'Age Groups Vs Potential Failure' table following results have been found out.

**Anova: Single Factor**

**SUMMARY**

| Groups | Count | Sum | Average | Variance |
|---|---|---|---|---|
| Column 1 | 2 | 6.08 | 3.04 | 0.005 |

| | | | | |
|---|---|---|---|---|
| Column 2 | 2 | 6.09 | 3.045 | 0.01125 |
| Column 3 | 2 | 7 | 3.5 | 0.5 |
| Column 4 | 2 | 5.62 | 2.81 | 0 |
| Column 5 | 2 | 6.56 | 3.28 | 0.0392 |
| Column 6 | 2 | 5.75 | 2.875 | 0.03125 |
| Column 7 | 2 | 6.33 | 3.165 | 0.05445 |
| Column 8 | 2 | 6 | 3 | 0 |
| Column 9 | 2 | 7.2 | 3.6 | 0.08 |

**ANOVA**

| Source of Variation | SS | df | MS | F | P-value | F crit |
|---|---|---|---|---|---|---|
| Between Groups | 1.15767778 | 8 | 0.14470972 | 1.80598697 | 0.19825666 | 3.22958261 |
| Within Groups | 0.72115 | 9 | 0.08012778 | | | |
| Total | 1.87882778 | 17 | | | | |

**Figure 7. Anova Result [Age Groups Vs Potential Failure]**

From the test it has been seen that P-value is greater than 0.05 hence we accept null hypothesis and conclude that there is no significant difference in the rating given by the respondent of different   age group with regards to the severity of the potential failure after investing in financial products and will have no impact on the FMEA model created above.

## ii.   Ho2:

There is no significant difference in the rating given by the respondent of different income groups with regards to the severity of the potential failure after investing in financial products.

**Input Data:**

### Severity Index

| Income | Above Rs. 1 Lakh per Month | Rs.50,001 to Rs. 1 Lakh per Month | Rs.20,001 to Rs. 50,000 per Month | Less than Rs.20,000 per Month |
|---|---|---|---|---|
| Loses all money | 3.08 | 3 | 3.09 | 3.15 |
| Return below expectations | 3.28 | 3.03 | 3.1 | 2.9 |

**Table 5. Income Groups Vs Potential Failures**

**Output:**

After conducting Anova: Single factor test on the 'Income Groups Vs Potential Failure' table following results have been found out (Figure 8).

From the test it has been seen that P-value is greater than 0.05 hence we accept null hypothesis and conclude that there is no significant difference in the rating given by the respondent of different income group with regards to the severity of the potential failure after investing in financial products and will have no impact on the FMEA model created above.

**Anova: Single Factor**

**SUMMARY**

| Groups | Count | Sum | Average | Variance |
|---|---|---|---|---|
| Column 1 | 2 | 6.36 | 3.18 | 0.02 |
| Column 2 | 2 | 6.03 | 3.015 | 0.00045 |
| Column 3 | 2 | 6.19 | 3.095 | 5E-05 |
| Column 4 | 2 | 6.05 | 3.025 | 0.03125 |

**ANOVA**

| Source of Variation | SS | df | MS | F | P-value | F crit |
|---|---|---|---|---|---|---|
| Between Groups | 0.0349375 | 3 | 0.01164583 | 0.90016103 | 0.51502746 | 6.59138212 |

| | | | |
|---|---|---|---|
| Within Groups | 0.05175 | 4 | 0.0129375 |
| Total | 0.0866875 | 7 | |

**Figure 8. Anova Result [ Income Groups Vs Potential Failures]**

### iii. Ho3:

There is no significant difference in the rating given by the respondent of different age groups with regards to the potential causes for incurring loss after investing in financial products.

**Input Data:**

**Potential Causes Rating**

| Age | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51-55 | 56-60 | 61 and above |
|---|---|---|---|---|---|---|---|---|---|
| Lack Of Knowledge | 3.8 | 3.76 | 3.83 | 3.77 | 3.58 | 3.75 | 4 | 4 | 3.08 |
| Economic Instability | 3.72 | 3.68 | 3.73 | 3.95 | 3.2 | 3.5 | 4 | 4 | 3.25 |
| Political Instability | 3.62 | 3.53 | 3.75 | 3.7 | 3.13 | 3.67 | 4 | 4 | 2 |
| Change in management of instrument investment | 3.56 | 3.49 | 3.72 | 3.51 | 3.36 | 3.29 | 3.6 | 3.77 | 3.26 |
| Technology Change | 3.43 | 3.28 | 3.42 | 2.95 | 3 | 2.67 | 2.75 | 3.5 | 3.5 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Investment made on the opinion of Non-Experts/ Rumours | 3.68 | 3.58 | 3.67 | 3.57 | 3.67 | 3.5 | 4 | 4 | 0 |
| Institutional Collapse | 3.71 | 3.64 | 3.67 | 3.71 | 3.5 | 3.67 | 4 | 4 | 0 |
| Change in Taxation Policy in the Country | 3.7 | 3.52 | 3.82 | 3.82 | 3 | 3.33 | 3 | 3 | 3 |

**Table 6. Age Groups Vs Potential Causes**

**Output:**

After conducting Anova: Single factor test on the 'Age Groups Vs Potential Causes' table following results have been found out (Figure 9).

From the test it has been seen that P-value is less than 0.05 hence we reject null hypothesis and conclude that there is significant difference in the rating given by the respondent of different age group with regards to the potential causes for incurring loss after investing in financial products and will have impact on the FMEA model created above.

**Anova: Single Factor**

**SUMMARY**

| Groups | Count | Sum | Average | Variance |
|---|---|---|---|---|
| Column 1 | 8 | 29.22 | 3.6525 | 0.01310714 |

| | | | | |
|---|---|---|---|---|
| Column 2 | 8 | 28.48 | 3.56 | 0.021 |
| Column 3 | 8 | 29.61 | 3.70125 | 0.01646964 |
| Column 4 | 8 | 28.98 | 3.6225 | 0.09276429 |
| Column 5 | 8 | 26.44 | 3.305 | 0.06822857 |
| Column 6 | 8 | 27.38 | 3.4225 | 0.11916429 |
| Column 7 | 8 | 29.35 | 3.66875 | 0.26352679 |
| Column 8 | 8 | 30.27 | 3.78375 | 0.13268393 |
| Column 9 | 8 | 18.09 | 2.26125 | 2.14578393 |

**ANOVA**

| Source of Variation | SS | df | MS | F | P-value | F crit |
|---|---|---|---|---|---|---|
| Between Groups | 13.9164278 | 8 | 1.73955347 | 5.44986443 | 0.00 | 2.08918504 |
| Within Groups | 20.1091 | 63 | 0.31919206 | | | |
| Total | 34.0255278 | 71 | | | | |

**Figure 9. Anova Result [ Age Groups Vs Potential Causes]**

## iv.  Ho4:

There is no significant difference in the rating given by the respondent of different income groups with regards to the potential causes for incurring loss after investing in financial products.

**Input Data:**

**Potential Causes Rating**

| Income | Above Rs. 1 Lakh per Month | Rs.50,001 to Rs. 1 Lakh per Month | Rs.20,001 to Rs. 50,000 per Month | Less than Rs.20,000 per Month |
|---|---|---|---|---|
| Lack of Knowledge | 3.81 | 3.68 | 3.78 | 3.82 |
| Economic Instability | 3.67 | 3.66 | 3.74 | 3.73 |
| Political Instability | 3.69 | 3.55 | 3.52 | 3.65 |

| Change in management of instrument investment | 3.45 | 3.49 | 3.57 | 3.55 |
|---|---|---|---|---|
| Technology Change | 3.13 | 3.16 | 3.44 | 3.4 |
| Investment made on the opinion of Non-Experts/Rumours | 3.52 | 3.71 | 3.67 | 3.64 |
| Institutional Collapse | 3.65 | 3.66 | 3.73 | 3.7 |
| Change in Taxation Policy in the Country | 3.65 | 3.62 | 3.72 | 3.57 |

**Table 7. Income Groups Vs Potential Causes**

**Output:**

After conducting Anova: Single factor test on the 'Income Groups Vs Potential Causes' table following results have been found out (Figure 10).

**Anova: Single Factor**

**SUMMARY**

| Groups | Count | Sum | Average | Variance |
|--------|-------|-----|---------|----------|
| Column 1 | 8 | 28.57 | 3.57125 | 0.0436125 |
| Column 2 | 8 | 28.53 | 3.56625 | 0.03216964 |
| Column 3 | 8 | 29.17 | 3.64625 | 0.01485536 |
| Column 4 | 8 | 29.06 | 3.6325 | 0.01633571 |

**ANOVA**

| Source of Variation | SS | df | MS | F | P-value | F crit |
|---------------------|-----|-----|-----|-----|---------|--------|
| Between Groups | 0.04075938 | 3 | 0.01358646 | 0.50803216 | 0.6799505 | 2.94668527 |
| Within Groups | 0.7488125 | 28 | 0.0267433 | | | |
| Total | 0.78957188 | 31 | | | | |

**Figure 10. Anova Result [Income Groups Vs Potential Failures]**

From the test it has been seen that P-value is greater than 0.05 hence we accept null hypothesis and conclude that there is no significant difference in the rating given by the respondent of different income group with regards to the potential causes for incurring loss after investing in financial products and will have no impact on the FMEA model created above.

## 6. Conclusions:

1. Based on the research outcome, the respondents agree that the lower level of awareness is the major issue for not investing. This also indicates that the general level of understanding about financial products is low in our country. Hence steps are necessary to increase awareness level.

2. It is observed that people are investing on the basis of personal prejudices which are not an effective way of investing.

3. As the world faces many pandemic diseases now and then such as Coronavirus, Sars, Swine flu etc. people want to increase their savings as early as they can to be able to provide better healthcare facilities to their families.

4. FMEA is the best tool for identifying the risk while investing in the financial products. The causes can be priorities on the basis of the risk priority number which is the product of severity rate, detection rate & occurrence rate. For the two different potential failures (as shown in Table 3) losing entire money & gaining returns below expectations, it was found that lack of knowledge (has RPN of 11), investment made on the opinion of Non-Experts / Rumours (has RPN of 9) & Economic Instability (has RPN of 9). Hence, they are the major potential causes which is of concern in the Indian market.

5. After conducting the ANOVA test to check the dependency of the financial products on various factors it has been found that there is significant difference in the rating given by the respondent of different age group with regards to the potential causes for incurring loss after investing in financial products and will have impact on the FMEA model created above.

## 7. Recommendation

1. As awareness among the people for financial products is less, there is a need to create awareness of the financial products through free workshops/sessions to educate the general public by governmental and non-government agencies including educational institutes.

2.  It is observed that people are mainly aware of bank deposits and life insurance products. Hence, more awareness on other products apart from bank deposits & Life insurance need to be created.

3.  People must be educated that better ROI is not the only factor which the Indian citizens should look at, there are many other factors that need to be considered which can increase the returns by taking the help of financial advisors.

4.  From the FMEA model designed the two of the three major causes i.e. lack of knowledge (RPN-11) & investment made on the opinion of Non-Experts / Rumours (RPN – 9) can be reduced considerably by including basic education of finance in curriculum (for e.g. in 10th & upto 12th in all the branches). The third major cause, Economic Instability (RPN-9) can be brought down by having stable monetary and fiscal policy. The occurrence rate of these factors can be brought down by approx. 35% respectively which will ultimately reduce the investment risks. The average RPN of all the potential causes for all the failures can be brought down from 9 to 5 by taking the necessary actions.

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# 8. Appendix

The model is created on the basis of the responses taken from the respondents of India. Following were the questions asked to them:

1. What is you Gender?

2. Which Age Group do you belong?

3. Which Income Group do you belong?

4. What is your Occupation?

5. In which kind of financial instruments do you invest?

6. What is the reason for not investing?

7. Why do you Invest?

8. Which factors delights you about the investment?

9. On what basis do you take investment decisions?

10. How often one can incur loss after investing in financial instruments?

11. Following are the possible reasons for " incurring loss" after investing in financial instruments. Rank the reasons on the basis of the riskiness you feel:

    i.   Lack of Knowledge

    ii.  Economic Instability

    iii. Political Instability

    iv.  Change in management of instrument investment

    v.   Technology Change

    vi.  Investment made on the opinion of Non-Experts/Rumours

    vii. Institutional Collapse

12. How often do you get return below your expectations?

13. Following are the possible reasons for " incurring loss" after investing in financial instruments. Rank the reasons on the basis of the riskiness you feel:

    i.   Lack of Knowledge

    ii.  Economic Instability

    iii.    Political Instability

    iv.    Change in management of instrument investment

    v.    Technology Change

    vi.    Investment made on the opinion of Non-Experts/Rumours

    vii.    Institutional Collapse