CHAPTER 8:
ANALYSIS &
INTERPRETATION
RESEARCH HYPOTHESES:

The main hypothesis can further be divided into sub hypotheses.

1. Majority (more than 50%) of the SMEs utilize less than 70% of their established capacity
2. Majority (more than 50%) of the SMEs fail on their production schedules for around 10 to 30% cases.
3. Majority (more than 50%) of the SMEs depends upon Intuition / Experience as their major tweak of demand forecasting.
4. Majority (more than 50%) of the SMEs face the difference of actual and forecasted demand in the range of 10% to 25% and more than 0% (non-negligible) units has this gap of more than 50%.
5. Less than 50% the SMEs use (that too not for complex analysis or decision-making purpose) analytical software tools

RATIONALE OF THE HYPOTHESES SET

Before proceeding for the testing of the hypotheses set, we are to evaluate the need and necessity for the hypotheses we set. We would assess them one by one.

1. Majority of the SMEs utilize less than 70% of their established capacity - A systematic decision making
always help to progress in the direction to the maximum utilization of resources, by helping in optimum allocation of resources. Idle resources, in long run, lead to decay of firm’s capital and wealth. To have a panorama of the existing and historic decision-making design of SMEs this is quintessential a hypothesis to be tested for significance. Here it is issue of utilizing less than 70% resources / established capacity. If we look at the collective wastage, it would be a waste of 30% resources from majority of the units, which is quite alarming.

2. **Majority (more than 50%) of the SMEs face the failure of production schedule in more than 10% cases** – For manufacturing units (since 77% units are manufacturing units) production schedule preparation is a prime job, and failure in production scheduling leads to turbulences in following all the procedures. More than 75% of the sample units possess more than 20% of the market share (diagram 9.3). If they fail in production schedules for more than 10% occasions, it obviously sends a disturbing wave to the whole market. At a lower scale of a small or medium scale unit, if the unit is unable to maintain the production schedules, other un-programmed decisions remain really questionable.
3. **Majority (more than 50%) of the SMEs depends upon Intuition / Experience as their major equipment of demand forecasting** – Demand forecasting is an issue which demands continuous attention, persistent data processing and importunate research. SMEs are found greatly either ignorant or remiss in this area, at least in the sample selected. Out of 200 units selected, 168 (84% units) units depend on intuition or past experience for demand forecasting. Even if the forecasting holds well, it is fatal to have sheer reliance on intuition for the existence of the unit in the long run. With the dynamics of global competition no single enterprise affords to stay still on its own gut feeling. We would like to assess, if in population too, more than 50% units depend upon intuition as their chief equipment of demand forecasting.

4. **More than 50% of the SMEs have deviation between actual and forecasted demand more than 10%** - As we have discussed in the point above, it is dangerous to rely purely on intuition or experience for demand forecasting. Here the resultant matter surfacing is that of variation between actual and estimated demand. 137 units have this variation more than 10%. This digression leads to the failure of production schedule and wastage of resources in short run, and
in long run it narrows the scope for the firm’s survival.

5. **Less than 50% of the SMEs employ BI tools** – 59 units employ no software tool and 62 units use only Microsoft Word for the purpose of documentation. Remaining 79 units use several applications (purposes are always preliminary). Usage of software tools indicates the approach and futuristic design of the enterprise. When a unit ignores the deployment of computerized tools and applications, it seems to have ignored all the future prospects and chances to sustain longer in the global race.

**TESTING OF HYPOTHESES:**

The research is path-finder in a sense, that it explores the status and scope for a Business Intelligence solution in the functioning, chiefly, in the decision-making process of SMEs. And so they weave around five essential aspects. We would take a little dip into all these five dimensions and would apply z-test for proportions for every individual hypothesis.

A sample of 200 SME units gives a benefit to rest assured of the sampling distribution to be following Normal Distribution, and so of the results to be dependable.
If all five hypotheses fail to hold good, we will have to conclude that even though SMEs do not approve of the need for Customized BI support, they need it, and their disapproval for the BI tools arise from their fear about financial and technical problems and infeasibility.

In that case it is a moral bound for the researcher to offer an application to the SMEs, which could be of help in decision-making and basic calculations.
1. USAGE OF ESTABLISHED CAPACITY:

An ideal decision making system, in the due course of action, for all intents and purposes, leads to the optimum allocation of resources, and so in so towards maximum utilization of established capacity.

$H_0: P = 0.50$ (50% the SMEs utilize less than 70% of their established capacity)

$H_1: P > 0.50$ (more than 50% the SMEs utilize less than 70% of their established capacity)

($\alpha = 5\%$, one tailed)

Here sample size is 200, $n = 200$. $p = 0.895$, $P = 0.50$, $Q = 1 - P = 0.50$

$p = 160$ (utilization between 50% to 70%) + 19

(utilization below 50%) = 179 / 200 = 0.895$
Hypothesis test for proportion v/s hypothesized value

<table>
<thead>
<tr>
<th>Observe d</th>
<th>Hypothesize d</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.895</td>
<td>0.5 (as decimal)</td>
</tr>
<tr>
<td>179/200</td>
<td>100/200 (as fraction)</td>
</tr>
<tr>
<td>179.</td>
<td>100. X</td>
</tr>
<tr>
<td>200</td>
<td>200 n</td>
</tr>
</tbody>
</table>

0.0354 std. error
11.17 z
1.654 Table Value for Z

Outcome:
Rejection of $H_0$

Standard Error (SE) = $\sqrt{\frac{pq}{n}} = \sqrt{\frac{0.5 \times 0.5}{200}} = 0.0354$

$z_{calc} = \frac{p-p}{SE} = \frac{0.895-0.5}{0.0354} = 11.17$

Since, $|z_{calc}| > z_{tab}$, $H_0$ is rejected.

Interpretation: The test confirms that more than 50% (majority) of the SME units utilize less than 70% of their established capacity.
2. FAILURE OF PRODUCTION SCHEDULE:

Production scheduling is one of the important routine decisions. Failure of production schedule signifies a failure of accuracy in scheduling. Even though production scheduling is a programmed decision, accuracy of it surely and purely depends upon regular and thorough study of past records, which stipulates a system of data storage, classification and scrutiny.

$H_0: P = 0.50$ (50% of the SMEs face the failure of production schedule in more than 10% cases)

$H_1: P > 0.50$ (more than 50% of the SMEs face the failure of production schedule in more than 10% cases)

$n = 200, p = 0.7, P = 0.5, Q = 0.5$

$(\alpha = 5\%, \text{ one tailed})$
### Hypothesis test for proportion vs. hypothesized value

<table>
<thead>
<tr>
<th>Observed</th>
<th>Hypothesized</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7</td>
<td>0.5</td>
</tr>
<tr>
<td>140/200</td>
<td>100/200</td>
</tr>
<tr>
<td>140.</td>
<td>100.</td>
</tr>
<tr>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

- **Observed**
- **Hypothesized**
- **p (as decimal)**
- **p (as fraction)**
- **X**
- **n**

<table>
<thead>
<tr>
<th>0.0354 std. error</th>
<th>5.66 ( Z_{calc} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.645 ( Z_{tab} ) (one-tailed)</td>
<td></td>
</tr>
</tbody>
</table>

#### Outcome: Rejection of \( H_0 \)

Standard Error (SE) = \( \sqrt{\frac{pq}{n}} = \sqrt{\frac{0.5 \times 0.5}{200}} = 0.0354 \)

\[
Z_{calc} = \frac{p - \hat{p}}{SE} = \frac{0.7 - 0.5}{0.0354} = 5.66
\]

Since, \( |Z_{calc}| > Z_{tab} \), \( H_0 \) is rejected.

**Interpretation**: The test confirms that more than 50% of the SMEs face the failure of production schedule in more than 10% cases.
3. INTUITION FOR DEMAND FORECASTING:

Demand forecasting is a very vital factor for so many other decisions. It is a decision that requires a systematic storage of details, classification, analysis and a moderate usage of statistical tools. In the details collected from 200 units it is noticed that 168 entrepreneurs estimate future demand on the basis of intuition or gut feeling.

- $H_0$: $P = 0.50$ (50% the SMEs depend on Intuition / Experience for Demand Forecasting)
- $H_1$: $P > 0.50$ (more than 50% the SMEs depend on Intuition / Experience for Demand Forecasting) ($\alpha = 5\%$, one tailed)

Here sample size is 200, $n = 200$. $p = 0.84$, $P = 0.50$, $Q = 1 - P = 0.50$

$[p = \frac{168}{200} = 0.84]$
### Table 8-3: Intuition for Demand Forecasting

<table>
<thead>
<tr>
<th>Observed</th>
<th>Hypothesized</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.84</td>
<td>0.5</td>
</tr>
<tr>
<td>$168/200$</td>
<td>$100/200$</td>
</tr>
<tr>
<td>168.</td>
<td>100.</td>
</tr>
<tr>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

$p$ (as decimal)  
$p$ (as fraction)  
$X$  
$n$

0.0354 std. error  
9.62 $Z_{calc}$  
1.645 $Z_{tab}$ (one-tailed)

**Outcome:** Rejection of $H_0$

Standard Error (SE) = $\sqrt{\frac{pq}{n}} = \sqrt{\frac{0.5 \times 0.5}{200}} = 0.0354$

$Z_{calc} = \frac{p-p_{H0}}{SE} = \frac{0.84-0.5}{0.0354} = 9.62$

Since, $|Z_{calc}| > Z_{tab}$, $H_0$ is rejected.

**Interpretation:** The test confirms that more than 50% (majority) of the SME units depend on Intuition / Experience for Demand Forecasting.
4. DEVIATION OF ACTUAL FROM FORECASTED DEMAND:

To evaluate a demand forecasting method the foremost criterion is the deviation between actual and estimated demand. There are 25 units having this deviation more than 25%. Larger the difference more it indicates the weakness or failure of demand forecasting method. Looking at the previous test, we would presume disappointment here to be high. But more than 25% of difference in 13.5% units is something very upsetting. We would try to check whether majority of the units (>50%) are having deviation more than 10%.

\[ H_0: P = 0.5 \text{ (50\% of the SMEs have deviation more than 10\%)} \]

\[ H_1: P > 0.5 \text{ (more than 50\% of the SMEs have deviation more than 10\%)} \]

(\( \alpha = 5\%, \) one tailed)

Here sample size is 200, \( n = 200 \). \( p = 0.685 \), \( P = 0.5 \), \( Q = 1 - P = 1 \)

\[ p = 137 / 200 = 0.685 \]
Table 8-4: DEVIATION OF ACTUAL FROM FORECASTED DEMAND

<table>
<thead>
<tr>
<th>Observed</th>
<th>Hypothesized</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.685</td>
<td>0.5</td>
</tr>
<tr>
<td>137/200</td>
<td>100/200</td>
</tr>
<tr>
<td>137.</td>
<td>100.</td>
</tr>
<tr>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>p (as decimal)</th>
<th>p (as fraction)</th>
<th>X</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.685</td>
<td>137/200</td>
<td>100/200</td>
<td>137. 100. 200. 200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>std. error</th>
<th>Z_{\text{calc}}</th>
<th>Z_{\text{tab}} (one-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0354</td>
<td>5.23</td>
<td>1.645</td>
</tr>
</tbody>
</table>

**Outcome:** Rejection of $H_0$

Standard Error (SE) = $\sqrt{\frac{p \times (1-p)}{n}} = \sqrt{\frac{0.5 \times 0.5}{200}} = 0.0354$

$z_{\text{calc}} = \frac{p-p}{SE} = \frac{0.685-0.5}{0.0354} = 5.23$

Since, $|z_{\text{calc}}| > z_{\text{tab}}$, $H_0$ is rejected.

**Interpretation:** The test confirms that more than 50% (majority) of the SME units have deviation more than 10% between actual and forecasted demand.
5. USAGE OF BI TOOLS:

Out of 200 units 59 units do not use any software application and 62 units use only Microsoft Word, which cannot be considered as a Business Intelligence – BI tools. Other 79 units use applications like Microsoft Excel (51), Microsoft Access (2), Tally (15), Customized Software (3) and Lotus (8). These applications help in various analytical processes, hence we can count them as Business Intelligence tools. We would check a hypothesis whether majority (> 50%) of the units employ BI tools.

\( H_0: P = 0.5 \) (50% of the SMEs employ BI tools)

\( H_1: P < 0.5 \) (less than 50% of the SMEs employ BI tools)

\( (\alpha = 5\%, \text{ one tailed}) \)

Here sample size is 200, \( n = 200 \). \( p = 0.395 \), \( P = 0.5 \), \( Q = 1 - P = 1 \)

\[ p = \frac{79}{200} = 0.395 \]
Table 8-5: USAGE OF BI TOOLS

**Hypothesis test for proportion vs. hypothesized value**

<table>
<thead>
<tr>
<th>Observed</th>
<th>Hypothesized</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.395</td>
<td>0.5</td>
</tr>
<tr>
<td>79/200</td>
<td>100/200</td>
</tr>
<tr>
<td>79.</td>
<td>100.</td>
</tr>
<tr>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
\text{std. error} & = 0.0354 \\
Z_{\text{calc}} & = -2.97 \\
\text{X} & = 1.645 \\
Z_{\text{tab}} \text{ (one-tailed)} & = 1.645
\end{align*}
\]

**Outcome:** Rejection of \( H_0 \)

Standard Error (SE) = \( \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{0.5 \times 0.5}{200}} = 0.0354 \)

\[
Z_{\text{calc}} = \frac{p\hat{} - p}{SE} = \frac{0.395 - 0.5}{0.0354} = -2.97
\]

Since, \(|Z_{\text{calc}}| > Z_{\text{tab}}\), \( H_0 \) is rejected.

**Interpretation:** The test confirms that less than 50% of the SME units employ BI tools for their routine processes.