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IJMER, Journal of Multidisciplinary Educational Research, concentrates on critical and creative research in multidisciplinary traditions. This journal seeks to promote original research and cultivate a fruitful dialogue between old and new thought.
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**Issue 5(3)**  
**May 2020**

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Editorial......

It is heartening to note that our journal is able to sustain the enthusiasm and covering various facets of knowledge. It is our hope that IJMER would continue to live up to its fullest expectations savoring the thoughts of the intellectuals associated with its functioning. Our progress is steady and we are in a position now to receive evaluate and publish as many articles as we can. The response from the academicians and scholars is excellent and we are proud to acknowledge this stimulating aspect.

The writers with their rich research experience in the academic fields are contributing excellently and making IJMER march to progress as envisaged. The interdisciplinary topics bring in a spirit of immense participation enabling us to understand the relations in the growing competitive world. Our endeavour will be to keep IJMER as a perfect tool in making all its participants to work to unity with their thoughts and action.

The Editor thanks one and all for their input towards the growth of the Knowledge Based Society. All of us together are making continues efforts to make our predictions true in making IJMER, a Journal of Repute

Dr.K.Victor Babu
Editor-in-Chief
QUALITY OF LIFE AMONG ELDERLY

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Professor Human Development and Family Studies, Department of Home Science, Sri Padmavathi Mahila Viswavidyalam, Tirupati. Andhra Pradesh, India

ABSTRACT

Components of quality of life includes changes in the body function, keeping the physically fit living arrangements and family relations, retirement and management of leisure time, economics of ageing, spirituality, maintaining good interpersonal relations and happiness through good health. It includes optimum intake of fresh air, clean water, nutritious food, good recreation, exercise and adequate rest and a happy mind set etc. While quality of life is inevitably subjective and dependent upon individual perceptions. The main objective of study is to assess and compare the quality of life among elderly in urban and rural areas of Tirupati.

A descriptive research approach, 2X2 factorial design was selected. A total number of 120 subjects (30 men + 30 women from urban area, 30 men + 30 women from rural area) aged between 60-80 years were randomly selected from four surrounding areas of Tirupati. The quality of life of older persons was assessed by using demographic data with WHO Quality of Life BREF field version. This contains 26 items. The reliability score 'r'=0.965. data was collected by using Interview Technique and it was analyzed with descriptive and inferential statistics and results were presented.

Keywords: Elderly, Quality of Life

Introduction to Aging

“Aging is a biological process, experienced by mankind in all times” Aging is an issue of global concern as a result of significant demographic transition. In India, the population of the elderly is growing rapidly and is emerging as a serious area of concern for the government and the policy planners, there is an increase in the proportion of the aged, decreased in the proportion of the young. India now has the second largest aged population in the world.

WHO defines Quality Of Life (QOL) “as an individual’s perception of their position in life, in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” Bowling (2001) defined the quality of life is a Macro (Societal-Objective) and Micro (Individual, Subjective) terms. It includes income, employment, housing, education, other living and environmental
circumstances; the later includes perceptions of overall quality of life, individual’s experiences and values and has included related “proxy indicators” such as well being, happiness and life satisfaction.

Indian Urban and Rural Population Census. In India the population of elderly is steadily increasing according to the decennial censuses. The proportion of elderly who were 5.6% of the total population in 1961 has increased to 7.7% in 2001. In comparison to the proportion of elderly in the urban areas, the proportional elderly in the rural areas to the total population in India has been higher all through these decades. According to 2001 census the share of elderly in rural areas is 8.3% and in urban areas 6.5%. Though in proportion it is not very obvious, the increasing magnitude of these elders is very alarming.

The increasing numbers of older people indicates higher expectations of a good life. Public policy is increasingly likely to be concerned with enabling older people to maintain their mobility, independence, their active contribution to society, and to respond effectively to the physical, psychological and social challenges of older age; in effect, to add quality to years of life.

The elder persons in India facing a number of problems ranging from absence of assured and sufficient income to support themselves and their dependents, for healthcare and other social securities, loss of a social role and recognition, and non-availability of opportunities for creative and effective use of free time. Hence, the trend clearly reveals that aging will emerge as major social challenge in the future: and vast resources will be required toward the support, service, care and treatment of the elderly persons. There is emerging need to pay greater attention to ageing-related issue and to promote holistic policies and programmes for dealing with ageing society. Equally important to older persons mean recognizing and respecting the dignity, authority, wisdom, and productivity of older persons in all societies, particularly in their roles as volunteers and multi-generational caregivers. And that, in turn, means promoting a more positive image of ageing.

For the above reasons the researcher wants to assess and compare the quality of life among the elderly in urban and rural areas of Tirupati. The present study mainly concentrates on Quality Of Life among the elderly in the age group of 60-80 years.

**OBJECTIVES**

- To understand the demographic details of urban and rural elderly.
- To assess and compare the quality of life among elderly in urban and rural areas.
- To correlate the socio-demographic variables with their quality of life among the urban and rural elderly.
- To prepare an information booklet on quality of life among elderly.

**METHOD**

A wide review of literature was collected related to research study. The conceptual frame for the study was adopted from SUSAN.L quality of life model. A descriptive
research approach, 2X2 factorial design was selected. A total number of 120 subjects (30 men + 30 women from urban area, 30 men + 30 women from rural area) aged between 60-80 years were randomly selected from four surrounding areas of Tirupati.

1) Independent variables: Gender: Men and Women
Locality of residence: Urban and Rural

2) Dependent variable: Quality of life

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>30</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Urban</td>
<td>30</td>
<td>30</td>
<td>60</td>
</tr>
</tbody>
</table>

DEVELOPMENT AND DESCRIPTION OF TOOL

The data collection tool used in the present study was WHO Quality of Life BREF Scale structural interview schedule. The instrument was organized under the following sections.

Section I: Demographic Data Personal Profile Modified Kuppuswamy socio economical scale (2007)

Section II: Contains Standard Quality of Life WHO-BREF Scale

The WHO quality of life BREF field version is a 26 items self administered questionnaire scale which emphasizes the subjective responses of elder people rather than objective life conditions with assessment made over preceding two weeks. It covers the four domains:

- Physical health-Items (3, 4, 10, 15, 16, 17, 18)
- Psychological health-items (5, 6, 7, 11, 19, 26)
- Social relationship-Items (20, 21, 22)
- Environment-Items (8, 9, 12, 13, 14, 23, 24, 25) in addition to item on general well being item 1 and 2. Each item is scored between 1 to 5 except for 3, 4 and 26 which are scored in reverse manner. The main aim is to assess the individual overall perception of quality of life and health. If, higher the score higher the quality of life.

Scoring Key: The quality of life scores were graded as follows

<table>
<thead>
<tr>
<th>Minimum score: 26</th>
<th>Maximum score: 130</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-26</td>
<td>very poor</td>
</tr>
<tr>
<td>27-52</td>
<td>poor</td>
</tr>
<tr>
<td>53-78</td>
<td>moderate</td>
</tr>
<tr>
<td>79-104</td>
<td>good</td>
</tr>
<tr>
<td>105-130</td>
<td>very good</td>
</tr>
</tbody>
</table>
Analysis of data was done by using descriptive and inferential statistics.

**OBJECTIVE 1**

To understand the demographic details of urban and rural older people

It was inferred that majority 25(41.67%) of the urban respondents were in the age group of 60-65 years, 55(91.67%) were belongs to Hindu community, 31(51.67%) were married, 27(45%) were completed primary school and 25(41.67%) were semi skilled workers.

The majority 27(45%) of the rural respondents were in the age group of 60-65 years, 52(86.67%) were belong to Hindu community, 35(58.33%) were belongs to widow/widower category, 45(75%) were illiterates and 20(33.33%) were semi skilled workers.

Among the urban respondents with regard to family income most of 29(48.33%) them were earning Rs.980-2,935/month; they belong to middle lower class. Most of them 35(58.33%) were getting financial support from children/friends and 46(71.67%) rural respondents were earning income below Rs.979/month, 31(51.67%) belong to lower socio economic class and 21(35%) were getting financial support from widow pensions.

The majority 30(50%) of the urban respondents living in rental house with their children, 28(46.67%) were having good health status. The rural respondents 58(96.67%) were living in own house with their family, 29(48.33%) were having moderate health status.

The results of the present study supported by the earlier study carried out by Ankur barua et al., (2003) an “Assessment of the domains of quality of life in geriatric population”. The aim of this study is to examine the different domains of QOL according to socio-demographic variables. The size of the sample was in the geriatric age group above 60 yrs. The results revealed that the mean scores of subjects in various age groups differed significantly in the domain of physical, psychological and social relations. Overall well being was significantly affected with unmarried/widowed in the aged group of 60-69yrs.

Bramston et al., (2005) stated that quality of life has been defined as multidimensional evaluation, by both intrapersonal and social normative criteria, of the person environment system of the individual. Most attempts to conceptualize (or) measure the overall quality of life propose some constellation of objective and subjective dimensions. The objective part of the quality of life refers to resource availability and objective life conditions, while the subjective one refers to the individual subjective feeling and evaluation towards his life.
OBJECTIVE 2 To assess and compare the quality of life among older people in urban and rural areas

Fig2: The cylinder diagram shows the percentage distribution according to their level of quality of life among the older persons in urban and Rural.
Results revealed that the urban older people 38(63.33%) had good quality of life, 14(23.33%) had moderate quality of life, and 8(13.33%) had very good quality of life.

As far as rural area is concerned 30(50%) had good quality of life, 27(45%) had moderate quality of life and finally 1(1.67%) had very good quality of life.

The rural women differ significantly (‘t’=3.22) with urban men in all domains of QOL at 0.01 level. The rural men differ significantly with urban women (‘t’=2.24) and urban men (‘t’=2.53) in all domains of QOL at 0.05 level.

The results of the present study was supported by the earlier study carried out by Easwara Murthy et al., (2007) on quality of life among the 580 respondents (305 men, 275 women) from five districts of Tamil Nadu. The finding of the study suggests that the rural older woman are disadvantaged in terms of economic, physical, psychological and social indicators, indicating that they are having comparatively poor quality of life than their counter parts.

Table 2: Mean, Standard Deviation, ANOVA and ‘t’ values on physical health domain of Quality of Life

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>Mean</td>
<td>S.D</td>
</tr>
<tr>
<td></td>
<td>11.88</td>
<td>2.44</td>
</tr>
<tr>
<td>Urban</td>
<td>Mean</td>
<td>S.D</td>
</tr>
<tr>
<td></td>
<td>13.93</td>
<td>2.28</td>
</tr>
</tbody>
</table>

N=120

Grand Mean
Men: 12.90 Rural: 11.77
Women: 12.60 Urban: 13.81

The ‘t’ value of four groups of subjects in physical domain

<table>
<thead>
<tr>
<th></th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td>Rural</td>
<td>11.52</td>
<td>11.88</td>
</tr>
<tr>
<td>Women</td>
<td>11.52</td>
<td>--</td>
</tr>
<tr>
<td>Men</td>
<td>11.88</td>
<td>--</td>
</tr>
<tr>
<td>Urban</td>
<td>13.69</td>
<td>--</td>
</tr>
<tr>
<td>Men</td>
<td>13.93</td>
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</tr>
</tbody>
</table>

Note: @Not Significant *Significant at 0.05 level ** Significant at 0.01 level
Summary of ANOVA Scores on Physical Health Domain of Quality of Life.

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Square</th>
<th>F @</th>
<th>Level of Significance</th>
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<tbody>
<tr>
<td>Gender</td>
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<tr>
<td>Locality</td>
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<td>132.952</td>
<td>21.57</td>
<td>0.000**</td>
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<td>Gender and Locality</td>
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<td>0.131</td>
<td>0.021</td>
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<tr>
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<td>11</td>
<td>6.164</td>
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<tr>
<td>Corrected Total</td>
<td>850.685</td>
<td>11</td>
<td></td>
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</table>

Note: @Not Significant  ** Significant at 0.01 Level

The elderly people living in urban areas have better QOL (Mean=13.81) i.e., in physical health domain when compared to elderly people living in rural areas (Mean: 11.77) (F: 21.57 significant at 0.01 level D).

- The ‘F’ value of 0.021 for the interaction effect is not significant, suggesting that there is no significant interaction between the gender and locality of residence with regard to physical health domain aspect of QOL.

- The rural women differ significantly with urban women (‘t’: 0.339) and urban men (‘t’: 3.90) in their physical health domain of QOL is significant at 0.01 level, rural men differ significantly with urban women (‘t’: 2.81) and urban men (‘t’: 3.35) in their physical health domain of QOL is significant at 0.01 level where as other mean differences are not significant.

Table 3: Mean, Standard Deviation, ANOVA and ‘t’ values on psychological health domain of Quality of Life

<table>
<thead>
<tr>
<th></th>
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<th>Women</th>
</tr>
</thead>
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<td>2.24</td>
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<tr>
<td>N=120</td>
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</table>

The ‘t’ value of four groups of subjects in psychological domain

<table>
<thead>
<tr>
<th>Rural</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women 11.52</td>
<td>Men 11.88</td>
<td>Women 13.69</td>
</tr>
<tr>
<td>Women 11.52</td>
<td>--</td>
<td>0.10</td>
</tr>
<tr>
<td>Men</td>
<td>--</td>
<td>0.48</td>
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</table>
Summary of ANOVA Scores on Psychological Aspects of Quality of Life

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<th>Sum of Square</th>
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<th>Mean Square</th>
<th>F @</th>
<th>Level of Significance</th>
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<td>Corrected Total</td>
<td>756.679</td>
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<td></td>
</tr>
</tbody>
</table>

Note: @ Not Significant

The elderly living in urban areas have better QOL (Mean: 13.48) i.e., in psychological health domain when compared to rural area (Mean: 13.11) (F: 0.623 not significant).

The ‘F’ values of 0.001 for the interaction effect are not significant. Suggesting that there is no significant interaction between the gender and locality of residence with regard to psychological health aspect of QOL.

The mean differences are not significant at any level.

Table 4 : Mean, Standard Deviation, ANOVA and ‘t’ values on social relationship aspect of Quality of Life

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>Mean</td>
<td>S.D</td>
</tr>
<tr>
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<td>2.14</td>
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<tr>
<td>Urban</td>
<td>Mean</td>
<td>S.D</td>
</tr>
<tr>
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<td>12.22</td>
<td>2.43</td>
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<tr>
<td>N=120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Mean</td>
<td>Men: 7.18</td>
<td>Rural: 1.98</td>
</tr>
<tr>
<td></td>
<td>Women: 6.24</td>
<td>Urban: 11.44</td>
</tr>
</tbody>
</table>
The ‘t’ value of four groups of subjects in social relationship domain

<table>
<thead>
<tr>
<th></th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women 11.52</td>
<td>Men 11.88</td>
</tr>
<tr>
<td>Women 11.52</td>
<td>--</td>
<td>0.26 @</td>
</tr>
<tr>
<td>Men 11.88</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Women 13.69</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Men 13.93</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: @ Not Significant      ** Significant at 0.01 level

Summary of ANOVA Scores on social relationship domain of Quality of Life

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Square</th>
<th>F @</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>21.387</td>
<td>1</td>
<td>21.387</td>
<td>4.775</td>
<td>0.031*</td>
</tr>
<tr>
<td>Locality</td>
<td>76.768</td>
<td>1</td>
<td>76.768</td>
<td>17.140</td>
<td>0.000**</td>
</tr>
<tr>
<td>Gender and Locality</td>
<td>15.137</td>
<td>1</td>
<td>15.137</td>
<td>3.380</td>
<td>0.069@</td>
</tr>
<tr>
<td>Error</td>
<td>519.558</td>
<td>116</td>
<td>4.479</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>632.850</td>
<td>119</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: @ Not Significant      * Significant at 0.05 level      ** Significant at 0.01 level

- The elderly people living in urban areas have better QOL (Mean: 11.44) that is social relationship domain when compared to elderly people living in rural areas (Mean: 1.98) (F: 17.140 significant at 0.05 level)
- The ‘F’ value of 3.380 for interaction effect is not significant suggesting that there is no significant interaction between the gender and locality with regard to social relationship of quality of life.
- The rural women differ significantly with urban men (‘t’: 4.39) in their social relationship domain. The rural men differ significantly with urban men (‘t’: 3.90) and urban women. Urban women differ significantly with urban men in their social relationship domain at 0.01 levels. Where as the other mean differences not significant.

Table 5: Mean, Standard Deviation, ANOVA and ‘t’ values on environmental aspect of Quality of Life

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>11.00</td>
<td>12.15</td>
</tr>
<tr>
<td>S.D</td>
<td>1.65</td>
<td>2.30</td>
</tr>
<tr>
<td>Mean</td>
<td>12.15</td>
<td>12.78</td>
</tr>
<tr>
<td>S.D</td>
<td>2.30</td>
<td>2.42</td>
</tr>
</tbody>
</table>
The ‘t’ value of four groups of subjects in environmental domain

<table>
<thead>
<tr>
<th></th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td></td>
<td>11.52</td>
<td>11.88</td>
</tr>
<tr>
<td>Women</td>
<td>--</td>
<td>0.22 @</td>
</tr>
<tr>
<td>Men</td>
<td>--</td>
<td>3.58 **</td>
</tr>
<tr>
<td>Urban</td>
<td>Women 13.69</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Men 13.93</td>
<td></td>
</tr>
</tbody>
</table>

Note: @Not Significant  **Significant at 0.01 level

Summary of ANOVA scores on environmental aspect of Quality of Life

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Square</th>
<th>df</th>
<th>Mean Square</th>
<th>F @</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>2.241</td>
<td>1</td>
<td>2.241</td>
<td>0.567</td>
<td>0.453 @</td>
</tr>
<tr>
<td>Locality</td>
<td>68.705</td>
<td>1</td>
<td>08.705</td>
<td>17.384</td>
<td>0.000 **</td>
</tr>
<tr>
<td>Gender and Locality</td>
<td>4.033</td>
<td>1</td>
<td>4.033</td>
<td>1.021</td>
<td>0.314 @</td>
</tr>
<tr>
<td>Error</td>
<td>458.448</td>
<td>116</td>
<td>3.952</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>533.428</td>
<td>119</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: @Not significant  **Significant at 0.01 level

- The elderly people living in urban areas have better QOL (Mean: 12.46) i.e., in environmental domain when compared to elderly people living in rural areas (Mean: 6.29) (F: 17.384 significant at 0.01 level).
- The ‘F’ value of 1.021 for the interaction effect is not significant, suggesting that there is no significant interaction between the gender and locality with regard to environmental aspect of QOL.
- The rural women differ significant with urban women (‘t’: 3.83) and urban men (‘t’: 2.42) in their environmental aspect of QOL is significant at 0.05 levels. The rural men differs significant with urban men (‘t’: 3.58) and urban women (‘t’: 2.21) in their environmental domain significant at 0.05 level, where as other mean differences are not significant.
Table 6: Mean and Standard Deviation Scores on Quality of Life in all domains

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>Mean S.D</td>
<td>Mean S.D</td>
</tr>
<tr>
<td></td>
<td>12.18</td>
<td>2.12</td>
</tr>
<tr>
<td>Urban</td>
<td>Mean S.D</td>
<td>Mean S.D</td>
</tr>
<tr>
<td></td>
<td>13.54</td>
<td>2.03</td>
</tr>
</tbody>
</table>

N=120

Grand Mean: Men: 12.86 Rural: 12.01
Women: 12.60 Urban: 13.45

The ‘t’ value of four groups of subjects in all domains

<table>
<thead>
<tr>
<th></th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women 11.84 Men 12.18</td>
<td>Women 13.37 Men 13.54</td>
</tr>
<tr>
<td>Women</td>
<td>0.63 @</td>
<td>0.32 @ 3.27 **</td>
</tr>
<tr>
<td>Men</td>
<td>2.24 *</td>
<td>2.53 *</td>
</tr>
<tr>
<td>Urban</td>
<td></td>
<td>0.32 @</td>
</tr>
</tbody>
</table>

Note: @ Not Significant * Significant at 0.05 level ** Significant at 0.01 level

Summary of ANOVA Scores on All Domains of Quality of Life

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Square</th>
<th>Df</th>
<th>Mean Square</th>
<th>F @</th>
<th>Level of Significance</th>
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<tbody>
<tr>
<td>Gender</td>
<td>1.908</td>
<td>1</td>
<td>1.908</td>
<td>0.446</td>
<td>0.505 @</td>
</tr>
<tr>
<td>Locality</td>
<td>62.714</td>
<td>1</td>
<td>62.714</td>
<td>14.670</td>
<td>0.000 **</td>
</tr>
<tr>
<td>Gender and Locality</td>
<td>0.201</td>
<td>1</td>
<td>0.201</td>
<td>0.047</td>
<td>0.829 @</td>
</tr>
<tr>
<td>Error</td>
<td>495.907</td>
<td>116</td>
<td>4.275</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Corrected Total</td>
<td>560.730</td>
<td>119</td>
<td>---</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: @ Not Significant ** Significant at 0.01 Level

An observation of table above shows that the ‘F’ value of 0.446 for the variable, gender is not significant, including that gender has no significant impact on the all domains of QOL. The ‘F’ value of 14.670 for the variable locality of residence is significant beyond at 0.01 levels indicating that the locality of residence significant impact on the all domains of QOL.

The elderly people living in urban areas have better QOL (Mean=13.45) i.e., in all domains when compared to elderly people living in rural areas (Mean: 12.01).
The ‘F’ value of 0.047 for the interaction effect is not significant, suggesting that there is no significant interaction between the gender and locality of residence with regard to all domains of QOL.

The elderly people living in urban areas have better QOL (Mean=12.86) i.e., in all domains when compared to elderly people living in rural areas (Mean: 12.01) (F: 14.67 significant at 0.01 level).

Since the ‘F’ value 14.67 is significant beyond 0.01 levels, the assumption predicted difference between the urban and rural elderly in their quality of life is accepted as warranted by that result.

- The ‘F’ value of 0.047 for the interaction effect is not significant, suggesting that there is no significant interaction between the gender and locality of residence with regard to all domains of QOL.

- The rural women differ significantly with urban men (‘t’: 3.27) in their all domains of QOL is significant at 0.01 levels, rural men differ significantly with urban women (‘t’: 2.24) and urban men (‘t’: 2.53) in their all domains, where as other mean differences are not significant.

Since the ‘F’ value 0.047 for the variable gender is not significant, the assumption which predicted that there would be a significant difference between the men and women elderly in their quality of life is not accepted.

OBJECTIVE 3
To correlate the socio-demographic variables with their quality of life among the urban and rural older people

- The chi-square test revealed that there was a significant association between the QOL with their education, occupation, family income per month, socio-economic class, financial support, place of residence and current health status to last four years.

- There was no significant association between the QOL with their gender, age in years, religion, marital status, regular income, type of family, type of house, living status, and idea regarding medical help, government funded schemes.

Since the assumption is predicted certain demographic variables would influence on quality of life among the older people is accepted as warranted by the results.

- The results of the present study was supported by the earlier study carried out by Yamazaki S et al., (2005) National Institute for Environmental Studies on household income is strongly associated with health-related quality of life among men but not women. The objective of the study is to assess the socio-economic status (SES) is strongly reflects individual economic status, to measure the health-related quality of life (HRQOL) by using Short Form-36 Health Survey (SF-36) questionnaire. Sample size is 4,500, cross sectional survey was conducted by using stratified random sampling among above 60 years older people. The study results
revealed that men with lower levels of annual household income had lower scores in all SF-36 domains that indicate lower the quality of life.

MAJOR FINDINGS

- The results revealed that the urban older people 38(63.33%) had good quality of life, 14(23.33%) had moderate quality of life, and 8(13.33%) had very good quality of life.
- As per as rural area concerned 30(50%) had good quality of life, 27(45%) had moderate quality of life, 2(3.33%) had poor quality of life and finally 1(1.67%) had very good quality of life.
- The chi-square test revealed that there was a significant association between the QOL with their education, occupation, family income per month, socio-economic class, financial support, place of residence and current health status to last four years.

There was no statistical significant association between the QOL with their gender, age in years, religion, marital status, regular income, type of family, type of house, living status, and idea regarding medical help, government funded schemes respectively.

CONCLUSION

The study concludes that the urban older people 38(63.33%) had good quality of life, 14(23.33%) had moderate quality of life, and 8(13.33%) had very good quality of life and as per as rural area concerned 30(50%) had good quality of life, 2(3.33%) had poor quality of life, 27(45%) had moderate quality of life and finally 1(1.67%) had very good quality of life.

The elderly people living in urban areas have better QOL (Mean=12.86) i.e., in all domains when compared to elderly people living in rural areas. The ‘F’ value of 0.047 suggesting that there is no significant interaction between the gender and locality of residence with regard to all domains of QOL. The rural women differs significantly with urban men in their all domains, rural men differ significantly with urban women and urban men in their all domains, where as other mean differences are not significant.

The Self Instructional Module (SIM) was given to men and women separately after data collection for future reference with the help of SIM, they can improve the quality of life, promotes good health and preserves the life.

IMPLICATIONS

The study findings had thrown new light on the implication of the future.

Community Practice Setting

In provision of care to the elderly and the people will be able to

- Recognize that sensation and perception in older adults are mediated by functional, physical, cognitive, psychological and social changes.
- Assess family member’s knowledge and skills that are essential to deliver care to elderly, communicate effectively, respectfully and compassionately.
• Prevent and reduce common risk factors that contribute to functional decline and impaired quality of life.

• Evaluate the utility of complementary and integrative health care practices on health promotion and symptom management of elderly.

• Guide elderly and their family members regarding the various resources (money and material) available in the community setting to utilize the rehabilitative health care services.

• Educate the elderly and their family members regarding various health care policies and facilities that are available to fulfill the various needs.

EDUCATION
• Curriculum should provide opportunity to the students to assess, compare and contract living environment of elderly. To analyze the effectiveness of community resources in assisting older adults and their families to attain the personal goals and minimize the functioning, maintain independence and to live in the least restrictive environment.

• Students get exposure to various available resources provided by government and nongovernmental organizations in provision of care, cure and rehabilitative services to the elderly.

• Students should get opportunity to render, assess and evaluate the case provided by family members and also the individuals to participate in their own health care through evidence based nursing practice during community, clinical rotations.

• The teaching faculty should plan for various programmes by using advanced educational technology to flourish the student’s minds and divert them to provide maximize their efforts towards the care of elderly in improving their Quality of life.

RESEARCH
• The mentors of research should focus their attention especially on improvement of quality of life among elderly, based on the needs elicited by various researchers.

• The experienced researchers should prepare the younger researcher to focus their attention on community needs of the elderly and guide them to conduct various studies in improving quality of life of the elderly.

• Government also should take interest and allot resources to conduct various research projects for the improvement of quality of life.

RECOMMENDATIONS
On the basis of the findings of the study the following recommendations are made.

- The study can be replicated with a large population to draw generalizations in this area of research.
- A similar study can be conducted at institutionalized and non institutionalized homes.
- A study can be made to assess the quality of life in various old age problems.
- A study can also be done to assess the knowledge of family members regarding old age problems.
- A study can be done to assess the knowledge regarding old age problems.
A similar study can be undertaken with a control group design.
A similar study can be conducted on psychological aspects of the quality of life among older persons

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JOURNALS


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THE IMPACT OF TECHNOLOGY ON TEACHER ATTITUDES TOWARDS TECHNOLOGY IN EDUCATION

ABSTRACT

This study aimed to investigate the impact of technology on teachers' attitudes towards technology in education. The study was conducted in a secondary school in the city of X, and the sample consisted of 100 teachers. The data was collected using a survey instrument, and the statistical analysis was conducted using SPSS software. The results indicated that the use of technology in education positively influenced teachers' attitudes towards technology. The study also highlighted the need for continuous professional development in technology integration.

KEYWORDS

Technology; Teacher Attitudes; Education

Introduction

The rapid advancement of technology has brought significant changes to the educational landscape. Teachers are required to integrate technology into their teaching practices to remain relevant and effective. This study seeks to investigate the impact of technology on teachers' attitudes towards technology in education.

Methodology

A quantitative research design was employed in this study. The sample consisted of 100 teachers in a secondary school in the city of X. A survey instrument was used to collect data on teachers' attitudes towards technology. The statistical analysis was conducted using SPSS software.

Results

The results indicated that the use of technology in education positively influenced teachers' attitudes towards technology. The study also highlighted the need for continuous professional development in technology integration.

Conclusion

This study underscores the importance of integrating technology into teaching practices. Professional development programmes should be developed to equip teachers with the necessary skills to effectively integrate technology into their teaching.

References


DECODING THE JAYPEE JUDGMENT: PREFERENTIAL TRANSACTIONS

Dr. Binoy J. Kattadiyil
ICSI IIP, IPA of IBBI, New Delhi

Introduction

On February 26, 2020, the Supreme Court gave its verdict in the long-drawn litigation between JaypeeInfratech Limited (JIL) and Jaiprakash Associates Limited (JAL). These two entities had brought forth competing creditor claims. While deciding the case, Supreme Court held that the JIL claims were preferential transactions and that third party security does not amount to financial debt. Through this article, we shall analyse the judgment and its implications.

Background

The statutory appeal is made to SC from NCLAT order dated 01.08.2019 which set aside the order passed by NCLT, Allahabad Bench where the application was moved by IRP of JaypeeInfratech Ltd. (JIL) for setting aside the transaction of mortgage of certain properties made by the corporate debtor (CD) in favour of its holding company Jaiprakash Associates Limited (JAL), having 71.64% equity shareholding in JIL, as being preferential, undervalued and fraudulent, in terms of Sections 43, 45 and 66 of IBC. JIL was set up as a special purpose vehicle for construction of an expressway from Noida to Agra and finance was obtained from a consortium of banks (including Respondents) against the partial mortgage of land acquired and a pledge of 51% of the shareholding held by JAL. IDBI Bank Limited instituted CIRP against JIL alleging that it committed a default in repayment of its dues of Rs. 526.11 crores. After passing an order of moratorium and public declaration, IRP was permitted to take over management of JIL and in the process made an application u/s. 43 of IBC to NCLT which ordered the security interest was ordered to be discharged and the properties involved therein were vested in the corporate debtor, with release of encumbrances. NCLAT however upturned the order of NCLT holding that the transactions in question do not fall within the mischief of being preferential or undervalued or fraudulent; and that the lenders in question (the lenders of JAL) were entitled to exercise their rights. The Respondent banks namely, ICICI Bank Limited and Axis Bank Limited, sought inclusion in the category of FC of JIL but IRP declined to recognize them as such. Being aggrieved by the IRP decision it preferred separate applications u/s. 60(5) of IBC before NCLT asserting their claim on account of the securities provided by JIL for the facilities granted to JAL. NCLT rejected the applications. Aggrieved banks approached the NCLAT which didn’t address the issues and has consequently appealed to SC.

Issues and Arguments

1. Whether the transaction of mortgage can be categorized as preferential, undervalued and fraudulent and consequently avoided?
   (i) whether such transfer is for the benefit of a creditor or a surety or a guarantor?
(ii) Whether such transfer is for or on account of an antecedent financial debt or operational debt or other liabilities owed by the corporate debtor?

(iii) Whether such transfer has the effect of putting such creditor or surety or guarantor in a beneficial position than it would have been in the event of distribution of assets being made in accordance with Section 53?

(iv) Whether the transfer was made during the period of two years preceding the insolvency commencement date?

(v) Whether such transfer is not an excluded transaction in terms of sub-section (3) of Section 43?

2. Whether the Respondents could be categorised as FC of JIL on the strength of the mortgage created by CD, as collateral security of the debt of its holding company for the purpose of CIRP?

Arguments by Appellants:

JAL would be preferred in the event of distribution of assets (waterfall mechanism) in terms of Section 53 of IBC due to the priority of interest created by way of security interest. The re-mortgage amounts to a fresh mortgage within the relevant time of two years before the date of commencement of CIRP and was not done in the ordinary course of business of JIL. The word “or” u/s. 43(3)(a) will have to be read as “and” otherwise it would mean that an overwhelming majority of transactions like the present one, whereby banks who would accept the security interest over properties belonging to a third party, after disbursing financial facilities to its loan, would get out of the net of “preferential transactions”, even if the transfer in question is not made in the ordinary course of business of the corporate debtor.

Arguments of Respondents:

The impugned mortgages had not been created on account of any antecedent debt liability owed by the CD; they had been within the ordinary course of business of and were not within the statutory period of one year and, therefore, Section 43 of IBC would not apply. The ‘relevant time’ in the present circumstances could be only one year as Bank is an unrelated party as the land parcels were mortgaged on 24.02.2015, which is beyond even the two years formulation, the relevant time being from 10.08.2016 to 09.08.2017. The security was provided on account of the debt obligations of JAL, and not any antecedent debt obligations of the corporate debtor. The transfer has no effect whatsoever on the relative position of JAL in the distribution waterfall as it remains an operational creditor without any security interest. A mere transfer of the assets within the look-back period (relevant time period) would not make the transaction preferential except when it is coupled with the intent to prefer one creditor over the other.

The Judgment And Its Implications

1(i) The transactions had been of transfers for the benefit of JAL, who is a related party of the corporate debtor JIL as explained in 1(ii)

1(ii) CD has given a preference by way of the mortgage transactions for the benefit of its related person JAL for and on account of antecedent financial debts, operational
debts and other liabilities owed to such related person as JAL had entered into Promoter Support Agreement to the lenders of JIL to meet the obligation of JIL towards its lenders; and had further extended Bank Guarantees of Rs. 212 crores to meet the obligation of JIL.

1(iii) Evidently, by way of the impugned transfers, JAL is put in a much beneficial position than it would have been in the absence of such transfers as JAL received a huge working capital (approx. Rupees 30000 crores), by way of loans JAL’s liability towards its own creditors shall be reduced, in so far as the value of the mortgaged properties is concerned. Other creditors and stakeholders of JIL shall have to bear the brunt of the corresponding disadvantage because such heavily encumbered assets will not form the part of available estate of the CD.

1(iv) Merely because look-back period is envisaged under IBC, for the purpose of finding ‘relevant time’, it cannot be said that the provision itself is retrospective in operation as contended by the Respondents. The concept of re-mortgage is equivalent to fresh mortgage and thus Respondent’s contention that the mortgages were formed prior to commencement of IBC or were re-mortgaged falls flat.

1(v) With regards to the Respondent’s contention of “ordinary course of business” in the landmark case of Downs Distributing Co. v. Associated Blue Star Stores, wherein it was held to mean “a transaction that falls into place as part of the undistinguished common flow business done”. Relying on this, SC was of the opinion that the mortgages were not in the ordinary course of business of the CD as lending was not in the ordinary course of business of the CD.

Banks contention that they were unaware of third-party encumbrances was legally untenable as they are hit by doctrine of due diligence (notice) and should’ve inspected for any encumbrances.

2 The debts in question are in the form of third party security; said to have been given by the corporate debtor JIL so as to secure the loans/advances/facilities obtained by JAL from the respondent-lenders. Such a ‘debt’ is not and cannot be a ‘financial debt’ within the meaning of Section 5(8) of the Code; and hence, the respondent-lenders, the mortgagees, are not the ‘financial creditors’ of the corporate debtor JIL. As per ration in Essar Steel and Swiss Ribbons, as being subsumed in financial creditors, is only that of such secured creditors who are directly engaged in advancing credit to the corporate debtor and not the indirect creditors who had extended any loan or facility to a third party but had taken a security from the corporate debtor, whose resolution is under consideration.

This decision of the Supreme Court will have a huge impact on how third party security transactions are viewed within the context of IBC. Classifying them as preferential transactions means that now insolvency professionals will have to re-think before approaching the NCLT for third-party security transactions. Moreover, the composition of committee of creditors would also have to undergo a change, as third-party security beneficiaries may not fall under the scope of financial creditors, post this decision.
ON DEVELOPMENT OF ESTIMATION PROCEDURE FOR
ESTIMATING POPULATION VARIANCE UNDER SIMPLE RANDOM
SAMPLING

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A Central University, Lucknow, India

Abstract

This paper proposes a family of estimators based on the auxiliary information on a variable. The
properties of the proposed estimator are derived up to the first order of approximation. The mean
squared error of the proposed estimator found to be lesser than the existing estimators. A
comparative study is done to show the better performance of our proposed work. Further, an
empirical study is performed to judge the efficiency of suggested work and hence conclude to be
better than conventional estimator. The proposed work is of much practical utility in sample
surveys.

Keywords: Ratio estimation procedure, simple random sampling, bias, mean squared error,
percent relative efficiency.

1. Introduction

In sampling theory, the use of auxiliary information, is always beneficial in order to get more
efficient estimates of the population parameters. Various authors have made the use of auxiliary
variable as a source of auxiliary information to increase the precision of the estimators, for the
estimation of the population parameter under consideration. In recent years, many authors have
also made use of various parameters associated with the auxiliary variable $x$ for e.g., standard
deviation $S_x$, coefficient of variation $C_v$, coefficient of kurtosis $b_2$, and correlation coefficient $r$
of the population in estimation of the population variance. Bhushan (2013), Kalidar and Cingi
(2003), Sisodia and Dwivedi (1981), Upadhyaya and Singh (1999), Singh et al. (2008), Pandey
and Dubey (1988), etc are some of the authors in the list. In this paper, a family of estimators
have been proposed by adapting the estimator of Koyuncu (2012) and a class of log type
estimators (Kumari et al. (2019)) using the auxiliary information on a variable.
Consider a finite population \( U = (U_1, U_2, ..., U_N) \) of size \( N \) from which a sample of size \( n \) is drawn according to simple random sampling without replacement (SRSWOR). Let \( y_i \) and \( x_i \) denote the values of the study variable and auxiliary variable for the \( i^{th} \) unit \( (i = 1, 2, ..., N) \), of the population. Further, let \( \bar{y} \) and \( \bar{x} \) be the sample means and \( s_y^2 = \frac{\sum (y_i - \bar{y})^2}{(n-1)} \) and \( s_x^2 = \frac{\sum (x_i - \bar{x})^2}{(n-1)} \) be the sample variance of the study variable and auxiliary variable respectively.

2. Estimators available in literature

2.1 Conventional variance estimator

\[ t_0 = s_y^2 \]

The bias and variance of \( t_0 \) to the first order of approximation, are given as

\[ B(t_0) = 0 \]
\[ V(t_0) = s_y^2 I b_{2y}^2 \]

2.2 Isaki ratio estimator

\[ t_1 = s_y^2 \left( \frac{s_x^2}{s_y^2} \right) \]

The bias and MSE of \( t_1 \) to the first order of approximation, are given as

\[ B(t_1) = s_y^2 \left( 1 - \frac{1}{t_{2yy}} \right) b_{2y}^2 \]
\[ V(t_1) = s_y^2 \left( b_{2y}^2 + b_{2x}^2 - 2t_{2yy} \right) \]

2.3 Conventional product estimator

\[ t_2 = s_y^2 \left( \frac{s_x^2}{s_y^2} \right) \]

The bias and MSE of \( t_2 \) to the first order of approximation, are given as

\[ B(t_2) = s_y^2 I b_{2y}^2 \]
\[ V(t_2) = s_y^2 I \left( b_{2y}^2 + b_{2x}^2 + 2t_{2yy} \right) \]

2.4 Isaki regression estimator

Isaki (1983) suggested the following regression estimator for population variance

\[ t_3 = s_y^2 + b (S_Y^2 - s_y^2) \]

where \( b \) is a sample regression coefficient whose population regression coefficient is \( \beta \).

The bias and MSE of \( t_3 \) to the first order of approximation, are given as
\[ B(t_3) = 0 \]
\[ V(t_3) = S_3^2 \left[ \frac{\hat{b}_{2y}}{k} \right] \]

**2.5 Singh et al. estimator**

Singh et al. (1973) considered the following estimator,

\[ t_4 = a_4 s_y^2 \]

where \( a_4 \) is a Searl (1964) constant. The optimum value of Searl's constant is \( a_4 = n(n + b_{2y}) \) for which the mean squared error is minimum.

\[ MSE(t_4)_{opt} = S_4^2 \left[ \frac{n b_{2y}}{n + b_{2y}} \right] \]

**2.6 Das and Tripathi estimator**

\[ t_5 = \frac{s_y^2}{S_5^2 + \alpha_5 (s_y^2 - x)} \]

where \( \alpha_5 \) is a constant. The bias and MSE of \( t_5 \) to the first degree of approximation is given as

\[ B(t_5) = S_5^2 \left[ \alpha_5 b_{2y} - \alpha_5 S_{22yx} \right] \]
\[ V(t_5) = S_5^2 \left[ \frac{b_{2y} + \alpha_5 b_{2x} - 2 \alpha_5 S_{22yx}}{n} \right] \]

The MSE of \( t_5 \) is optimum for \( \alpha_5 = \frac{S_{22yx}}{S_{22yx}} \) and is given by

\[ MSE(t_5)_{opt} = S_5^2 \left[ \frac{S_{22yx}}{b_{2x}} \right] \]

**2.7 Prasad and Singh estimator**

Prasad and Singh (1992) introduced the following estimator

\[ t_6 = a_6 \frac{S_6^2}{S_y^2} \]

where \( a_6 \) is a constant. The bias and MSE of \( t_6 \) to the first degree of approximation is given as

\[ B(t_6) = S_6^2 \left[ a_6 (n + b_{2y} - S_{22yx}) - n \right] \]
\[ V(t_6) = S_6^2 \left[ a_6 (n + b_{2y} + 3b_{2x} - 4S_{22yx}) - 2a_6 (n + b_{2y} - S_{22yx}) - n \right] \]

The MSE of \( t_6 \) is optimum for \( a_6 = \frac{(n + b_{2y} - S_{22yx})}{(n + b_{2y} + 3b_{2x} - 4S_{22yx})} \) and is given by
\[ MSE(t_{\text{opt}}) = S^2 T \left( n - \frac{(n + b_{2x}^* - l_{2xy}^*)^2}{(n + b_{2x}^* + 3b_{2x}^* - 4l_{2xy}^*)} \right) \]

### 2.8 Garcia and Cebrian estimator

Garcia and Cebrian (1996) introduced the following estimator

\[ t_{\gamma} = S^2 \left[ \frac{s_b^2}{S^2} \right]^{\alpha_{\gamma}} \]

where \( \alpha_{\gamma} \) is a constant. The bias and MSE of \( t_{\gamma} \) to the first degree of approximation is given as

\[ B(t_{\gamma}) = S^2 T \left[ \alpha_{\gamma} \frac{l_{2xy}}{2} b_{2x}^* - \alpha_{\gamma} l_{2xy}^* \right] \]

\[ V(t_{\gamma}) = S^2 T \left[ b_{2y}^* + \alpha_{\gamma}^2 b_{2x}^* - 2\alpha_{\gamma} l_{2xy}^* \right] \]

The MSE of \( t_{\gamma} \) is optimum for \( \alpha_{\gamma} = \frac{l_{2xy}^*}{2b_{2x}^*} \) and is given by

\[ MSE(t_{\gamma}) = S^2 T \left[ b_{2y}^* - \frac{l_{2xy}^*}{b_{2x}^*} \right] \]

### 2.9 Upadhaya and Singh estimator

Upadhaya and Singh (2001) suggested following estimator

\[ t_{\theta} = S^2 + \alpha_{\theta} \left( S^2 - s^2 \right) \]

where \( \alpha_{\theta} \) is a constant. The MSE of \( t_{\theta} \) is optimum for \( \alpha_{\theta} = \frac{s_b l_{2xy}^*}{s_b l_{2xy}^* s^2} \) and is given by

\[ MSE(t_{\theta}) = S^2 T \left[ b_{2y}^* - \frac{l_{2xy}^*}{b_{2x}^*} \right] \]

### 2.10 Shabbir and Gupta (2006) estimator

Shabbir and Gupta (2006) proposed the following estimator

\[ t_{\lambda} = \lambda t_m \]

where \( \lambda \) is a Searls (1964) constant whose value is to be determined later. Here \( t_m \) is a combination of Singh et al. (1973), Prasad and Singh (1992) and is defined as

\[ t_m = K_1 s^2 + K_2 s^2 \left( \frac{S^2}{s^2} \right) \]

where \( K_1 \) and \( K_2 \) are the weights such that \( K_1 + K_2 = 1 \)

The optimum MSE of \( t_m \) is given by
\[ MSE(t_{10})_{opt} = S^2 I \left[ n - \frac{\left( n + I_{22xy}^2 - I_{22xy}^2 b_{2x}^2 \right)^2}{\left( n + b_{2y}^2 + 2 I_{22xy} - 3 I_{22xy}^2 b_{2x}^2 \right)} \right] \]

2.11 Shabbir and Gupta (2007) estimator

\[ t_{10} = K_1 s_1^2 + K_2 \left( s_2^2 - s_3^2 \right) \exp \left( \frac{s_2^2 - s_3^2}{s_2^2 + s_3^2} \right) \]

where \( K_1 \) and \( K_2 \) are suitably chosen constants.

**Situation 1.** \( k_1 + k_2 = 1 \) The bias and MSE of \( t_{10} \) the first degree of approximation are given as

The optimum MSE of \( t_{10} \) is given by

\[ MSE(t_{10})_{opt} = S^2 I \left[ A_1 - \frac{(A_1 + A_2)^2}{(A_1 + A_3 + 2A_3)} \right] \]

**Situation 2.** Unconstrained choice of \( K_1 \) and \( K_2 \) The bias and MSE of \( t_{10} \) the first degree of approximation are given as

\[ MSE(t_{10})_{opt} = S^2 I \left[ \frac{\text{Var}(\hat{S}_{reg})}{\text{Var}(\hat{S}_{reg})} \right] \]

2.12 Kadilar and Cingi estimator

Kadilar and Cingi (2006) suggested the following ratio type estimator

\[ t_{11} = w_1 s_1^2 + K_2 \left( s_2^2 - \frac{s_{12}^2}{s_3^2} \right) \]

where \( w_1 \) and \( w_2 \) are the weights such that \( w_1 + w_2 = 1 \)

The optimum MSE of \( t_{11} \) is given by

\[ MSE(t_{11})_{opt} = S^2 I \left[ n - \frac{\left( n + I_{22xy}^2 - I_{22xy}^2 b_{2x}^2 \right)^2}{\left( n + b_{2y}^2 + 2 I_{22xy} - 3 I_{22xy}^2 b_{2x}^2 \right)} \right] \]

2.13 Yadav and Kalidar (2013) estimator

Yadav and Kalidar (2013) introduced the following estimator

\[ t_{12} = s_1^2 + \exp \left( 1 - \frac{\alpha_{12} s_{12}^2}{s_2^2 + (\alpha_{12} - 1) s_3^2} \right) \]
Where \( \alpha_{12} \) is a constant. The optimum MSE of \( t_{12} \) is given by

\[
MSE(t_{12})_{opt} = S^2_j \left[ b_{2y}^2 - \frac{I_2 y x}{b_{2x}^2} \right]
\]

2.14 Yadav and Kadilar (2014) estimator

Yadav and Kadilar (2014) introduced the following ratio-product-ratio estimator

\[
t_{\alpha, \beta, 12} = S^2_j \alpha \left( \frac{(1-\beta)\alpha^2 + \beta \alpha^2}{\beta S^2_j (1-\beta) S^2_j + \beta \alpha^2} \right) + S^2_j \beta (1 - \alpha) \left( \frac{(1-\beta)\alpha^2 + \beta \alpha^2}{\beta S^2_j (1-\beta) S^2_j + \beta \alpha^2} \right)
\]

Where \( \alpha \) and \( \beta \) is a constant. The optimum MSE of \( t_{\alpha, \beta, 12} \) is given by

\[
MSE(t_{\alpha, \beta, 12})_{opt} = S^2_j b_{2y}^2
\]

3. Research Methods or Methodology

In this paper, the following family of estimator has been proposed for the estimation of the parameter under consideration i.e., the population variance of the study variable \( y \) using auxiliary information on a variable.

\[
T_\epsilon = \left[ w_1 S^2_j + w_2 \left( \frac{S^2_j}{S^2_x} \right) \right] \left[ 1 + a \log \left( \frac{S^2_j}{S^2_x} \right) \right]
\]

where \( a \) is the characterizing scalar.

\[
s^2_x = a S^2_x + b, \quad S^2_x = a S^2_x + b
\]

such that \( a \neq 0 \) and \( b \) are either real numbers or functions of the known parameters of the auxiliary variable \( x \) such as the standard deviation \( S_x \), coefficient of variation \( C_v \), coefficient of kurtosis \( b_3 \), coefficient of skewness \( b_4 \), and correlation coefficient \( r \) of the population.

It is noteworthy that, if \( a - b = 0 \), then the proposed estimator becomes the usual variance estimator \( \hat{S}_y^2 \). If \( a - b = 1 \), then the proposed class of estimators become a ratio type estimator and when \( a - b = -1 \), then the proposed class of estimators become a product type estimator.

4. Properties of the suggested classes of log-type estimators

In order to obtain the bias and mean square error (MSE), let us consider
\[ E(\varepsilon_0) = E(\varepsilon_1) = 0, E(\varepsilon_0)^2 = I b_{2x}^2, E(\varepsilon_1)^2 = I b_{2x}^2, E(\varepsilon_0 \varepsilon_1) = I l_{2222}. \]

Where \( b_{2x} = b_{22} - 1, b_{2y} = b_{22} - 1 \) and, \( l_{2222} = l_{2222} - 1, I = \frac{1}{N}, I_{pq} = \frac{m_{pq}}{m_{20} m_{02}} \)

\[ m_{pq} = \sum_{i=1}^{N} (y_i - \bar{Y})^p (x_i - \bar{x})^q / N, b_{2x} = m_{40} / m_{20}^2, b_{2y} = m_{04} / m_{02}^2, \]

are the coefficients of kurtosis of \( y \) and \( x \) respectively.

**Theorem 1.** The bias and mean squared error of the proposed estimators are given by

\[
\text{Bias}(T) = S_y^4 \left[ w_1 \left( 1 + l a p r x \sqrt{b_{2y}^2 b_{2x}^2} - \frac{an^2}{2} b_{2x}^2 \right) - 1 \right] + w_2 \left( 1 + l a p b_{2x}^2 - \frac{an^2}{2} b_{2x}^2 \right)
\]

\[
\text{MSE}(T) = S_y^4 w_1^2 A + w_2^2 B + S_y^2 w_1 D + S_y^2 w_2 G + S_y^2 w_1 w_2 F + S_y^4 \]

where

\[
A = \left[ 1 + l \left( b_{2y}^2 + a^2 \eta^2 b_{2x}^2 + 4 a p r x \sqrt{b_{2y}^2 b_{2x}^2} - a \eta^2 b_{2x}^2 \right) \right]
\]

\[
B = \left[ 1 + l \left( b_{2y}^2 + a^2 \eta^2 b_{2x}^2 + 4 a p r x b_{2y} - a \eta^2 b_{2x}^2 \right) \right]
\]

\[
D = l \left( a \eta^2 b_{2x}^2 - 2 a p r x \sqrt{b_{2y} b_{2x}} \right) - 2
\]

\[
G = l \left( a \eta^2 b_{2x}^2 - 2 a p r x \right) - 2
\]

\[
F = 2 + 2 l \left( 2 a p r x + 4 a p r x \sqrt{b_{2y} b_{2x}^2} + r_{xy} \sqrt{b_{2y} b_{2x}} - a \eta^2 b_{2x}^2 + a^2 \eta^2 b_{2x}^2 \right)
\]

\[
\eta = \frac{a \eta}{a \eta + b}, \quad r_{xy} = \frac{r_{xy}}{\sqrt{b_{2y} b_{2x}}} \]

respectively.

**Corollary 1.** The mean square error of the proposed class of estimator \( T_c \) will be minimum for the optimum value of the characterizing parameters, given

\[
w_{1\text{opt}} = \frac{G_F - 2B D}{4 A B - F^2}
\]

\[
w_{2\text{opt}} = S_y^2 \left[ \frac{D F - 2 A G}{4 A B - F^2} \right]
\]

and the minimum value of the mean square error within the proposed class of estimator is

\[
\text{MSE}(T_{c\text{opt}}) = S_y^4 \left[ 1 - \frac{B D^2 - D F G + G^2 A}{4 A B - F^2} \right]
\]
5. Multivariate extension of the suggested classes of estimators using multiple auxiliary information

Let there are $k$ auxiliary variable then we can use the variables by taking a linear combination of these $k$ estimators of the form given in section 3, calculated for every auxiliary variable separately, for estimating the population variance. Then the estimators for population variance will be defined as

$$T_e = \left[ w_1 s^2_{y} + w_2 \left( \frac{S^2_{x}}{s^2_{x}} \right) \prod_{i=1}^{n} \left[ 1 + a_i \log \left( \frac{S^2_{x}}{s^2_{x}} \right) \right] \right]$$

where $a_i$'s are the optimizing scalar, $i = 1, 2, \ldots, n$.

6. Properties of the suggested classes of estimators using multiple auxiliary information

**Theorem 3.** The bias of the proposed estimators are given as

$$Bias(T) = S^2_{T} \left[ w_2 \left( 1 + \frac{1}{n} \sum_{i=1}^{n} a_i \eta^2 b_{2x_i} - 1 \right) \sum_{i=1}^{n} a_i \eta y_i \left( b_{2y_i} b_{2x_i} - \frac{1}{2} \sum_{i=1}^{n} a_i \eta^2 b_{2x_i} \right) \right]$$

$$+ w_2 \left( 1 + \frac{1}{n} \sum_{i=1}^{n} a_i \eta b_{2x_i} + \frac{1}{n} \sum_{i=1}^{n} a_i \eta^2 b_{2x_i} \right)$$

$$MSE(T) = S^2_{T} w_1^2 A + w_2^2 B + S^2_{T} w_1 D + S^2_{T} w_2 G + S^2_{T} w_1 w_2 F + S^2_{T}$$

where

$$A = \left[ 1 + \frac{1}{2} \sum_{i=1}^{n} a_i \eta^2 b_{2x_i} - 4 \sum_{i=1}^{n} a_i \eta y_i \left( b_{2y_i} b_{2x_i} - \frac{1}{2} \sum_{i=1}^{n} a_i \eta^2 b_{2x_i} \right) \right]$$

$$B = \left[ 1 + \frac{1}{2} \sum_{i=1}^{n} a_i \eta^2 b_{2x_i} + 4 \sum_{i=1}^{n} a_i \eta y_i \left( b_{2y_i} b_{2x_i} + \frac{1}{2} \sum_{i=1}^{n} a_i \eta^2 b_{2x_i} \right) \right]$$

$$D = \left( 2 \sum_{i=1}^{n} a_i \eta y_i \left( b_{2y_i} b_{2x_i} - \frac{1}{2} \sum_{i=1}^{n} a_i \eta^2 b_{2x_i} \right) \right) - 2$$

$$G = \left( - \sum_{i=1}^{n} a_i \eta^2 b_{2x_i} - 2 \sum_{i=1}^{n} a_i \eta y_i \right) - 2$$
\[ F = 2 + 2I \left( \sum_{i=1}^{n} a_i q_i b_{2i} - \sum_{i=1}^{n} a_i q_i r_{2i} - \sum_{i=1}^{n} b_{2i} b_{2i} + \sum_{i=1}^{n} a_i q_i^2 b_{2i} \right) \]

\[ \eta = -\frac{a_i q_i^2}{a_i q_i^2 + b_i}, \quad r_{2i} = \frac{b_{2i} b_{2i}}{b_{2i} b_{2i}} \]

respectively.

7. Some members of the class of estimators \( T_e \)

It can be easily seen that the proposed class \( T_e \) is a generalization of class of estimators for the \( a(\neq 0) \) and \( b(\neq 0) \) are either real numbers or functions of the known parameters of the auxiliary variable \( x \) such as the standard deviations \( S_x \), coefficient of variation \( C_x \), coefficient of skewness \( b_1(x) \) and correlation coefficient \( r \) of the population. Therefore, a wide variety of estimators can be designed using the above known population parameters. Some of them are listed below.

Table 1: Some generalized members of the proposed class of estimators \( T_e \)

<table>
<thead>
<tr>
<th>Log type estimator ( T_e )</th>
<th>a</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>( T_{e1} )</td>
<td>( w_1 s_x^2 + w_2 \left( \frac{s_x^2}{s_x^2 + C_x} \right)^b \left[ 1 + \log \left( \frac{s_x^2}{s_x^2 + C_x} \right) \right] )</td>
<td>1</td>
</tr>
<tr>
<td>( T_{e2} )</td>
<td>( s_x^2 \left[ w_1 s_x^2 + w_2 \left( \frac{s_x^2 + C_x}{s_x^2 + C_x} \right)^b \right] \left[ 1 + \log \left( \frac{s_x^2 + C_x}{s_x^2 + C_x} \right) \right] )</td>
<td>1</td>
</tr>
<tr>
<td>( T_{e3} )</td>
<td>( s_x^2 \left[ w_1 s_x^2 + w_2 \left( \frac{b_2(x) s_x^2 + C_x}{b_2(x) s_x^2 + C_x} \right)^b \right] \left[ 1 + \log \left( \frac{b_2(x) s_x^2 + C_x}{b_2(x) s_x^2 + C_x} \right) \right] )</td>
<td>( b_{2x} )</td>
</tr>
<tr>
<td>( T_{e4} )</td>
<td>( s_x^2 \left[ w_1 s_x^2 + w_2 \left( \frac{C_x s_x^2 + b_2(x)}{C_x s_x^2 + b_2(x)} \right)^b \right] \left[ 1 + \log \left( \frac{C_x s_x^2 + b_2(x)}{C_x s_x^2 + b_2(x)} \right) \right] )</td>
<td>( C_x )</td>
</tr>
<tr>
<td>( T_{e5} )</td>
<td>( s_x^2 \left[ w_1 s_x^2 + w_2 \left( \frac{s_x^2 + S_x}{s_x^2 + S_x} \right)^b \right] \left[ 1 + \log \left( \frac{s_x^2 + S_x}{s_x^2 + S_x} \right) \right] )</td>
<td>1</td>
</tr>
<tr>
<td>( T_{e6} )</td>
<td>( s_x^2 \left[ w_1 s_x^2 + w_2 \left( \frac{b_1(x) s_x^2 + S_x}{b_1(x) s_x^2 + S_x} \right)^b \right] \left[ 1 + \log \left( \frac{b_1(x) s_x^2 + S_x}{b_1(x) s_x^2 + S_x} \right) \right] )</td>
<td>( b_{1x} )</td>
</tr>
</tbody>
</table>
\[
T_{c7} = s_x^2 \left[ w_1 s_x^2 + w_2 \left( \frac{S_x^2 + r}{s_x^2 + r} \right) \right] \left[ 1 + \log \left( \frac{b_2(x) S_x^2 + S_x}{b_2(x) s_x^2 + S_x} \right) \right]^{b_3 x} S_x
\]

\[
T_{c8} = s_x^2 \left[ w_1 s_x^2 + w_2 \left( \frac{S_x^2 + r}{s_x^2 + r} \right) \right] \left[ 1 + \log \left( \frac{S_x^2 + r}{s_x^2 + r} \right) \right]^{b_2(x)} 1 = R
\]

\[
T_{c9} = s_x^2 \left[ w_1 s_x^2 + w_2 \left( \frac{S_x^2 + b_2(x)}{s_x^2 + b_2(x)} \right) \right] \left[ 1 + \log \left( \frac{S_x^2 + b_2(x)}{s_x^2 + b_2(x)} \right) \right]^{b_2(x)} 1 = b_2(x)
\]

\[
T_{c10} = s_x^2 \left[ w_1 s_x^2 + w_2 \left( \frac{C_x S_x^2 + r}{C_x s_x^2 + r} \right) \right] \left[ 1 + \log \left( \frac{C_x S_x^2 + r}{C_x s_x^2 + r} \right) \right]^{b_2(x)} 1 = b_2(x)
\]

\[
T_{c11} = s_x^2 \left[ w_1 s_x^2 + w_2 \left( \frac{r S_x^2 + C_x}{r s_x^2 + C_x} \right) \right] \left[ 1 + \log \left( \frac{r S_x^2 + C_x}{r s_x^2 + C_x} \right) \right]^{b_2(x)} 1 = b_2(x)
\]

\[
T_{c12} = s_x^2 \left[ w_1 s_x^2 + w_2 \left( \frac{b_2(x) S_x^2 + r}{b_2(x) s_x^2 + r} \right) \right] \left[ 1 + \log \left( \frac{b_2(x) S_x^2 + r}{b_2(x) s_x^2 + r} \right) \right]^{b_3 x} S_x
\]

\[
T_{c13} = s_x^2 \left[ w_1 s_x^2 + w_2 \left( \frac{r S_x^2 + b_2(x)}{r s_x^2 + b_2(x)} \right) \right] \left[ 1 + \log \left( \frac{r S_x^2 + b_2(x)}{r s_x^2 + b_2(x)} \right) \right]^{b_3 x} S_x
\]

8. Comparison of estimators

In this section, we compare the proposed classes of estimators with some important estimators. The comparison will be in terms of their MSEs up to the order of \(n^{-1}\). Let us define

\[
C_1 = b_{1y}^2 + b_{2x}^2 \cdot 2l_{12}^2, \quad C_2 = b_{1y}^2 + b_{2x}^2 \cdot 2l_{12}^2, \quad D = b_{1y}^2 \cdot b_{2x}^2 - l_{12}^2, \quad E = \frac{mb_{2y}}{n + b_{2y}^2}
\]

\[
F = \left[ n - \frac{(n + b_{1y}^2 - l_{12}^2)^2}{n + b_{1y}^2 + 2b_{1y}^2 - 4b_{1y}^2} \right], \quad G = \left[ n - \frac{(n + b_{1y}^2 - l_{12}^2)^2}{n + b_{1y}^2 + 2b_{1y}^2 - 4b_{1y}^2} \right], \quad H = \left( A_3 - \frac{(A_1 + A_2)^2}{A_1 + A_2 + 3A_1} \right)
\]

\[
MSE(t_3) > MSE(T_1)_{opt} \quad \text{if} \quad b_{1y}^2 + \frac{n^2}{A} \cdot n > 0
\]

\[
MSE(t_1) > MSE(T_1)_{opt} \quad \text{if} \quad C_1 + \frac{n^2}{A} \cdot n > 0
\]

\[
MSE(t_2) > MSE(T_1)_{opt} \quad \text{if} \quad C_2 + \frac{n^2}{A} \cdot n > 0
\]
\[ \text{MSE}(t_3) > \text{MSE}(T_1^*)_{\text{opt}} \quad \text{if} \quad D - \left( n - \frac{b_z^2}{A} \right) b_{x2}^* > 0 \]
\[ \text{MSE}(t_4) > \text{MSE}(T_1^*)_{\text{opt}} \quad \text{if} \quad E - \frac{b_z^2}{A} - n > 0 \]
\[ \text{MSE}(t_5) > \text{MSE}(T_1^*)_{\text{opt}} \quad \text{if} \quad D - \left( n - \frac{b_z^2}{A} \right) b_{x2}^* > 0 \]
\[ \text{MSE}(t_6) > \text{MSE}(T_1^*)_{\text{opt}} \quad \text{if} \quad F + \frac{b_z^2}{A} - n > 0 \]
\[ \text{MSE}(t_7) > \text{MSE}(T_1^*)_{\text{opt}} \quad \text{if} \quad D - \left( n - \frac{b_z^2}{A} \right) b_{x2}^* > 0 \]
\[ \text{MSE}(t_8) > \text{MSE}(T_1^*)_{\text{opt}} \quad \text{if} \quad D - \left( n - \frac{b_z^2}{A} \right) b_{x2}^* > 0 \]
\[ \text{MSE}(t_9) > \text{MSE}(T_1^*)_{\text{opt}} \quad \text{if} \quad G + \frac{b_z^2}{A} - n > 0 \]
\[ \text{MSE}(t_{10}) > \text{MSE}(T_1^*)_{\text{opt}} \quad \text{if} \quad H + \frac{b_z^2}{A} - n > 0 \]
\[ \text{MSE}(t_{11}) > \text{MSE}(T_1^*)_{\text{opt}} \quad \text{if} \quad G + \frac{b_z^2}{A} - n > 0 \]
\[ \text{MSE}(t_{12}) > \text{MSE}(T_1^*)_{\text{opt}} \quad \text{if} \quad D - \left( n - \frac{b_z^2}{A} \right) b_{x2}^* > 0 \]

9. Empirical study

To compare the efficiency of the suggested class of estimator numerically, we considered nine natural data sets. The description of the population is given below.

Population 1. (Cochran (1977), Pg. no. 107)
y : number of persons per block
x : number of rooms per block
\[ S_y^2 = 214.69, \ S_x^2 = 56.76, \ b_{2y}^* = 1.2387, \ b_{2x}^* = 1.3523, \ I_{2y2x} = 0.5432, \ C_x = 0.1450, \ \bar{X} = 58.8, \]
\[ \rho = 0.6513, n = 10. \]

Population 2 (Cochran (1977), Pg. no. 203)
y : actual weight of peaches on each tree
x : eye estimate of weight of peaches on each tree.
\[ S_y^2 = 99.81, S_x^2 = 85.09, b_{2y}^* = 0.9249, b_{2x}^* = 1.2932, I_{2y2x} = 1.1149, C_x = 0.1621, \ \bar{X} = 56.9, \]
\[ \rho = 0.9937, n = 10. \]

Population 3. (Sukhatme P. V. (1970), Pg. no. 185)
y : wheat acreage in 1937
x : wheat acreage in 1936
$S^2_y = 26456.99, S^2_x = 22355.76, b^2_{xy} = 2.1842, b^2_{xx} = 1.2030, I^2_{2xy} = 1.5597, C_x = 0.5625, \bar{X} = 265.8, \rho = -0.977, n = 10.$

**Population 4.** (Singh D and Chaudhary F. S., Pg. no. 107).

$y: \text{number of boats landing at a particular centre}$

$x: \text{catch of fish in quintals}$

$S^2_y = 201324.4, S^2_x = 396.8889, b^2_{xy} = 0.9462, b^2_{xx} = 0.6078, I^2_{2xy} = 0.6333, C_x = 0.7288, \bar{X} = 27.3333, \rho = -0.9308, n = 4.$

**Population 5.** (Singh D and Chaudhary F. S., Pg. no. 141).

$y: \text{number of bearing limbs two}$

$x: \text{area under lime (in acres)}$

$S^2_y = 656486.45, S^2_x = 1092.1024, b^2_{xy} = 12.2574, b^2_{xx} = 4.5788, I^2_{2xy} = 6.7126, C_x = 1.4273, \bar{X} = 22.6209, \rho = -0.9021, n = 9.$

**Population 6.** (Choudhary F. S. and Singh D., Pg. no. 176).

$y: \text{number of cows in milk enumerated}$

$x: \text{number of cows in milk in the previous year.}$

$S^2_y = 332721.2079, S^2_x = 281472.7868, b^2_{xy} = 6.2079, b^2_{xx} = 5.0043, I^2_{2xy} = 4.9528, C_x = 0.8276, \bar{X} = 641.05, \rho = 0.8933, n = 8.$

**Population 7.** (Singh S., Pg. no. 324-325).

$y: \text{approximate duration of sleep (in minutes)}$

$x: \text{age in years of the persons.}$

$S^2_y = 3582.579, S^2_x = 85.2367, b^2_{xy} = 1.6678, b^2_{xx} = 1.2389, I^2_{2xy} = 0.9961, C_x = -0.1349, \bar{X} = 67.2567, \rho = -0.8552, n = 9.$

**Population 8.** (Singh S., Pg. no. 1114).

$y: \text{approximate duration of sleep (in minutes)}$

$x: \text{age in years of the persons.}$

$S^2_y = 0.0073, S^2_x = 0.0063, b^2_{xy} = 2.6323, b^2_{xx} = 2.4016, I^2_{2xy} = 1.8351, C_x = 1.2352, \bar{X} = 0.1831, \rho = -0.7789, n = 11.$

By using the above data set, the percent relative efficiency of the different estimator are given in Table 2.
Table 2: PRE of the estimators w.r.t. $t_0$

<table>
<thead>
<tr>
<th>Est.</th>
<th>Pop 1</th>
<th>Pop 2</th>
<th>Pop 3</th>
<th>Pop 4</th>
<th>Pop 5</th>
<th>Pop 6</th>
<th>Pop 7</th>
<th>Pop 8</th>
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<tr>
<td>$t_0$</td>
<td>100</td>
<td>100</td>
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<td>100</td>
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<td>100</td>
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<td>100</td>
</tr>
<tr>
<td>$t_1$</td>
<td>121.38</td>
<td>320.81</td>
<td>815.60</td>
<td>329.16</td>
<td>359.35</td>
<td>475.29</td>
<td>182.39</td>
<td>193.03</td>
</tr>
<tr>
<td>$t_2$</td>
<td>33.68</td>
<td>19.48</td>
<td>33.56</td>
<td>33.54</td>
<td>40.50</td>
<td>29.39</td>
<td>34.04</td>
<td>30.24</td>
</tr>
<tr>
<td>$t_3$</td>
<td>121.38</td>
<td>639.14</td>
<td>1347.98</td>
<td>330.39</td>
<td>507.23</td>
<td>475.29</td>
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<td>214.00</td>
</tr>
<tr>
<td>$t_4$</td>
<td>112.38</td>
<td>639.14</td>
<td>121.42</td>
<td>30.91</td>
<td>236.19</td>
<td>177.59</td>
<td>118.53</td>
<td>125.93</td>
</tr>
<tr>
<td>$t_5$</td>
<td>121.38</td>
<td>109.23</td>
<td>1347.98</td>
<td>330.96</td>
<td>507.23</td>
<td>475.29</td>
<td>192.40</td>
<td>214.00</td>
</tr>
<tr>
<td>$t_6$</td>
<td>112.95</td>
<td>639.14</td>
<td>810.13</td>
<td>348.03</td>
<td>381.77</td>
<td>550.96</td>
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<td>$t_7$</td>
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<td>639.14</td>
<td>1347.98</td>
<td>330.39</td>
<td>507.23</td>
<td>475.29</td>
<td>192.40</td>
<td>214.00</td>
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<tr>
<td>$t_8$</td>
<td>121.38</td>
<td>639.14</td>
<td>1347.98</td>
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<td>$t_9$</td>
<td>143.14</td>
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<td>1434.48</td>
<td>349.88</td>
<td>528.70</td>
<td>559.08</td>
<td>220.35</td>
<td>258.35</td>
</tr>
<tr>
<td>$t_{10}$</td>
<td>121.38</td>
<td>489.41</td>
<td>306.84</td>
<td>227.25</td>
<td>319.46</td>
<td>457.77</td>
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<tr>
<td>$t_{10}$</td>
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<td>1369.81</td>
<td>354.05</td>
<td>643.42</td>
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<td>329.05</td>
<td>358.77</td>
<td>269.13</td>
<td>182.54</td>
<td>102.02</td>
</tr>
<tr>
<td>$t_{12}$</td>
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<td>1347.98</td>
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<td>475.29</td>
<td>192.40</td>
<td>214.00</td>
</tr>
<tr>
<td>$t_{a_{12}}$</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>$T_e$</td>
<td>147.02</td>
<td>1163.41</td>
<td>1863.95</td>
<td>439.47</td>
<td>991.93</td>
<td>2120.43</td>
<td>247.66</td>
<td>311.67</td>
</tr>
</tbody>
</table>

In the above table, the relative efficiency of the proposed estimator is much better as compared to other estimators for all the data sets given here.

10. Conclusion

The present study extends the idea of Kumar et al. (2019) regarding the effective use of auxiliary information if the relationship between the study variable and the auxiliary variable is of logarithmic type. Further, the efficiency of the proposed estimators are compared with some conventional estimators and some recent estimators of Singh et al. (1973), Das and Tripathi (1978), Sisodia and Dwivedi (1981), Isaki (1983), Bahl and Tuteja (1991), Prasad and Singh (1992), Swain (1994), Garcia and Cebrian (1996), Upadhyaya and Singh (2001), Kalidhar and Cingi (2006a, 2006b); Gupta and Shabbir (2006, 2007), Yadav and Kadilar (2013, 2014). The
The proposed estimator is most efficient than all the estimators. This study is also supported through an empirical study and the result of this study is quite encouraging.

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SUPPLY CHAIN RISK MANAGEMENT IN TIMES OF PANDEMIC

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Abstract

For the businesses to deliver their promises to their customers, it must have a supply chain that operates properly and fulfil the purpose. The impact of COVID-19 has taken a toll on economy globally, causing crash in stock prices and distressing earnings projections. The scope of this pandemic disease, with regard to the number of people affected and for how long it will last, seems to be distinctive and new remembrance. This paper aims to suggest that corona virus risk is a wakeup call for many companies to manage their supply chains.

INTRODUCTION:

HOW COVID-19 HAS AFFECTED THE INDUSTRIES SO FAR

The global effects on supply chain management have occurred because of the outbreak of corona virus in Wuhan, China. This has affected the supply of inputs for large number of manufacturers and retailers globally because China is an extremely large source of components and finished goods. Manufacturers are forced to suspend their operations as their key inputs have exhausted. Big Brands like Apple, Microsoft, JCB and Nissan have perceived the interruption as their factories in China are operating at limited capacity or suspended their production. Local economies in the world that are dependent on China as a customer are also facing the facts.

Although there are some indications that exports from China have started again, there is an increasing likelihood that situation will get worse before getting better. Now, the outbreak has spread throughout the globe. This has resulted in labour shortage and restrictions on travel within and outside the country, further disrupting the supply chains of businesses around the world.

The corona virus has an influence on movement of goods as a consequence of restrictions by the countries all over the world on loading and unloading of goods from the ports. With travel limitations, extension in lockdowns and longer than usual quarantine periods, businesses are notably facing challenge of disturbance of labour. Lockdown has severe impact on service industries as well because of inability of labour to move in and out of corona virus affected areas, especially in identified hotspot zones.

The COVID-19 outbreak has made the supply chains fragile and vulnerable because of sudden supply shortages. The main reason for this is rigid supply chains and suppliers.
are not able to switch easily to an alternative in times of stress. One more reason is consolidated production zones, where a country or a city is specialized in production of some key components, parts or products. This reduces the overall cost of supplying goods from one part of the world to another in good times but is a matter of concern in the times of distress.

**RISK IN GLOBAL SUPPLY CHAIN**

The complication of supply chains call for an estimation of types of risks involved as these risks are related to each other. The three types of risks involved are: supply risk, demand risk and operational risk.

Supply Risk affects procurement of raw material, components, parts, products and services from suppliers, indicating that the supply chain is not able to meet the demand concerning quantity and quality of finished products. The end result is described as supply disruption.

Demand Risk affect outbound supply chain which means movement of finished goods including storage, transportation and delivering to end customer, especially in times of epidemic when fluctuation in demand is unforeseen.

Operational Risk affect segments within a supply chain, reducing its capacity to supply raw material, parts or finished products within a stipulated time and cost. Carrying goods from one place to another is not easy during disturbance.

**WHO CAN MITIGATE RISK**

Companies with diversified supply chains from geographic viewpoint are at less risk in comparison to one’s dependent on one region or country for their supplies. Such companies have developed and executed supply chain risk management strategies to keep continuing their businesses. They procure their key components from different sources to reduce their dependency on one supplier and keep buffer stock to mitigate risk against supply chain disruption. Companies who have better visibility beyond the expanded supply chain network can better respond to adverse situation.
HOW TO MANAGE SUPPLY CHAIN RISK AND DISRUPTION

The motivation towards writing this research paper is to suggest some ways in which supply chain disruptions can be managed.

1. **Strengthening focus towards labour or workforce arrangements:** Companies have started resuming work in various parts of the world. There is a need to check out how to restart the business operations during ongoing pandemic and how to take necessary prevention and control measures. Due to travel restrictions there is an urgent need to pay extra attention to labour planning and providing quality product as production units run with less than a full supplement of workers.

2. **Shifting production facilities:** Companies along with their key suppliers (Tier-1 and Tier-2 suppliers) should work together to understand the workability to shift production and purchase order fulfilment to some other regions or locations as an alternative. This proves to be critical in minimizing supply chain disruptions.

3. **Adopting New Digital techniques to enhance supplier network:** Obtaining clarity to the status of inventory at the location of supplier and his shipment status will help the company to anticipate shortage of supply and respond correspondingly. For this, complete electronic connectivity with key component suppliers has to be maintained. Technologies that provide clarity on available inventory across the channel of distribution including distribution centres, vendors, wholesalers, stores; provide considerable advantage for transparency and flexibility to serve the customers in effective manner given the limitations in supply. These help the company to access data easily and chalk out plans and make decisions accordingly. Things like deliveries through drones, a new digital technique, can be an alternative in near future.

4. **Locating substitute suppliers in the not affected regions:** All the companies that are heavily dependent on Chinese supply have to find substitute sourcing markets for raw materials. These industries can diversify to countries like India, Brazil, Chile and Mexico for procurement of components and parts for their operations.

5. **Upgrading inventory policy and plans:** From past few decades, large companies have been applying various ways to reduce their inventory across the supply chain and safety stocks are set statistically, only to buffer normal variations in demand and supply. Companies have not kept buffer stock for the enormity of destruction caused due to corona virus epidemic. It’s high time to upgrade inventory planning and framing policies so that companies are at least risk during such disturbances.

6. **Understanding sudden Demand-Supply fluctuations:** Demand for necessary goods like groceries, vegetables, fruits and other eatables rises manifold as people want to stock maximum supply of food for at least two weeks in a fear that basic
necessities will not be available during lockdown period. As soon as government in India and other parts of the world announced for complete shutdown along with stoppage of public transport and railways, people rushed to stockpile the necessities and stores are left empty shelves. In such distressing times, consumer’s value product availability but small businesses are at high risk because of sudden demand shocks. Most of the panic buying is only because no one wants to be left without resources.

Alternatively as the lockdown period is being extended by many countries, demand for petrol, diesel and expenditure on household spending has drastically reduced by consumers all over the world. In the present scenario where certain commodities have unexpected rise in demand and some have sudden fall in demand businesses have to focus on liquidity of cash as well as working capital. Advanced statistical forecasting tools along with the industry experience of planning team help them find a authentic demand signal to decide necessary supply. Companies need to keep assessing their supply chains and manufacturers need to rethink their commercial plans to forecast demand during and after the crises.

7. **Need for supply network mapping:** There is an urgent need to do supply chain network mapping as a risk reduction strategy. Companies avoid doing mapping because of sizeable labour and time requirement in doing this activity. They continue to depend on human intelligence for the information of key suppliers of their businesses. The information gathered by procurement staff is informal which is collected via personal relationships. When the staff quit the company or gets retired or their roles change within the firm, their acquired knowledge and experience leaves with them. The new employee will take some time to get to know about these key (tier-1, tier-2, tier-3) suppliers and their reach. The benefit of locating supply network map is greater than the time and cost of developing it.

Mapping can be done by focussing on supplier of essential parts and components, beginning with suppliers of leading five products by revenue and going down to numerous tiers of suppliers possible. Perhaps some invisible critical supplier is there which the company is not aware of. Thus mapping will help the firm to mitigate risk and find alternatives in the times of torment.

8. **Ensuring supplier’s data privacy:** The upstream suppliers do not want to disclose their information to the end customer because of the mistrust and fear of losing commercial dominance, if their customers are aware about their functioning, sourcing and pricing policies. Conventional supply chains are centralised and cannot provide individual access controls, but a decentralised arrangement which is owned by a single large buyer is the optimum way by which supplier and buyer can have the privacy they need.
The other way by which supplier can be encouraged to give his information to the buyer is through incentives. If the buyer worth supplier data, he should pay for the data also in addition to the goods sourced from tier-1 supplier so that the data narrates the information of tier-2 or even further upstream supplier’s data in the network.

**DIGITAL SUPPLY CHAIN MODEL**

Digital supply chains have become essential for the competitiveness of large companies. New supply chain technologies are coming that can improve end to end visibility to a large extent. The conventional outlook of a linear supply chains are transforming into digital supply chain network, making it possible for businesses to connect to their whole supply network. Digital supply chain networks will enhance optimization and collaboration. These are being set up and arranged in a manner to predict disruptions and are configured differently to mitigate the risk in times of pandemic.
CONCLUSION

Supply chain risk management becomes a challenge for the companies during times of epidemic and disturbances. If the supply chains are made anti fragile, they will become company’s considerable strength. The consolidated centres of production should also be minimized. New digital supply chain models will play a significant role to help supply chain managers to mitigate the risk of disruption and provide a network where they can serve their customers better. New digital techniques like cloud computing, robotics, artificial intelligence, 5G are pivotal to enable the future of digital supply chain network. The lesson to be learned from the pandemic covid-19 is to build a supply chain network which will remain unaffected or return to normal swiftly from difficult times.

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HOW DIGITAL MARKETING HELPS HIGHER EDUCATION INSTITUTION BRANDING

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Abstract

In this era of industry 4.0, company ability to adapt with technology is mandatory. One unavoidable change in marketing related to technology radical development is digital marketing. Digital marketing plays major role in developing brand of company today. Digital marketing is considered cheaper and fit to products that are targeted to millennial. However, a lack of research related to its relationship with brand image remains. BundaMulia University as a reputable university in Indonesia with target market of millennial has suffered from the uncertainty. Therefore this research aims to understand how social media, website and search engine marketing affect the university brand image. This type of research is associative research that is research conducted to connect one variable with another variable. The purpose of this study is to find out the relationship between two or more variables. By utilizing questionnaire as data collection tool, this research got 180 valid and reliable student respondents. The data had passed validity, reliability and classic assumption pre-tests, and then it was analyzed by multiple linear regression method in SPSS. It resulted in fact that social media, website and search engine marketing simultaneously and partially affect the university brand image. The positive correlation suggests university to increase their attention on improving their social media, website and search engine marketing in order to build up better brand image among their students or customers. The adjusted R square value has reached up to 77%, which explains that brand image is affected by social media, website and search engine marketing by 77% and the rest 23% is explained by other variables out of the proposed mode.

Keywords: Social media, website, search engine marketing, brand image

JEL Classification: M31, M15

1. INTRODUCTION

Along with technological developments in industry 4.0, internet can no longer be separated from everyday life. At this era of modern society, many activities are carried out by utilizing internet technology. One of internet technology implementation that has been applied in business world is digital marketing. The application of digital marketing to search engines such as Google, Yahoo, and Baiducan enhance a company's
brand image. By registering a website on search engines using certain keywords and good search engine marketing techniques, it is very possible for a website to be more often found by public compared to other companies and therefore enhance brand image of the company.

BundaMulia University is one of famous Indonesian universities that apply digital marketing to build up its brand image such as registering its website on Google, Yahoo, and Baidu with the keywords example “university”, “scholarship”, “Jakarta”. Every search on Google that contains keywords will direct consumer to BundaMulia University website so that it can increase the university brand image and finally it can lead to new student registration. BundaMulia University is a university that implements digital marketing in its marketing process well. However, the university is lack of information and research about how significant the effect of digital marketing on their brand image. While there are many theories support that digital marketing can increase their brand image, internal marketing department cannot confirm it therefore research gap occurs.

This research is intended to examine the effect of social media, websites and search engine marketing simultaneously and partially on brand images of BundaMulia University. This research can be used as an evaluation and study material for companies to be able to maintain the success of the digital marketing program in their effort to attract new students while enhancing brand images in their head. It can also provide inspiration and references for other relevant studies in digital marketing field.

2. LITERATURE REVIEW
2.1 Digital Marketing
According to Tarigan & Sanjaya (2009), digital marketing is a brand marketing activity which includesthe use of various web-based media such as blogs, web sites, e-mails, adwords, or social networking. Digital marketing is more than just term internet marketing. According to Heidrick & Struggless (2009), the development of digital marketing through the web, mobile phones, and gaming devices, offers new access to advertising that is not heralded and it is very influential. Thus marketers should shift from spending budget on traditional marketing such as TV, radio and print to new technology and more interactive media such as in digital marketing. There are many types of digital marketing method along with its own advantages and disadvantages. Urban (2004) explain that the type of digital marketing exists includes online banner advertisement, sponsorship, classified listings, email marketing, partnership/affiliate marketing, search engine marketing, social media and website.

2.2 Brand Image
Kotler & Keller (2009) defined brand image as a set of beliefs, ideas, and impressions that a person has towards a brand. He further said that brand image is the perception and belief carried out by consumers, as reflected in the association that occurs in consumer memory. Brand image is considered as how abrand is perceived by consumers. Dealing with perceptions, brands can be described through adverb objectives, or phrases. Kotler & Keller (2009) also said that brand image has two components, which are brand association and brand personality. Iglesias et al (2019)
stated that image is reality. Therefore if market communication does not match reality, normally reality will win. The image will eventually become good, when consumers have enough experience with the new reality. The new reality is acceptable when organization works effectively and has good performance. Some benefits that can be obtained by companies when they have satisfied their customers through the delivery of quality services are a positive corporate image.

Therefore, consumers' attitudes and actions towards a brand are very much determined by the brand's image. Kotler & Keller (2009) also added that brand image is a requirement of a strong brand and image is a relatively consistent perception in the long run. Building image is not an easy process and once it has been built up, it is difficult to change it. The developed image must be clear and has an advantage compared to competitors. When brand differences and advantages are confronted with other brands, brand position will emerge. Thus, basically it is the same as the process of perception, because image is formed from perceptions that have been formed over time. After going through the stages that occur in the process of building up perception, then company can proceed to the stage of consumer involvement. This level of involvement does not only affect perception, but also affect memory function.

### 2.3 Digital Marketing and Brand Image

Marketers used social media to build up brand image and communicate brand related matters to consumers. It is more impactful than traditional broadcast or massage because people are more willing to read customized information on social media platform rather than traditional platform (Schulze et al., 2015). The application of e-marketing such as social media, website ownership and search engine marketing has an influence on brand image. By using e-marketing, the brand will be easily recognized so that it will increase the possibility of product purchasing transactions by customers (Ridho, 2013).

#### Research Framework

**Picture 1. Research Framework**

![Digital Marketing Diagram](source: Developed from literature review)
Based on literature review, thus hypothesis in this study defined as follows:

H1 = Social media significantly and positively affects brand image of BundaMulia University

H2 = Website significantly and positively affects brand image of BundaMulia University

H3 = Search engine marketing significantly and positively affects brand image of BundaMulia University

H4 = Social media, website and search engine marketing significantly and positively affects brand image of BundaMulia University

3. METHOD

This type of research is associative research that is research conducted to connect one variable with another variable. The purpose of this study is to find out the relationship between two or more variables. Through this research a theory can be built that can function to explain, predict, and control a phenomenon. In conducting the analysis, the authors shared questionnaires to about 223 scholar respondents. A total of 223 respondents were obtained using the Stratified Random Sampling technique with the population being students at Bunda Mulia University, Jakarta. But after removing incompleted surveys, 180 valid and reliable questionnaires are left. The statistical methods used by the authors are inferential, parametric, and correlative statistics. This includes multivariate regression. The required data is obtained based on the formulation of the problem. The qualitative descriptive method is used for fact finding with the correct interpretation and the aim is to look for a systematic picture that is used for accurate fact finding. This type of research is basically to determine what methods will be used in research, including data collection methods, methods of analysis and hypothesis testing.

The statistical method used is multiple regression analysis. Multiple regression analysis is a tool used to predict the effect of two or more independent variables on one dependent variable to determine whether there is a correlational relationship or causal relationship between two or more independent variables X1, X2, X3, ....... Xi with respect to a dependent variable Y. The analysis is used to determine effect caused by the implementation of Social media, Website, and Search Engine Marketing to increase Brand Images of Bunda Mulia University.

The multiple linear regression equation is

\[ Y = a + b_1X_1 + b_2X_2 + b_3X_3 \]

Where:
- \( Y \) = Variabel dependen
- \( a \) = konstanta / intercept
- \( b \) = koefisien regresi
- \( X_1 \) = Social media
- \( X_2 \) = Website
- \( X_3 \) = Search Engine Marketing

In terms of gender, the authors obtained data that 96 respondents were male and 84 respondents were female. When they were asked about the most used social media, 98 respondents most often access Facebook social media, 55 respondents most
often access Twitter social media, and 27 respondents most often access Instagram social media. The majority of respondents access Facebook because Facebook is the first popular social media, while social media Instagram is the least accessed because it is not popular among their social circles and their smartphone memory is not enough to save good quality photos. While analyzed from the frequency of respondents’ visit to the Bunda Mulia university website in 1 week, 34 respondents accessed the website www.ubm.ac.id about 1-3 times a week, 63 respondents accessed the website www.ubm.ac.id 4 - 6 times in 1 week and 83 respondents access the website www.ubm.ac.id> 6 times in 1 week. The majority of Bunda Mulia University students access the website www.ubm.ac.id> 6 times a week, because Bunda Mulia University uses website to provide a lot of information ranging from announcements, schedules, grades, to the package registration process and seminar.

4. ANALYSIS AND DISCUSSION

4.1 Validity and Reliability Test for Variable X

Table 1. Reliability Statistic for Variable X

<table>
<thead>
<tr>
<th>Reliability Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cronbach’s Alpha</td>
</tr>
<tr>
<td>.825</td>
</tr>
</tbody>
</table>

Source: Developed from data analysis
In accordance with Malhorta (2007) who stated that the statement is declared reliable if it has a Cronbach’s Alpha> 0.6. Therefore the digital marketing statement item in this research questionnaire is justified reliable because it has cronbach’s alpha> 0.6.

Table 2. Item-Total Statistics for Variable X

<table>
<thead>
<tr>
<th>Item-Total Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale Mean if Item Deleted</td>
</tr>
<tr>
<td>social1</td>
</tr>
<tr>
<td>social2</td>
</tr>
<tr>
<td>social3</td>
</tr>
<tr>
<td>social4</td>
</tr>
<tr>
<td>web1</td>
</tr>
<tr>
<td>web2</td>
</tr>
</tbody>
</table>
In accordance with Naga (2008) who stated that the statement item is considered valid if it has a Corrected Item - Total Correlation > 0.2. Therefore, digital marketing statement items are considered valid because they have a Corrected Item - Total Correlation value > 0.2.

4.2 Validity and Reliability Test for Variable Y

Table 3. Reliability Statistic for Variable Y

<table>
<thead>
<tr>
<th></th>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.849</td>
<td>.848</td>
<td>15</td>
</tr>
</tbody>
</table>

Source: Developed from data analysis

In accordance with Malhorta (2007) who stated that the statement is declared reliable when it has a Cronbach’s Alpha > 0.6. Therefore the brand images statement item in this research questionnaire is considered reliable because it has cronbach’s alpha > 0.6.

Table 4. Item-Total Statistics for Variable Y

<table>
<thead>
<tr>
<th></th>
<th>Scale Mean if Item Deleted</th>
<th>Scale Variance if Item Deleted</th>
<th>Corrected Item - Total Correlation</th>
<th>Cronbach's Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>brand1</td>
<td>10.16</td>
<td>4.024</td>
<td>.628</td>
<td>.575</td>
</tr>
<tr>
<td>brand2</td>
<td>10.31</td>
<td>4.203</td>
<td>.626</td>
<td>.581</td>
</tr>
<tr>
<td>brand3</td>
<td>10.01</td>
<td>4.459</td>
<td>.492</td>
<td>.663</td>
</tr>
<tr>
<td>brand4</td>
<td>10.13</td>
<td>5.315</td>
<td>.297</td>
<td>.768</td>
</tr>
</tbody>
</table>

Source: Developed from data analysis
In accordance with Naga (2008) who stated that the statement item is considered valid if it has a Corrected Item - Total Correlation > 0.2. Therefore, the brand images statement item is considered valid because it has a Corrected Item - Total Correlation value > 0.2.

4.3 Classical Assumption Tests
Multicollinearity Test

Table 5. Result of Multicollinearity Test

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>Tolerance</td>
</tr>
<tr>
<td>(Constant)</td>
<td>1.104</td>
<td>.283</td>
<td>3.895</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>SOCIAL</td>
<td>.154</td>
<td>.114</td>
<td>.138</td>
<td>1.355</td>
<td>.177</td>
</tr>
<tr>
<td>WEBSITE</td>
<td>.087</td>
<td>.099</td>
<td>.088</td>
<td>.880</td>
<td>.380</td>
</tr>
<tr>
<td>SEO</td>
<td>.419</td>
<td>.077</td>
<td>.395</td>
<td>5.437</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Developed from data analysis
Based on table 4.8 above, it can be concluded that multicollinearity does not occur because VIF <10.

Autocorrelation Test
Table 6. Result of Autocorrelation Test

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.531a</td>
<td>.282</td>
<td>.270</td>
<td>.57740</td>
<td>1.363</td>
</tr>
</tbody>
</table>

Source: Developed from data analysis

From the test results using SPSS, the Durbin-Watson statistical value is 1.363. According to Sudarmanto (2005) when Durbin-Watson statistical value approaches value 2, it can be stated that the observational data does not have autocorrelation. Thus, it can be concluded in this observation there is no autocorrelation because the Durbin-Watson statistical value is 1.363.
Heteroscedasticity Test
Picture 2. Scatterplot

Heteroscedasticity occurs when for each value of the independent variable, there are several scores of dependent variables with different variances. The purpose of the heteroscedasticity test is to test whether in the regression model. There is an inequality of variance from the residuals of one observation to another. A good regression model should not have heteroscedasticity. Detection of heteroscedasticity can be observed using scatterplots. Heteroscedasticity does not occur in the data because the points that are spread randomly without any particular pattern (Nisfianoor 2009).

Normality Test
Picture 3. Normal P-P Plot

Normal P-P Plot of Regression Standardized Residual

Source: Developed from data analysis
The normal P-P diagram above provides standardized regression plots which illustrate the existence of points on the scatterplot line proves that the data is normally distributed.

4.4 Multiple Linear Regression Analysis

Table 7. Multiple Linear Regression Equation

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>Tolerance</td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>1.104</td>
<td>.283</td>
<td>3.366</td>
<td>.000</td>
</tr>
<tr>
<td>SOCIAL</td>
<td>.154</td>
<td>.114</td>
<td>.138</td>
<td>1.355</td>
<td>.177</td>
</tr>
<tr>
<td>WEBSITE</td>
<td>.087</td>
<td>.099</td>
<td>.088</td>
<td>.880</td>
<td>.380</td>
</tr>
<tr>
<td>SEO</td>
<td>.419</td>
<td>.077</td>
<td>.355</td>
<td>5.437</td>
<td>.000</td>
</tr>
</tbody>
</table>

Source: Developed from data analysis

Then, the multiple linear regression of this research is:

\[ Y = 1.104 + 0.154X_1 + 0.087X_2 + 0.419X_3 \]

Where: 
- \( Y \) = Brand Images
- \( X_1 \) = Social media
- \( X_2 \) = Website
- \( X_3 \) = Search Engine Marketing

4.5 t Test

Thus the partial test (t-test) finds out the effect of independent variable to dependent variable partially. Partial test result from the multiple linear regression analysis can be seen as follows:

Table 8. Result of t Test

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>1.104</td>
<td>.283</td>
<td></td>
</tr>
<tr>
<td>SOCIAL</td>
<td>.154</td>
<td>.114</td>
<td>.138</td>
<td>2.355</td>
</tr>
<tr>
<td>WEBSITE</td>
<td>.087</td>
<td>.099</td>
<td>.088</td>
<td>3.880</td>
</tr>
<tr>
<td>SEO</td>
<td>.419</td>
<td>.077</td>
<td>.395</td>
<td>5.437</td>
</tr>
</tbody>
</table>

Source: Developed from data analysis

Social media and brand image

H1 is accepted for the variable social media, \( t = 2.355 \). Sig = 0.007 and significance < 0.05; thus H1 is accepted. Ho was rejected therefore, there was a significant effect of the implementation of social media on the brand image of Bunda Mulia University if the website and search engine marketing were controlled with a 95% confidence level.

Website and brand image

H2 is accepted for variable website, \( t = 3.880 \). Sig = 0.000 and significance < 0.05; thus H2 is received. Ho was rejected therefore, there was a significant effect of website
implementation on Bunda Mulia University brand image if social media and search engine marketing were controlled with a 95% confidence level.

**Search engine marketing and brand image**
H3 is accepted for variable search engine marketing, \( t = 5.437 \)  Sig = 0.000 and significance <0.05; thus H3 is accepted. Ho was rejected therefore, there was a significant effect of the implementation of search engine marketing on the brand image of Bunda Mulia University if social media and website were controlled with a 95% confidence level.

**4.6 F Test**
This test aims to determine whether the independent variables simultaneously affect the dependent variable. The independent variables together are simultaneously considered to have a significant effect on the dependent variable if the Sig (P-value) <0.05 at \( \alpha = 0.05 \).

**Table 9. Result of F Test**

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>23,364</td>
<td>3</td>
<td>7,788</td>
<td>23,360</td>
<td>.000a</td>
</tr>
<tr>
<td>Residual</td>
<td>59,343</td>
<td>178</td>
<td>.333</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>82,706</td>
<td>181</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Developed from data analysis

Ho is rejected and H4 is accepted, because the significance is smaller than \( \alpha \) (alpha), namely: Significance value of 0.000 compared to \( \alpha \) (alpha) of 0.05 There is a significant and positive effect from Social media, Website, and Search Engine Marketing simultaneously to Brand Images of BundaMulia University with a 95% confidence level.

**4.7 R² Test**
This test aims to figure out how big dependent variable is explained by independent variables in the model.

**Table 10. Result of R² Test**

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.831a</td>
<td>.782</td>
<td>.770</td>
<td>.57740</td>
</tr>
</tbody>
</table>

Source: Developed from data analysis

The research model works well by adjusted R square value of 77%, which explains that brand image is affected by social media, website and search engine marketing by 77% and the rest 23% is explained by other variables out of the proposed mode.
5. CONCLUSION AND RECOMMENDATION

The research results in significant and positive effect from social media, website and search engine marketing to brand image in Bunda Mulia University, Indonesia. The positive and significant correlation occurs both partially and simultaneously. The research model is proven works out well since adjusted R square value has reached up to 77%, which explains that brand image is affected by social media, website and search engine marketing by 77% and the rest 23% is explained by other variables out of the proposed mode. It however gives conclusive explanation that universities need to pay attention on their social media, website and search engine when they need to build up positive brand image. When university performs digital marketing better, more positive brand image can be achieved. Many universities in Indonesia is still lack of attention to their digital marketing and therefore their social media account and website are so conventional and very often found that universities don’t provide updated materials on the website, SEO is also key to build up brand image in consumer mindset. Getting easier people find the website in search engine, getting better the brand image will be achieved.

Future researcher is expected to figure out other variables that contribute to brand image of education institution such as university. Another suggestion for future research is to expand the use of this research model accross industry to figure out the effect of digital marketing implementation on brand image. Application accross popoulation and country is also suggested because different culture can create different result and each country has its own population charateristic, there could be another factor such as internet use and speed that can affects the result, for instance in country like Cambodia where most of the universities still conduct their registration and promotion offline, the people may not really care about website and emphasizes on word of mouth marketing, traditional newspaper and referalls to judge brand image of a university.

REFERENCES
AN ANALYSIS “TO UNDERSTAND THE EFFECT OF ONLINE VIDEO GAMES ON THE BEHAVIOUR OF CHILDREN” LESS THAN 15 YEARS

Dr. Anjali Singh
Assistant Professor and Research Guide
Manav Rachna International Institute of Research and Studies, Faridabad

Ms. Rishika Goel
Research Scholar
Manav Rachna International Institute of Research and Studies, Faridabad

Abstract
In the new era of globalization science and technology development cause a lot of changes in many fields including the form of popular online video games among the children. The traditional games that are famous formerly have been replaced by the modern games like online video game. This paper examined that which are the main attributes which influence the consumers/children to play the online video games having age of less than 15 years. The final goal of the study is to understand the behaviour of children after playing video games. In previous study it has been observed that video game industry has surprised both the music and video industry as it captures the highest share of market. This study reveal that students play video games online due to peers’ pressure; and online video games are liked because they are considered more modern, practical, realistic and varied but subsequently, they are becoming addicted, and reach a condition that they find it difficult to stop playing games. This condition will directly affect their progress and behaviour. The purpose of doing this research is to compare the attitude and preference of children towards different video. The research suggests that it is necessary to activate the patterns of social communication networks such as friendly footing, taking more responsibilities, and highlighting social life to diminish game addiction.

Keywords: Effect, Video Games, Social, Communication, Footing And Attitude Etc.

INTRODUCTION:
Children spend a huge time in online video games, which have positive and negative effects on children’s behaviour. for example, when we talk about the positive skills and abilities and negative consequences that are there on the online gaming in today’s scenario. Today in every house children spend most of the time in playing video games on the internet or on console or Xbox, Wi-Fi, PlayStation and similar other electronic gadgets and devices. Earlier it was thought that video games are entertainment and sometimes educational for the children, as per what parents shared. The people who are in favor of online gaming say that it has helped control diseases, manage disappointment and depression, improve deep eyesight and other neurological and physiological processes. There had been negative impact as well on the children because these games on making this generation to violent because they play the games that do use lot of violence in combating, further leading to social isolation anxiety, Distraction from studies and lack of patience.
Video games become most popular entertainments in today’s time period. They target adults and they are engage in games for their entertainment and time pass. They engage their self so much in games which make them separate from the society and their surroundings. Online Video games also play positive role in making children smarter in thinking higher level things while playing the games. Sometimes online gaming also play negative role in life of children as it makes them aggressive. Nowadays students play the video games to reduce boredom , for enjoyment and to make them alone from their surroundings. In today’s time students are so much attracted towards video games because parents and authorities did not have a well planned for students leisure time so that’s why students are getting engaged in video games.

They also become lazy because they don’t have any physical work to do. Playing video games up to some extent can be useful but playing long term leads to physical and mental problems in the students, pressure of completing the level fatly to be at the top of the score board. It makes nervous system of the body sensitive and it also creates anxiety symptoms in the player. Development of these video games may prove a threat for youth. In traditional scenario children play with other children for their enjoyment but in the modern scenario children only play video game they do not have any type of face to face interaction with the children. The increasing craze of video games among children made many researchers to do research on the positive and negative effects of these games on children. Online games are one of the way for students to learn something new. In the last few years it has been seen that there is rise in the online games. Online games have become one of the paths to motivate the students for doing their work in a better way.

Internet plays an important role in developing person’s mind by creating or innovating productive works. In today’s time period internet become the effective and efficient tool to enhance themselves and updating the according to upcoming new technologies. No doubt those students are learning more from the internet but it will make the students away from the curricular activities held in the school and society.

It is observed and believed that the people who are engaged so much in games are so much addicted to the online video games. Existing studies shows that craze of online video games among adults have highly negative affect on the health of the them it also affects the studies of adults. They are also suffering from the psychological issues. There are mostly negative effects in comparison of positive effects of addicted to online video games. It is said that addiction to anything is harmful for health. Online video game also plays an important role in grooming of the children and through internet students also become updated with the new and upcoming technologies in the market but regular and permanent usage of internet make the children lazy. It also affects the education and life style of the children. But many people play the game for their entertainment and to reduce the tension. There is a correlated relationship between the online video game and the aggressiveness.

some online video games are educational these educational games help the children to increase their motivation level, communication skills, improve their concentration level through playing these educational games students can easily achieve their goals, task and objectives in their real life also. Their learning skills and problem skills were gets improved. It helps them to take their decision in a right way. Their decision was proved
to be effective and efficient. Playing video games also improves reaction times and visual skills.

But nowadays to decrease the negative effects of violent video games on the behavior of children owners restricts the age limit of games the 18 plus age students can only play some games.

In today’s time period government of India take measures to reduce aggressiveness, violence among the students which force them up to the limit of committing suicide, murders and not obeying their parents.

Online video games have affected the society in negative aspects. After coming of the online video games children are not aware about the traditional games if they are aware they were playing those games on their mobile phones, laptops etc. Modern video games have replaced the traditional games and make the children to play the games online and which decreases the interaction of one child with another one. It also cuts the social link of the children with the society because he/ she gets so much engaged in the games and think of winning the game every time and reach on the higher or next level.

It has been seen that there are positives as well as negative when we talk about online gaming and it’s effect on the behaviour of children. There are both positive skills and abilities and negative consequences that are there on the online gaming in today’s scenario

REVIEW OF LITERATURE
Geithner, S., & Menzel, D. (2016). “Attention to the potential effects that technology has on health, education, and society. Parents to pay attention on what kind of games their children are playing”.
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Crocco, F., Offenholley, K., & Hernandez, C. (2016) “he talks about the changing behavior of children”
Carenys, J., & Moya, S. (2016) “He speaks about the effect of changing technology in the market on the online video games”.
Angelini, M. L. (2016) “He talks about the Age and Violent-Content Labels which Make Video Games Forbidden Fruits for Youth”.
Beuk, F. (2015). “talks about the separation of children from the society”.
Shariarpour N., Kafi Z., (2014) “Said that video games are used for teaching the students”.

**SCOPE OF THE STUDY**

Main purpose of doing the study is concerned with impacts of online video games on the behaviour of children. This study will help the readers to understand the positive and negative effects of online video games. This study tells us about what children are perceiving what is video game and what parents perceive that the children are doing.

**OBJECTIVES OF THE STUDY**

- To Understand the Effect of Online Video Gaming on Behavior of Children
- To know perception of children towards online video games.

**RESEARCH METHODOLOGY**

It is defined as a process where a researcher collects information and relevant data for the purpose of research and if talk about business scenario then it is a key which helps in taking business decisions. It can comprise of both past and current information. It includes all the methods and techniques used such as surveys, personal interviews and work of various publications.

Descriptive and Exploratory research design is adopted in this study.

**Sampling**

It can be defined as a process wherein a limited number of people are chosen or selected from a large population and those limited ones represent and consist of all the characteristics of the population.

**sample size: 100**

- Population: parents whose children are involving in playing video games.
- Type of sampling:
  - Random and Non Random sampling.
  - Random sampling – Every item of the universe has equal chance of getting selected
  - Non-random sampling- Selection is done as per the choice and convenience of the researcher.
- Convenience and judgement sampling are used in this study
- Sample area: Faridabad
- Method of data collection
  - There are two methods of data collection which are primary and secondary.
Primary method includes data collected by researcher himself in the form of survey. Secondary method includes data is someone else’s data collected by researcher for reference purpose.
In this study primary data is used for research purpose.

- Statistical tool: Correlation
- Research method: survey method (questionnaire)
- Hypothesis
  - Ho (null hypothesis) - There is no significant effect of online video games on children.
  - Ha (alternate hypothesis) - is significant effect of online video games on children.

**DATA ANALYSIS AND INTERPRETATION**

1. Are you aware of increasing rise of online gaming among children?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>97</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
</tr>
</tbody>
</table>

**INTERPRETATION:** From the above figure, it has been found that the majority of the respondents were aware about the increasing rise in inline games and only 3 percent of respondents were not aware.

2. Do you think children are not aware about the overall effects of online gaming?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>43</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>37</td>
</tr>
<tr>
<td>Neutral</td>
<td>13</td>
</tr>
<tr>
<td>Disagree</td>
<td>7</td>
</tr>
</tbody>
</table>
INTERPRETATION: From the above figure, it has been found that majority of the respondents were agree that the children are not aware about the overall effect of online gaming.

3. Digitalization has been the major cause towards online gaming?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>46</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>24</td>
</tr>
<tr>
<td>Neutral</td>
<td>18</td>
</tr>
<tr>
<td>Disagree</td>
<td>12</td>
</tr>
</tbody>
</table>

INTERPRETATION: From the above figure, it has been seen that the majority of the respondents were agreed that digitalization is the major cause towards online gaming and the rest were strongly agree neutral some were disagree.

4. Do children perceive that online gaming is trendy?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>55</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>31</td>
</tr>
<tr>
<td>Neutral</td>
<td>10</td>
</tr>
<tr>
<td>Disagree</td>
<td>04</td>
</tr>
</tbody>
</table>
INTERPRETATION: From the above figures, it has been observed that the majority of the respondents were agreed that online gaming is trendy and rest of the respondents were strongly agreed neutral and disagree.

5. Marketers of online gaming have been responsible for unlimited options?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>53</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>24</td>
</tr>
<tr>
<td>Neutral</td>
<td>19</td>
</tr>
<tr>
<td>Disagree</td>
<td>04</td>
</tr>
</tbody>
</table>

INTREPRETATION: From the above figures it has been observed that the majority of the respondents are agree that the marketers are responsible for unlimited options of online gaming.

6. online gaming on mobile is more attractive as compared to computer gaming?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>74</td>
</tr>
<tr>
<td>No</td>
<td>14</td>
</tr>
<tr>
<td>None</td>
<td>3</td>
</tr>
<tr>
<td>Can’t say</td>
<td>9</td>
</tr>
</tbody>
</table>
INTERPRETATION: From the above figures and graphs it has been seen that majority of the parents say yes that the playing games on mobile is more attractive than the computer gaming.

7. perception of your children towards online gaming is influenced by peer group?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>72</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
</tr>
<tr>
<td>Can’t say</td>
<td>1</td>
</tr>
</tbody>
</table>

INTERPRETATION: From the above figures, it has been seen that the majority of the respondents say that perception of the children is perceived by the peer group.

8. Parents and family has effect on perception of children about online gaming?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>57.6</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>20.2</td>
</tr>
<tr>
<td>Neutral</td>
<td>14.1</td>
</tr>
<tr>
<td>Disagree</td>
<td>8.1</td>
</tr>
</tbody>
</table>
INTERPRETATION: From the above graphs and data it has been found that the majority of the respondents are agree that the family has an effect of the perception of children.

9. what are the positive effects on behaviour of children for online games?

<table>
<thead>
<tr>
<th>Positive Effect</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand eye coordination</td>
<td>21.8</td>
</tr>
<tr>
<td>Concentration level</td>
<td>33.7</td>
</tr>
<tr>
<td>Critical thinking</td>
<td>44.6</td>
</tr>
</tbody>
</table>

INTERPRETATION: From the above data it has been seen that most of the parents are saying that critical thinking is increased through online gaming.

10. what are the negative effects on behaviour of children for online games?

<table>
<thead>
<tr>
<th>Negative Effect</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggressiveness</td>
<td>24</td>
</tr>
<tr>
<td>Violent</td>
<td>27</td>
</tr>
<tr>
<td>Social isolation</td>
<td>41</td>
</tr>
<tr>
<td>Depression</td>
<td>8</td>
</tr>
</tbody>
</table>
INTERPRETATION: From the above data and graphs it has been observed that the children are getting social isolated.

11. should online gaming has governmental controls?

<table>
<thead>
<tr>
<th>Answer</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>48</td>
</tr>
<tr>
<td>No</td>
<td>23</td>
</tr>
<tr>
<td>Can’t say</td>
<td>29</td>
</tr>
</tbody>
</table>

INTERPRETATION: Most of the parents says that the online gaming has governmental controls also.

12. Age group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-30</td>
<td>36</td>
</tr>
<tr>
<td>30-35</td>
<td>26</td>
</tr>
<tr>
<td>35-40</td>
<td>23</td>
</tr>
<tr>
<td>40-45</td>
<td>15</td>
</tr>
</tbody>
</table>
INTERPRETATION: From the above it is analyzed that there are different categories of children, so it all depends upon the taste and preferences of the different group of children in society.

13. Gender

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>51</td>
</tr>
<tr>
<td>Female</td>
<td>49</td>
</tr>
</tbody>
</table>

INTERPRETATION: It has been analyzed that the preference of games and online games are most popular in male as compare to female children in society.

FINDINGS OF THE RESEARCH STUDY
The objectives of the study has been achieved. As the correlation is significant at 0.01 level and hypothesis has been accepted. So that it is concluded that now-a-days online video games has the negative effect on the behaviour of children.
RECOMMENDATIONS AND SUGGESTIONS

After conducting the study, the researchers would like to have more government control steps towards online video games to control the negative effects of games on their children.

LIMITATIONS

- Sample size was limited to 100 people
- Survey was limited to Faridabad.

CONCLUSION

The online video games are now heavily played by the children these days and therefore the number of marketers are increasing considerably in online video games industry. The research is focused on understanding the effect on the behaviour of children in Faridabad city. According to the survey, parents observed that children are very much engaged in playing video games and getting away from the society and becomes aggressive. From the survey it has clear that children are more influenced by the online video games and they purchased many playstations for playing video games. It is found from the research that children make a habit of playing the video games on a regular basis because they are not aware about the traditional games. Finally the objective of the study has been achieved and it has been seen that video games has become a Fashion for the children, either some play it as a source of entertainment and some play it as a source of learning. So that it is concluded that now-a-days online video games has the negative effect on the behaviour of children.

REFERENCES

FACTORS INFLUENCING THE CONSUMERS TO PREFER ORGANIC FOOD PRODUCTS: A LITERATURE REVIEW

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Assistant Professor, PG & Research Department of Commerce,
Gobi Arts & Science College, Gobichettipalayam, Erode Dt., Tamil Nadu

Abstract
Consumers’ buying behaviour is changing day by day worldwide. In this view, demand of the organic products is increased gradually. Organic products are made from materials produced by organic agriculture, i.e., organic products refer to products that are grown on the farm without the application of synthetic fertilizers or pesticides and without using genetically modified organisms. Health, more nutrition, safer, animal welfare, environmental friendly, perceived product quality, taste etc. are some factors influencing the consumers to prefer the organic food products. Against this background, the present study is an attempt to understand the factors influencing consumers to prefer organic food products through existing research studies which are conducted on organic food products.

Keywords: Organic food products, Factors, Consumers.

INTRODUCTION
In marketing, to understand the consumer buying behaviour is dealing primarily with preferences of consumer and how these preferences are generated in the mind of the consumers. Consumers buying behaviour is changing day by day because of so many reasons. So, it is essential for producers as well as marketers to know the trends and to be aware of changing consumers buying behaviour. Now a day, consumers are searching the organic products to purchase. The demand of the organic products is drastically increased. They prefer organic products in all than conventional products. Organic products are made from materials produced by organic agriculture, i.e., organic products refer to products that are grown on the farm without the application of synthetic fertilizers or pesticides and without using genetically modified organisms. There are different types of products, i.e., organic food products, organic clothing products and organic personal care products. However, organic product is more known for food items like organic grocery, organic vegetables, organic certified food etc. Most appropriately organic products can be explained as any products that are made or cultivated organically should be treated as organic products. Health, more nutrition, safer, animal welfare, environmental friendly, perceived product quality, taste etc. are some factors influencing the consumers to prefer the organic food products. By keeping in view the above realities, the present study is an attempt to understand the factors influencing consumers to prefer organic food products through existing research studies which are conducted on organic food products.
OBJECTIVES OF THE STUDY

Based on the literature review, the specific objective of the present study is as follows:

1. To study various research aspect widespread in the ground of factors influencing consumers to prefer organic food products.

DATA SOURCE AND METHODOLOGY

This study is based on secondary data. In order to review the extensive literature, information were gathered from various research articles published in referred journals and also in electronic databases related to organic food products. Later, an extensive review of the literature was conducted in order to find the factors influencing the consumers to prefer organic food products.

FINDINGS FROM THE LITERATURE

Factors influencing the consumers to prefer organic products

Most of the consumers have started to purchase the organic products instead of conventional product because of so many factors. Most important factor has been identified through a broad review of earlier studies.

Padmathy and Saraswathy (2016) conducted a study on consumers’ buying behaviour towards organic food products. This study was based on primary data. The required primary data have been collected from 175 sample respondents through questionnaire. Such collected data have been analysed with the help of statistical tools like percentage and chi-square test. It is concluded that consumers have positive behaviour towards purchasing organic food products, when it comes to actual purchase, price, environmental concerns and quality are still the key factors influencing their purchase decisions.

Uma and Selvam (2016) conducted a study on awareness among consumers towards organic food products. This study was based on primary data. The required primary data have been collected from 200 sample respondents by using convenience sampling through questionnaire. Such collected data have been analysed by using statistical tools like percentage and chi-square test. It is concluded that organic food consumption is increasing due to environmental and health concerns associated with food products. As consumer awareness on organic food products and trust are increasing the most effective way for raising the market share.

Konda Kalyani (2017) conducted a study on consumer perception towards organic food products. This study was based on primary data. The required primary data have been collected from 50 sample respondents by using simple random sampling technique through questionnaire. Such collected data have been analysed with the help of Microsoft excel by using bar diagrams, pie charts etc. It is found that most of the respondents relied that organic products are grown using natural methods, have health
benefits and better taste and most of the respondents are agree that organic food is expensive and price should match quality.

Pardeep Kumar and Hema Gulati (2017) conducted a study on consumer’s perception towards organic food products. This study was based on both primary data and secondary data. The required primary data have been collected from 110 sample respondents by using stratified random sampling technique and the secondary data have been collected from published books, reports, journals, magazines and internet. Such collected data have been analysed with the help of statistical tool percentage and charts. It is found that rural respondents are facing lot of problems while purchasing organic products in the markets. Organic products are not easily available in the rural area and limited varieties are available.

Abisha and Kannan (2018) conducted a study on consumer awareness and satisfaction towards organic products. This study was based on both primary and secondary data. The required primary data have been collected from 680 sample respondents by using stratified random sampling method. It is found that most of the sample respondents are satisfied because of taste and quality of organic products. Lack of awareness is the main problem faced by the organic consumers. Further, it is concluded that majority consumers were awake to organic food, its edges and issues related to conventional food.

Akankshya Patnaik (2018) made a study on consumer perception towards organic food. This study was based on primary data. The required primary data have been collected from 60 sample customers and from 10 sales persons of retail outlet through structured questionnaire. Such collected data have been analysed with the help of statistical tools like percentage, charts and five point likert scale. It is found that consumers mostly perceive organic products as eco-friendly and healthier and they agree that organic food products are superior in quality.

Padmaja and Nikhil Parashar (2018) conducted a study on consumer buying behaviour towards organic food product. This study was based on primary data. The required primary data have been collected from 100 sample respondents by using non probability sampling through questionnaire. Such collected data have been analysed with the help of statistical tools like percentage, chi-square test and SPSS. It is found that healthy and nutritious are the reasons for purchasing organic food products and majority of the consumers felt that organic products are too expensive and majority of the sample respondents says that television advertisement and other marketing media helps in creating awareness about organic products.

Galina Mladenova (2019) made a study on motives affecting consumer attitudes and consumption of organic foods. This study was based on primary data. The required primary data have been collected from 1600 sample respondents through personal interview and from 800 sample respondents from online survey. Such collected data have been analysed with the help of statistical tool percentage. It is found that majority of the sample respondents are agree the organic food are tastier and healthier than conventional food and also agree the price of organic food are unreasonably high.

Mania and Nedumaran (2019) made a study on consumer perception and swot analysis of organic food products. This study was based on both primary and secondary data. The required primary data have been collected from 100 sample respondents.
through questionnaire and secondary data have been collected from various journals, articles, magazines etc. Such collected data have been analysed with the help of statistical tools percentage and chi-square test. It is found that there is a significant relationship between educational qualification and level of buying behaviour of organic food products and majority of the consumers’ perception had been nutritional value towards the usage of organic food products in Rajapalayam Taluk.

Jeyalakshmi and Arthi (2020) made a study on consumers awareness towards organic food products. This study was based on both primary data and secondary data. The required primary data have been collected from 100 sample respondents through questionnaire and the secondary data have been collected through various journals, magazines etc. Such collected data have been analysed with the help of statistical tools percentage and chi-square test. They found that there is huge gap between the agriculture and consumer awareness and most of the sample respondents came to know about Organic foods through doctors or professionals. Further, it is concluded that consumer awareness plays a vital role in determining the buying behaviour aspect for selecting organic food.

Kavitha (2020) conducted a study on organic consumers’ awareness and attitude of organic vegetables. This study was based on primary data. The required primary data have been collected from 160 sample respondents by using convenient sampling method through questionnaire. Such collected data have been analysed with the help of statistical tools like percentage garret ranking technique and correlation. It is found that consumers are getting awareness about the organic product through neighbours. Further, it is suggested that the seller’s duty is not only selling the products, it is their duty to convey the buyers’ requirement and market information to the producers. In this regard the organic products seller has to give adequate information to the farmers.

Khushleen Kaur (2020) made a study on consumers’ attitude and behaviour towards organic products. This study was based on both primary data and secondary data. The required primary data have been collected from 100 sample respondents by using questionnaire and the secondary data have been collected from various books, reports, journals, magazines and internet. Such collected data have been analysed with the help of statistical tool percentage. It is found that information and wakefulness about the products which are organic in nature can affect viewpoint about the product and eventually, purchasing decisions of the consumers. Further, the quality uniqueness affects consumers’ preferences for organic products.

Marin Cagalj et al. (2020) made a study on consumer preferences towards organic food in the market. This study was based on primary data. The required primary data have been collected from 113 respondents through questionnaire. Such collected data have been analysed with the help of statistical tools like percentage and Likert five point scale. It is found that when consumers purchasing organic food with the greatest importance of protection of the environment and at the least importance are they retain the taste. The most significant constraint on purchasing organic food of surveyed consumers is the high cost of the product.

Nethra and Rathina Prabha (2020) conducted a study on consumer attitude towards organic food products. This study was based on both primary and secondary
data. The required primary data have been collected from 100 sample respondents through questionnaire and secondary data have been collected from journals, magazines, websites and articles. Such collected data have been analysed with the help of statistical tools percentage and chi-square test. It is found that more trust and long life are the important factors influencing purchasing of organic food products and less varieties is the main problem faced by sample respondent while purchasing organic food products. Further, it is concluded that consumer attitude plays a vital role in determining the buying behavioural aspect for selecting organic food products.

Sivasankari and Jothi (2020) conducted a study on consumers buying behaviour towards organic food products. This study was based on both primary data and secondary data. The required primary data have been collected from 90 sample respondents by using convenience sampling method through structure questionnaire. The secondary data have been collected from various published books, reports, journals, magazines and internet. Such collected data have been analysed with the help of statistical tools like Percentage, Chi-square and Weighted Average method. It is found that Quality is the most influencing factor in buying organic food products.

SUGGESTIONS AND CONCLUSION

By realizing the significance of food products consumption, an attempt has been made to identify the factors influencing the consumers to prefer organic food products. In the present study, it is found that Health, Quality and Environment protection are the important factors influencing the consumers to prefer the organic food products. Hence, it is suggested that Government and Agriculture Department should take all possible steps to introduce various innovative organic farming methods to produce more healthy products.

REFERENCES


MOBILE APP PLATFORM FOR LICENSE VERIFICATION AND VALIDATION

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\textsuperscript{1}Assistant Professor, Department of Information Technology, KGiSL Institute of Technology
\textsuperscript{2,3,4}UG Scholar, Department of Information Technology, KGiSL Institute of Technology
Coimbatore, Tamil Nadu, India

ABSTRACT:

The main process of license verification and validation is a difficult task for the government to monitoring because of the population is the major factor to be consider. As a result, shows the number of vehicles are growing by his, her, their, etc. increasing the problem of license registration, license issue and transfer that requires a lot of work. Similarly, people are make some licensed based crimes and regulates traffic rules. This kind of problem can occur in day today life, but it does not contain any proper records also. This project can be approaching to solve such problems that store the information about the related license owner at database. Especially now when the mobile communication technology is developed quickly. Most of the people have their android mobile and easy to take anywhere which contain internet facility also. By the android application is provided to cops to retrieve license information.

Keywords – License, Traffic, Database, Registration, Login, Admin, User

INTRODUCTION:

In the current scenario the key issue faced by commuters while travelling is to deal with inefficiency and discrepancy in the traffic systems and people are involved in managing same. If any commuters caught by police, they have to submit the driving license and other documentation for the verification. If the commuters are forgot to bring their license. So, they can be fined. In the road sides are many traffic violations can be occurred by the any commuters. But it does not contain any proper records also. So, that traffic violation can be raised in our country. Even traffic police also don’t know about the statistics for the traffic violations. In case vehicle has been stolen the vehicle-owner has to complaint by nearest police station. So, the process of complaint and subsequent response will be slow. By the todays age of science and technology, where the internet is in the palm of everyone hand. So, the better system can be used for managing above process can be setup which could be reduce the traffic violations and we can insure the proper rule for the commuters. To verify a license details of a person, cops no need to cross-check the person, they can simply enter their driving license number in their android device to communicate with the web server. So, that he can grab the user’s details with a second with whole information including their photo. In the android application we added provision to track stolen vehicle. If the vehicle owner informs to cops, they can be updated the stolen vehicle status. Then it will be forward to all the cops they will be find out easily by using the application. In order of using these processes most of the road side crimes can the avoided, and we can insure a proper rule
for the vehicle users. This can be applicable for all kind of drivers throughout India and all kind of vehicles.

LITERATURE SURVEY:

The formation and enhancement of the license system is necessary requirement for peoples, especially now when the mobile communication technology is developed quickly. In this paper which considering the android mobile phone for license system to verify the license they can simply enter their driving license number in their android device to communicate with the web server, they can get the license information. Now the population is major factor to be considered. As a result, shows number of vehicles are increased and traffic violation also increased. In the existing system they can check only person license information, but they don’t know the how manytimes he made traffic violation and road crimes. So, that we developed android application system manages the punishment data for the multiple person of various date and time. If the person can be punished for traffic violation or road crimes, then cops can add punishment star in license that should be updated. In order to verify a license details of a person cops no need to cross check the person, they can simply enter their driving license number in their android device to communicate with the web server. So that he can grab the user’s details with a second with whole information including their photo. If cops can be seen the person got above the five stars in license means, then person license should be cancelled. In the android application we added provision to track stolen vehicle. If the vehicle owner informs to cops, they can be updated the stolen vehicle status. Then it will be forward to all the cops they will be find out easily by using the application. In order of using this process most of the road side crimes can the avoided and we can able to insure a proper rule for the vehicle users. This can be applicable for all kind of drivers throughout India and all kind of vehicles.

SYSTEM MODEL:

The following architecture diagram explains the overall process of this project here the larger system decomposed in to subsystems. That provides some related set of services. Through the android phones and the requires internet for the data transfer. In the architecture new aplier can be submit the document to admin. then the information is stored in the database. Then the admin can create the user has inspector and constables and their information also stored in the centralized databases. On client side an android application will be provided to both commuters and police. Then inspector or any higher officer can be logging into system can retrieve license information form databases. If the commuters made any traffic violations or any crimes the inspector or any higher officer can update punishment in the license, then it will be stored in centralized databases. Then we can able to check statistics of station and police.
IMPLEMENTATION:
MODULE IMPLEMENTATION

License server
This is the initial module of this project. This will work after validating the license to the user. Here a license details will be created for user and even a card will be issued to a new user. All the basic information of the user will be issued here like their date of issue, driving for two wheelers or four wheelers or for heavy vehicles. While issuing the card there will be no punishment details updated.

Centralizing the data
This is most important module in this project; this is because the updating details will be stored in the centralized server and the sub servers. A prior admin will be allocated to access these details. They will be permitted to update the details too. All the centralized details will be available in the web server so that user or admin can able to access the server anywhere at any time. There will be more security provided to the centralized server and high bandwidth will be allocated to access more number of users at a same time.

User Rights
Here 2 types of users are available; these users are decided by the admin.
- Viewer (Police and Constables) and Updates (Inspectors or Higher officials)

The viewer will be the lower officials, so that using their android devices they can able to view the details of the license holder. The responsibility of these users will be less. So that in case of any criminal activates done by the license holder that details can be viewed by the police constable and they will be produces in the police station. The higher officials will have an individual login for viewing the license details. So that using this login higher officials can able to apply punishments to the license holder, and one applied punishment cannot be removed even by the admin.
Information Warehouse

A special server will design to store all this confidential information as well as prior security will be provided by the system admin. User will be permitted to access any details from the card; they are simply the card holders. The accessing agents are the admin here. That detail too will be stored in the centralized server.

Mining data from server

Admin plays a most important role here, Admin having a special login to access the license card from the user. Here the data will be mine according to the admin role. In case of a police man they can mine the license and other information relevant to license. And even they can able to update the black marks for the users. In case accessing other policeman in some other area, he can able to see the black mark updated by the other admin.

Vehicle theft Information

This module deals with user. User can update their vehicle theft information. The updated information will be shared to all inspector and constable’s login. So, they can take necessary steps to capture the theft vehicles.

CREATE LLR:

To get permanent driving license first we need register for the learner license registration which allow you to learn driving with an experienced instructor on Indian roads. To get LLR where client need to fill registration. In the registration client need give total information about his/her to make records.

LOGIN

The system provides protection of information through the mechanism of the id and password. Therefore, only authorized people can be access the database. After the registration process can be done successfully. User can login with his/her unique id and password.

ADMIN

After the registration can be done successfully, admin can be login the system by using unique id and password. then admin can be able to create the license for the user by giving his/her details. Even admin can able to create the user has inspector and constables by his/her details for license verification and validation.
Create constable

Create inspector
INSPECTOR:
After the admin can create the inspector by his/her details then it will generate unique id and password for inspector to their system login. If they get their unique id and password they can be login and check the commuters license and also update the punishment that can be stored in the databases.

CONSTABLE:
After the admin can create the constable by his/her details then it will generate unique id and password for inspector to their system login. If they get their unique id and password, they can be login and check the commuters license and also updated the stolen vehicle status.

USER VIEW:
In the process user can be seen the license by using android application by entering his/her license number and details. Because if user can have made any road crimes then the inspector or higher officer updates the punishment in the user license that should be viewed by user.

CONCLUSION:
This project is done according to the committed concepts. And followed all the valid implementation methods and testing methods. Our mission in this project is to develop a highly deliverable output. This is an ideal implementation of the Single Responsibility Principle (SRP). Furthermore, by careful application of abstractions can reduce dependency on concrete classes and increase the expansibility and reliability of our Android applications. Thus, this project was successfully completed and satisfied all the needs from the requirement.

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PINK BUS - AN INTELLIGENT PROTOTYPE SYSTEM FOR WOMEN SAFETY IN PUBLIC TRANSPORT

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Department of Computer Science Engineering
A P J Abdul Kalam Technological University, KMEA Engineering College, Edathala

ABSTRACT:

Pink bus is a smart public transport bus which will provide the customer more safety and smart option to make the travelling experience more reliable, a user-friendly dependable system. Compared to the ordinary public transportation system. Women’s Safety in Public Transport is one of the key challenges across the world. Pink bus address this problem by concentrate on providing safety inside the vehicles, ensure the safety of women from origin to destination, Safe and accessible First and Last Mile Connectivity, Safe Passengers Facilities, Bus stops , Safe Boarding and Alighting, Safety inside the vehicle. Ordinary public transport uses the outdated technology of paper ticket machine which have many disadvantages like Outdated Technology, high unskilled employment etc. Pink bus as a smarter transport system will solve this problem through Smart Bus Fare Collection System implemented by RFID card. This system is user friendly , which will automatically identify the passenger and deduct the passenger’s fare according to the distance travelled. Compared to the paper-based ticketing system using of RFID cards are more convenient and reusable. Crime concentrates and is potentially specialized within and around the public transport system are increasing at immense rate. Pink bus is a secured public transport system which will give the law enforcement more control over the ordinary public transport system. It also enables the law enforcement to prevent the use of public transport as a tool to achieve coordinated criminal activities. Various sensors implemented on the transport will make the pink bus more accessible when they are in dangerous situation like accident, over speed uncontrollable situation etc. This project “PINK BUS” is designed with the hope that it is very much economical and helpful for passengers and as well as conductors during Journey.

I. INTRODUCTION

In recent times, acts of assault and violence against women are increasing at a menacing rate. With increasing percentage of female employees in industries and other sectors of the commercial market, now it is becoming a necessity for females to travel at late hours and visit distant and isolated locations as a part of their assigned duties. However, the exponential increase in assault, violence and attacks against women in the public transportation, is posing a threat to the growth and development of women. Sexual harassment against women in public transport reported to police up 160% in a Year. Around 315 cases of “insult to modesty of women” (under section 509 of the IPC) in public transport were reported in
an increase of 160% over the preceding year, according to government data. Up to 57% of these cases were registered in the southern state of Telangana, followed by Maharashtra (28), Andhra Pradesh (24), Delhi (19) and Assam (14). New Delhi, along with Brazil’s Sao Paulo, ranked as the worst megacity for sexual violence and harassment of women, according to a poll released by Thomson Reuters Foundation on October 16, 2017. Rape cases reported in Delhi more than tripled over the last five years, registering an increase of 277% from 572 in 2011 to 2,155 in 2016, IndiaSpend reported on July 8, 2017. So Defence isn’t the only measure that can suffice against this increasing abuse. We propose a prevention method: smart public transport bus which will provide the customer more safety and smart option to make the travelling experience more reliable, a user-friendly dependable system. So precaution can be arranged to eliminate such threat before it could happen. We also provide a defensive method for female customers in dangerous situations when they face real time harassments during their travel which is a simple push button, which will alert the law enforcement through a SOS message.

Fig: Details of abuse against women during travelling in the years of 2014 and 2015

Pink bus is a secure smart public transport system, which help women to travel safe at any time any where. Some of our features are implemented in many of the developed countries with the help of its nation. However, in our country, littering is a norm. Authorities encourage women safety and empowerment but they could not take any lukewarm responses. Our main motivation for creating the proposed project: PINK BUS is to provide a smart and secure transport facilities mainly focus on female passengers. In our country, we have already existing public transport system which have many drawbacks. Our project addresses various features to avoid these problems. Pink bus is a simple public transport which will provide user friendly experience and security for customer while their time in travelling. At present we have bus pass for the convenience of the passengers issued by the transport corporation and have zero percentage of security foe consumers. The bus pass is issued for one month and the procedure for bus
pass renewal is manual. The passengers should wait for long time queues to get a monthly bus pass, which is very time consuming. The limitations of existing system are manual process, which time consuming and the passengers should wait in long lines.

II. LITERATURE REVIEW

[1] A security solution which creates a sense of safety among women needs to be devised. In instance of attack, it is largely reported that women are helpless. There is thus, a need of simplesafety solution that can be activated simply by pressing a switch and can instantly send out alert message to the near ones of the victim. The objective of research work is to create a safety system in the form of a portable safety device for women, which does the following tasks: Alerts family, police and gives location of the woman being attacked. Captures, stores and streams image/video of the real time scenario to maintain a proof for legal actions. Incorporates an on-the-spot defensive mechanism by giving a mild electric shock to the attacker. The wearable section consists of a switch which is to be triggered manually by a woman, in instance of an attack. This switch triggers the shock mechanism and the on-body controller. The controller has a combined camera and audio module attached to it (in the form of a combinational and compact accessory such as a webcam). Along with the webcam, an RF module is interfaced with the controller to trigger the in-bag unit. The portable in-bag unit consists of a controller interfaced with an RF module, a GPS module and a GSM modem. The portable unit will activate only after receiving a wireless trigger from the wearable unit. Such a distribution of the hardware as wearable and portable was done to reduce the total wearable weight and divide the different processes between two sections resulting in faster simultaneous functioning.

[2] The device are used to learn the individual pattern of temperature and heartbeat, then it find out the threshold for generating alarm. It design deals to a wearable women safety device that automatically read and create patterns of body temperature and pulse rate during running. If readings are higher than the normal readings then it will automatically call and message more than one person along with the location so that actions can be taken. It used temperature and pulse sensors which will detect the activity of the woman and the data from the sensors will be sent to cloud where machine learning algorithm is applied to analyse the data generated. Initially the data is collected by sensors in non-danger conditions to train the algorithm, after that data is used for testing to find out the accuracy and how close it is to our trained data. More accuracy gets more surety of danger and the emergency alarm will be there on emergency contacts. Finally, deals with scenarios where there is no internet facility. To overcome this problem of internet we have used ZigBee mesh network, which helped the device to send the data to multiple hop distance.

[3] Public transport ticketing system, prevails in the megacity of Dhaka (Bangladesh), introduces severe malfunctions in the system, arguments among public, corruption and most number of traffic jam. Here actually suggests more public friendly automated system of ticketing as well as the credit transaction by using RFID based tickets. The
total system acts to bring out the consistency among various bus agencies for conclude a uniform access for passengers for their daily travels through an automated server which is updated every single time, when passengers travel by carrying their RFID based tickets.

[4] Vehicle accidents cause lot of damage. Detection and timely action will help a lot more in accident situations. Researchers proposed methods to analyse vehicle mounted sensor data to detect accidents. To get a big clear picture, we need to correlate and analyse pieces of sensor data instead of analysing them independently. Along with it, if we also analyse traveller’s health data, it will be helpful to take rescue actions. It may not be straightforward to correlate and analyse all these data sets in real time. A big system and framework is together is needed to implement the system. An architecture and design methodology is proposed in this paper to analyse the data provided by the vehicle mounted sensors and health data sent by passenger's wearable devices to detect accidents in real time. After detecting the accidents, system assesses the impact of the accident. Then it either alerts relevant people for rescue action or it does needful actions (as described by the domain experts) on its own.

[5] The paper investigates various causes related to the demand modelling and line-planning for bus transport systems based on data from Electronic Ticket Machine (ETM). The ETM data is not explored thoroughly for travel planning although it is collected and compiled by public transport on a regular basis. The electronic fare collection system is a key element in automated data collection system in the public transport industry. In the case of a developing country like India where smart card or travel card facilities are not commonly available, it is required to develop tool for eliciting data compiled using ETMs. The ETM database is also known as the fare box data. The ETM is a machine that records the data when a passenger pays for the ticket. It records the trip number, fare stage code, ticket number, origin, destination, passenger-count, time of issue of the ticket, fare, and the type of the ticket. These details can be derived from the ETM database to determine the effectiveness and efficiency factors of the public transport mode.

[6] In recent years, acts of physical attack and violence against women are rising at a menacing rate. With escalation of female employees in industries and other sectors of the commercial sector, it is now becoming a necessity for females to travel at late hours and visit distant locations as a part of their work regime. However, the exponential increase in violence and attacks against women in the past few years, is posing a threat to the growth and development of women. Defence isn’t the only measure that can suffer against this increasing abuse. A security explanation that creates a sense of safety among women needs to be devised. In instances of attack, it is largely reported that women are immobilized. There is thus, a need of simpler safety solution that can be activated as simply as by pressing a switch and can instantly send out alerts to the neurones of the victim. In this paper we intend to design and implement such a system in to the form of a partial wearable and partial portable system.

[7] The system incorporates all the unique features mainly as real-time location tracking and integrate all the features offered by the existing system such as GPS tracking, SOS.
The application requires an initial registration and along with that, emergency contacts and the user is asked to update the emergency contacts from time to time. When the user is travelling from one place to another place, the dynamic GPS tracking offered by Pub Nub’s channel is turned on to view the user’s location on a map. Users with this app can monitor other users with the same app through the dynamic GPS Tracking system through the Pub Nub channel. When the SOS button is pressed and then an alert message which contains the name of the user, GPS Location and a help message is sent via SMS. The user has all access to first-aid information and toll free helpline phone numbers. All the information and data is integrated with Firebase.

[8] In today’s world, security is the major issue for an individual persons. Although harassments on women, elders and children are increasing gradually. In this project the system consists of a monitoring device, which gets activated when the device is tapped upon and then a text message along with voice alert message is received by the respective emergency contacts. Further the person who receives the notifications can find and track the current location without the interaction of the victim’s application at each and every function.

[9] Safety for women has become a major factor and issue in most of the countries. Conducted Survey results shows that every year almost above 25000 crime against women were filed across India. In last ten years, the statistics shows women abusement, sexual harassment have been steadily increasing. It became a mandatory factor to come up with a solution to protect the women from being a victim and to reduce the attacks. The main goal or objective of this paper is to design and implement a highly reliable system for protecting women from being harassed. In this paper, we have developed an intelligent women safety system using Radio Frequency Identification (RFID) and Global positioning system. The main idea here is using a active RFID tag with passive RFID reader to scan the information and this information is transferred to the AT89C52 microcontroller where in the contacts of around 4 to 5 people is stored in the data base. Once the information is received by the controller, it sends the message to the contacts through GSM module and the location is tracked through the GPS.

III. PROPOSED METHOD

Pink bus is a smart public transport bus which will provide the customer more safety and smart option to make the travelling experience more reliable, a user-friendly dependable system. The Proposed prevention smart ticket machine which will collect the data that are required to identify the threats against women and send those data with a warning message to nearby law enforcement station throughout their journey. So precaution can be arranged to eliminate such threat before it could happen. By introducing Smart Bus Fare Collection System implemented by RFID card the users traveling experience is made smarter, digital and user friendly.
The proposed project consists of 3 modules in the below figure. Provide necessary trip information along with an additional parameter which will identify the gender of the customer to the ticket machine. Ticket machine accumulate and processes the data given by the operator and check for special conditions where women faces real-time threat. Special conditions such as a woman travelling alone in a public transport, when speed of the vehicles exceeds the limit, when number of passengers exceeds the limit, when the vehicle is not on time etc. If the real-time threat are real then the ticket machine will simply inform the law enforcement via SMS and provide ticket to the customer. If the above mentioned real-time threat become reality then the customer simply press a simply button which will enable the customer to give an alert message to the law enforcement through the SMS and assistance will be provided. If the real-time threat is not real then the ticket machine will simply perform as a ordinary ticket machine and provide ticket to the customer. The fair reduction or expense for travel will be through contact less smart card system or using liquid money.

Main goal of the proposed project make ordinary public transport ticket machine smarter and identify all those real-time threat through a simple program which will safeguard women’s in their time during travel. Identified real-time threat will be given to law enforcement through SMS, which will give the law enforcement more control on public transportation system and identify the threat and eliminate it before it could happen.

**SYSTEM DESCRIPTION**

This system has basically 3 types of modules.
1. Ticket machine
2. Women safety detection and prevention
3. Accident detection

**TICKET MACHINE**

This is a smart bus Fare Collection System implemented by RFID card. This system is very user friendly, which will automatically identify and deduct the passenger and the passenger’s fare according to the distance travelled. The Radio Frequency Identification (RFID) card is used to identify the passenger and make transaction very precise.

When compared to the paper based ticketing system using of RFID cards are more convenient and reusable. RFID cards are distributes among the public. By collecting the personnel details of a customer, an account will be created and unique ID will be assigned to that particular person with RFID cards.

By accessing the database, it is thus possible to identify the traveller and check his account then deduct the fare from his/her account. Creating database facilitates efficient filtering of anti-social elements and gives firm assurance to both passenger and Public Transport System (PTS) about the transaction. The web based application is used to send push notifications and also for the RFID card renewal process. IOT based web-page monitor system helps to overcomes all the problems faced in bus with.

**WOMEN SAFETY DETECTION AND PREVENTION**

This feature of the proposed method is provide assistance to the customer when they are in an Emergency Situation. Pink bus will provide the customer the needed assistance through informing the law enforcement. During the time in the pink bus, the proposed method will simply identify various situation that could be a potential threat to female customer such as when they are travelling along, or any potential criminal nearby etc. through the help of IR sensors and the given trip information’s etc. When such identified situation occurs the proposed method will simply inform the law enforcement through an warning message so that they could make precaution that could eliminate the presence of the threat being real. If such situation occur or the female customer had some difficulty while using pink bus. Customer can simply press a button for assistance from the law enforcement. Through the GSM module implemented in the proposed method.
ACCIDENT DETECTION
This feature of the proposed system is to identify the situations where the public transport are in danger of accidents that happen during their travel. The public transport is implemented in a way that the entire system is monitored by the vibration sensors which are connected to the main micro controller.

When such scenario of accident occurs the sensor identify the situation and provide an warning or sos message to the respective authorities through the gsm module. In Such way faster and much efficient assistance can be provided to the accident victims.

IV. CONCLUSION
By implementing this as a real time project, many advantage in ticketing system is rectified and implementation sending accident occurrence information automatically to nearest hospital may save many lives. Fare is debited from the RFID tag where tag is rechargeable one. Implementing this project both passenger and bus station administrators will benefit from the system as a real time information’s are provided. Due to the less manpower requirement, government cannot only gain more benefit also can bring our national transport system towards the global standard and assure women safety.

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Computing & Communications, Cloud & Big Data Computing, Internet of People and Smart City Innovations.


“I AM A LOVER OF AMERICA”. REPRESENTATION OF A MUSLIM-AMERICAN IN THE RELUCTANT FUNDAMENTALIST

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Abstract

The paper focuses on how one’s religion is marked as a critical identity signifier in times when globalization claims to cross and merge all boundaries. It attempts to explore the conflicts a Muslim-American faces post 9/11 with regard to his identity as a Muslim and as an American through various character studies varied in their depiction of his experience which may focus on the various social, economic and political issues that encompass the tragic event. These issues bring forth the dilemmas a Muslim-American faces in light of Islamophobia which intensifies both in nature and in magnitude post 9/11 and provide a better understanding of the complexities of identity issues faced by them. It would enable us to look at the complex dynamics of the interactions of one aspect of one’s identity with another.

Keywords: 9/11, Identity, Representation, Muslim, Other

The fall of the Twin Towers on September 11, 2001 will always be remembered as one of the most horrible atrocities ever experienced by the people of the United States. It is perceived as a watershed moment in history that had a huge impact on world politics, local and global culture, the sense of community and world history at large. The assessment of the event as a crucial moment in American and world history began soon after and consequently gained momentum. It was accompanied by a mood of paranoia and fear that gripped not just the people of America but from all across the world. The most apparent consequence of the event was the emergence of discourses of ‘War on Terror’ propounded by Bush administration which further raised political debates about the credibility of the attacks the ripples of which are felt to this day. The other social consequences may include the rise of inner anxieties, conflicted identities, and intertwined relationships between individuals and communities that was shaped as a result of their experiences in the aftermath of 9/11.

In its immediate aftermath, it has ensued complex reactions that surround the issues of identity and national allegiance while constructing simplified discourses that have led to generalisations harvesting the feelings of hate and prejudices among people from different communities. A large body of academic writing attests that the attempt to find meaning in the chaos that 9/11 ushered led to complex inquiries into its meaning and significance in history. It has not only been measured as a significant and deeply tragic loss of human lives but also with its impact on social and cultural climate not only of America but the world at large.
The attempt to fictionalise a politically and emotionally charged event like 9/11 poses unusual challenges and a number of limitations. How does one write about the trauma and horror of the event by eluding the polarising discourse of the binaries around 9/11? How can one engage with the political aspect of the event without allowing the narrative to turn into a propagandist tool driven by some form of ideological apparatuses? How can fiction subtly urge the readers to a humanistic response rising beyond the politics of hate and propaganda? How can fiction entail a morally and intellectually sound analysis of 9/11 by exploring the interconnection between political, ethical, emotional and the literary aspects surrounding it? It also reiterates the role and function of art and literature in a time of conflict and crisis. The attempt is to understand and explore the role of fiction in negotiating the personal and collective trauma post 9/11. Do the novels reiterate or disrupt the dominant discourses that perpetuate paranoia, chauvinistic nationalism, and xenophobia? Do the post 9/11 novels address the larger context of the event or merely explore personalised and individualistic accounts? Does post 9/11 fiction succumb to the psychosis constructed in the aftermath of 9/11 or shed light on the victimisation of people on the basis of their religious identities? How far can a writer's geographical location and cultural and ethnocultural identity influence one’s responses to 9/11, specifically between American and non-American, Western and non-Western?

The paper focuses on how one’s religion is marked as a critical identity signifier in times when globalization claims to cross and merge all boundaries. It attempts to explore the conflicts a Muslim-American faces post 9/11 with regard to his identity as a Muslim and as an American through various character studies varied in their depiction of his experience which may focus on the various social, economic and political issues that encompass the tragic event. These issues bring forth the dilemmas a Muslim-American faces in light of Islamophobia which intensifies both in nature and in magnitude post 9/11 and provide a better understanding of the complexities of identity issues faced by them. It would enable us to look at the complex dynamics of the interactions of one aspect of one’s identity with another.

Among all the writers who are writing in a world after 9/11, writers of Pakistani origin have largely been credited to have integrated the themes of identity and belonging to the impact of 9/11. The Reluctant Fundamentalist by Mohsin Hamid, Home Boy by H.M. Naqvi and Burnt Shadows by Kamila Shamsie are the prominent three works that have successfully done so. The representation of Muslim-Americans in these novels and the kind of identity issues they experience post 9/11 owing to their ethnic background is the most striking feature of their writings. These novels explore and validate Bhabha's theory of hybridity in the narratives centering on immigrants who have come to America to live the American Dream but end up feeling out of place everywhere, at home nowhere pushing them farther to the peripheries. An explicit manifestation of Bhabha’s definition of hybridity as new, neither the one nor the other, which is struggling to free itself from a past ancestry, is depicted through the characters of these novels, consequently replacing "temporal linearity with a spacial plurality" (Ashcroft B. G. 1989). The struggle of the protagonists in these novels with the issues of...

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identity renders them vacillating between their ethnic backgrounds where they were born and the city they have moved to in the hope of a better life. In light of the massive altercations in the social and economic frontiers, the present paper focuses on the corresponding changes in the idea of Self and identity in the post 9/11 scenario in which an individual is coping with multiple identities that one has ascribed to oneself in a globalised world which has promised the homogenisation of identities and cultures through the analysis of Mohsin Hamid’s novel, *The Reluctant Fundamentalist*. The consequences of 9/11 resulted in exposing the ‘Muslimness’ in the various literary representations of Muslim characters as immigrants seeking reformulation of identity post 9/11.

The novel, *The Reluctant Fundamentalist* offers a framework with which the author has sought to re-examine the prejudices as well as relationships between the East and West in the aftermath of post 9/11. He has avoided mimicking many other literary works drawn in the tradition of the West and thus displacing and dispelling the varied assumptions with regard to the cultural interactions between the two. In this process, with its deliberate design in terms of narrative action and setting that has positioned a Muslim and a Western character in a close proximity, Hamid has offered a fertile ground for the exploration of the issues like the negotiation of identity, hybridity and cultural assimilation in light of the perceived distrust in the post 9/11 world. The structure of the novel necessarily invites the reader to think and question and challenge the essentialising of Muslim behavior and practices. Through the interaction of the two characters in a conversation that is one-sided only, there is an evident shift in the frames of identity, otherness and normative behavior. Even as it portrays a seemingly engaging and balanced American culture, there is a covert hostility that is barely acknowledged in the novel. The negotiation of identity and otherness, however comprise a stark feature of the novel with direct observation of the Other. By adopting the dramatic monologue form, Hamid has effectively demonstrated how external gaze is effective in creating a distance between the characters and cultures by reframing the gaze from the Eastern Other to the American subject.

The author of the novel being a Muslim has an advantage over western writers in his effort to deal with a “Muslim” character. Being a Muslim-American himself, he has been able to encounter both the cultures and can certainly give a better understanding of his protagonist’s experience in a post 9/11 America. Hamid seems to re-evaluate the treatment given to Muslims post 9/11, how the stereotypes and clichés attached to a Muslim intensified after the fall of the Twin Towers. In the increasingly politicized atmosphere post 9/11 which is characterized by fear and suspicion of ‘Other’, Hamid’s novel seeks to allow a Muslim to narrate the experience of the ‘Other’ in America which also marks the disillusionment of the multicultural America.

Against the backdrop of 9/11, *The Reluctant Fundamentalist* is a story that destabilizes the categories that were dominant in a post 9/11 narrative through the experience of its protagonist, Changez. It describes his journey from capitalist “fundamentalist” to the object of American gaze and finally anti-American. According to anthropologist Mahmood Mamdani, the era since the Cold War has seen the
“ascendancy and rapid politicizing of a single term: culture. Americans are trapped in “Culture Talk,” a way of framing the problem of terrorism which assumes that culture was made, only at the beginning of creation, as some extraordinary, prophetic act. After that, it seems Muslims just conformed to culture. According to some, our culture seems to have no history, no politics, and no debates, so that all Muslims are just plain bad. According to others, there is a history, a politics, even debates, and there are good Muslims and bad Muslims. In both versions, history seems to have petrified into a lifeless custom of an antique people who inhabit antique lands. Or could it be that culture here stands for habit, for some kind of instinctive activity with rules that are inscribed in early founding texts, usually religious, and museumized in early artifacts?

Culture talk after 9/11 […] explained the practice of terrorism as “Islamic”. “Islamic Terrorism” is thus offered as both description and explanation of the events of 9/11. It is no longer the market (capitalism), nor the state (democracy), but culture (modernity) that is said to be the dividing line between those in favour of a peaceful, civic existence and those inclined to terror. It is said that our world is divided between those who are modern and those who are premodern. The moderns make culture and are its masters; the pre-moderns are said to be but conduits. (16–17)

He questions the notions that are being placed as the dominant narrative in the West. If this world is after all divided into two: on the one hand, savages who must be saved before they destroy us all and, on the other, the civilized whose burden it is to save all? Is it really true that people’s public behaviour, specifically their political behaviour, can be read from their religion? Could it be that a person who takes his or her religion literally is a potential terrorist? And only someone who thinks of the text as not literal, but as metaphorical or figurative, is better suited to civic life and the tolerance it calls for? How, one may ask, does the literal reading of religious texts translate into hijacking, murder, and terrorism? Is there not less and less talk of the clash of civilizations, and more and more talk of the clash inside civilizations?

Culture (and cultural difference) is then constructed as cause (and legitimation) of violence, whether that be the fury of the terrorist or the calculated precision attacks of “smart” warfare, unmanned drones, and so on.

Critics such as AmartyaSen have noted the insistence on cultural difference at the heart of identity claims which seem to possess the potential for separatism and therefore violence against the Other. He aims to criticize what he calls the 'solitarist' approach to human identity, which sees human beings as members of exactly one group. For Sen, we choose what facets of identity to accentuate and organize around, out of the myriad dialogic identities we take on in our daily professional and personal lives. In
particular, he points out, “The illusion of destiny, particularly about some singular identity or other […] nurtures violence in the world through omissions as well as commissions” (xiv)

In illuminating this mutual construction of culture, studies of hybridity can offer a juncture for a counter-narrative, through which the dominated can reclaim shared ownership of a culture that relies upon them for meaning. Hybridity can be seen as a powerful tool for liberation from the domination imposed by bounded definitions marked by the notions of difference. Identities owe their formation and position in society to the operation of social, economic, cultural and political forces that are inseparable from the forces that create and maintain socio-economic groups. In this view, rather than being opposed, identity politics and class politics, while distinct, have the potential to be allied actors in a commonplace political process.

Much anthropology in this field demonstrates how identities have been, and are invented, reinvented and shaped for political and other purposes, out of disparate historical and cultural experiences. Other studies have repeatedly shown that identities are driven with contradictions and are not to be understood as seamlessly unified comprehensive cultural entities, therefore impossible to go back to the original one.

HomiBhabha in this regard exclaims,

It is that Third Space, though unrepresentable in itself, which constitutes the discursive conditions of enunciation that ensure that the meaning and symbols of culture have no primordial unity or fixity; that even the same signs can be appropriated, translated, rehistoricized and read anew. (Bhabha 15)

Mohsin Hamid’s *The Reluctant Fundamentalist* is an example of a sort of de-territorialisation of literature which impels its readers to think beyond the totalizing categories of East and West, “Them and Us,” which are continuously insisted upon in “war on terror” discourse. The narrative tone replicates a site of struggle between East and West. Through *The Reluctant Fundamentalist*, Mohsin “writes back” to the imperial American discourse which immediately destabilizes the gaze of the West upon the Islamic world. In the novel, Hamid has constructed a “modern” Muslim immigrant and anti-hero that sees fit to challenge the reductive lens that all Muslims are religious fanatics and zealots.

The protagonist of the novel and the narrator, Changez, is a successful graduate in a prestigious university hired by a reputed financial firm, living the American dream who eventually “awakens” in a post 9/11 scenario. The novel is a journey of the changing dynamics of his relation with America keeping 9/11 in focus.

Do not be frightened by my beard. I am a lover of America. (Hamid 1)

These lines highlight the tension of the post 9/11 world where tension is located in the manner in which a person is represented and how he perceives himself. The dynamics of
his representation changed drastically post 9/11 which also impacted upon his self-understanding as a Muslim-American and his identity oscillates between his loyalties towards Pakistan and America.

The story is narrated by Changez at the time when he has left America and moved to Lahore as a university lecturer. The identity of the American with whom Changez is in conversation isn’t revealed. Just like Chuck in Home Boy, Changez is thrilled to be in a multicultural America as at that time he does not feel culturally inferior. On the contrary, he feels proud of his Eastern lineage.

This is a dream come true. Princeton inspired in me the feeling that my life was a film in which I was the star and everything was possible. (Hamid 3)

Instead of experiencing cultural inferiority, he is proud of his Pakistani background as he points out that his city is the “ancient capital of Punjab, home to nearly as many people as New York, layered like a sedimentary plain with the accreted history of invaders from the Aryans to the Mongols to the British.” (8) In an interview for a job at a valuation company, Underwood Samson, the interviewer, Jim further acknowledges his being “different” and “hungry,” and offers him the job.

After his graduation, he goes to Greece with the help of his friend as “he was well-liked as an exotic acquaintance by some of the others.” (19) He met and was immediately attracted to a girl named Erica. Erica also reciprocates to his feelings and starts a romantic relationship with him after his cautious efforts to make an impression upon her which gets complicated as the story unfolds. His nationality doesn’t seem to be a problem here and on the contrary might have given him some added advantage over other handsome and rich boys in their group. He is not made conscious of the “difference,” maybe because he is perceived as a “good” Muslim.

After his stay at Greece ends, Changez returns back to New York and starts working for Underwood Samson. Here also his background and his roots pose no problem in his success as he becomes the most praised employee in the firm. In fact he takes it to his advantage and claims, “I was aware of the advantage conferred upon me by my foreignness, and I tried to utilize it as much as I could.” (47) His tenacity and sense of formality and natural politeness which lacks in his American counterparts is appreciated by his new colleagues, as he “stood out from the pack.” Apart from being a story of infatuation and disenchantment with America, the story also sheds light on the binary relations between East/West and also on the (mis)representation of the two. Where Erica’s father associates fundamentalism with Changez’s religion, Changez’s employer Underwood Samson’s motto “Focus on the fundamentals” forces one to reconsider one’s preconceptions about such words and their meanings and hence subverts the idea that the real fundamentalism here is that of US capitalism.
Changez tries to assimilate with American identity and often basks in the glory of being a “New Yorker with the city at his feet,” but his identity is subjected to inevitable dichotomies. There is an ambivalence in his tone even when he attempts to assimilate and at various points in the novel he is shown conflicted with his identity.

I attempted to act and speak, as much as my dignity would permit, more like an American. The Filipinos we worked with seemed to look up to my American colleagues, accepting them almost instinctively as members of the officer class of global business – and I wanted my share of respect as well. (65)

Changez also realized that his efforts are ineffectual at large,

Then one of my colleagues asked me a question, and when I turned to answer him, something rather strange took place. I looked at him – at his fair hair and light eyes and, most of all, his oblivious immersion in the minutiae of our work – and thought, you are so foreign. (67)

He realized that he is a member of a different “tribe” which ushers in mixed feelings of being both proud and ashamed.

Four thousand years ago, we, the people of the Indus River basin, had cities that were laid out on grids and boasted underground sewers, while the ancestors of those who would invade and colonize America were illiterate barbarians. Now our cities were largely unplanned, unsanitary affairs, and America had universities with individual endowments greater than our national budget for education. To be reminded for this vast disparity was, for me, to be ashamed. (38)

Where he is proud to take advantage of his foreignness, he is also resentful that the rich heritage of his country had faded away at the hands of globalization led by America and Europe. He finds himself unable to resonate with the American life and struggles to associate with it. It irks him when he meets Erica’s father the first time as he remarks,

Economy is falling apart though, no? Corruption, dictatorship, the rich living like princes while everyone else suffers. Solid people, don’t get me wrong, I like Pakistanis. But the elite has raped the place well and good, right? And fundamentalism. You guys have got some serious problem with fundamentalism. (62-63)

Changez experiences what Hamid himself has put that there are “first order and second order citizens in our globalized world, and although we interact at offices and dinner parties as equals, were not treated as equals.” (“Seven Questions”) Changez also shares this feeling as he states,
“I feel like a distant runner who thinks he is not doing too badly until he glances over his shoulder and sees that the fellow who is lapping him is not the leader of the pack, but one of the laggards.” (74)

The 9/11 attacks in New York further distances him from the American dream that he has been living. The impact was very widespread in magnitude to the extent that his position as an outsider in America was further accentuated. The representation of 9/11 attacks in the media and its impact on the lives of Muslim-Americans propelled Changez to reconsider his ideas about American life where he sees himself as an outsider. He further believes that there is no possibility of his full inclusion into American life. The inner struggle that Changez had been going through intensified as he tries to resolve his identity crisis post 9/11. His reaction to the images of the attacks surprises him. He was on a trip to Manila when it happened,

I turned on the television and saw what at first I took to be a film. But as I continued to watch, I realized that it was not fiction but news. I stared as one – then the other – of the twin towers of New York’s World Trade Center collapsed.” And then I smiled. Yes, despicable it may sound, my initial reaction was to be remarkably pleased. (83)

Though he tries to defend his sense of perplexity at this sense of pleasure at the horror of the attacks. He reflects,

But at that moment, my thoughts were now with the victims of the attack – death on television moves me most when it is fictitious and happens to characters with whom I have built up relationships over multiple episodes – no, I was caught up with the symbolism of it all, the fact that someone had so visibly brought America to her knees. (110)

Clearly he had already started to associate himself more with his Pakistani identity. The source of his pleasure is the realization of being an outsider to a society he is simultaneously connected to.

After the attacks, when Changez was about to board the plane for New York, Changez is escorted by armed guards to a room at the airport and was stripped down to his boxer shorts. He recalls,

I flew to New York uncomfortable in my own face: I was aware of being under suspicion; I felt guilty; I tried therefore to be as nonchalant as possible; this naturally led to my becoming stiff and self-conscious. (99)

He was subjected to another investigation upon his arrival in New York. He travelled “very much alone” to Manhattan that evening as his team didn’t wait for him.
Changez avoids the evening news for two weeks after America began to bomb Afghanistan. Then one evening he chances “upon newscast with ghostly night-vision images of American troops dropping into Afghanistan for what was described as a daring raid on a Taliban command post.” Changez unsettles the boundaries of the definition of terrorism and by using the concept of fundamentalism against America. His engagement with American society and his eventual disillusionment with what he sees as American fundamentalism cause him to voice his disagreements with American society publically. Changez, now a possible terrorist figure from the perspective of America, repositions concepts and unsettles the distinction between terrorism and counter terrorism in the US led War on Terror. He explains,

A common strand appeared to unite these conflicts, and that was the advancement of small coterie’s concept of American interests in the guise of the fight against terrorism, which was defined to refer only to the organized and politically motivated killings of civilians by killers not wearing uniforms of soldiers. I recognized that if this was to be the single most important priority of our species, then the lives of those of us who lived in the lands in which such killers also lived had no meaning except as collateral damage. This, I reasoned, was why America felt justified in bringing so many deaths to Afghanistan and Iraq, and why America felt justified in risking so many more deaths by tacitly using India to pressure Pakistan. (202-3)

Changez also experiences racist attack. A man calls him “fucking Arab” and tries to pick up fight with him. Changez’s experience resonates Hamid’s own experience in the aftermath of 9/11.

Earlier this year [2010], on a trip from Pakistan to New York with my wife and baby daughter, I had my usual lengthy encounter at J.F.K. Airport. Sent to secondary inspection, I waited my turn to be investigated. Eventually it came, the officer questioning me about such things as whether I had ever been to Mexico or received combat training. As a result, we were the last passengers on our flight to claim luggage, a lonely set of suitcases and a foldable playpen on a now-stationary baggage carousel. And until we stepped out of the terminal, my heart kept pounding in a way incongruent with my status as a visitor with papers in order. (Hamid “Discontent”)

After 9/11 Changez’s resentment towards America grows. He starts identifying himself with his Pakistani identity. He is further infuriated by the “War on Terror” and America’s foreign policy in Asia in general. According to him, America succumbed to self-righteous rage and nationalistic nostalgia and his perception towards America changes.
I always thought of America as a nation that looked forward; for the first time I was struck by its determination to look back. Living in New York was suddenly like living in a film about the Second World War; I, a foreigner, found myself staring out at a set that ought to be viewed not in Technicolor but in grainy black and white. While your fellow countrymen longed for was unclear to me – a time of unquestioned dominance? Of safety? Of moral certainty? I did not know – but that they were scrambling to don the costumes of another era was apparent. I felt treacherous for wondering whether that era was fictitious, and whether – if it could indeed be animated – it contained a part written by someone like me. (Hamid 131)

He was enraged and blamed America for many ills and wrongs all over the world.

As a society, you [America] were unwilling to reflect upon the shared pain that united you with those who attacked you. You retreated into myths of your own difference, assumptions of your own superiority. And you acted out these beliefs on the stage of the world, so that the entire planet was rocked by the repercussions of your tantrums, not least my family, now facing war thousands of miles away. Such an America had to be stopped in the interest not only the rest of the humanity, but also in your own. (190)

In such an atmosphere Changez becomes even more aware of his position as an outsider in America and is able to identify more with his Pakistani identity. He visits Pakistan to see his family. He decides to grow a beard to assert his newly found identity and wage a war against his American self. “It was perhaps a form of protest on my part, a symbol of my identity, or perhaps I sought to remind myself of the reality I had left behind.” (147-48)

The turmoil in Changez’s mind grows more intense during his stay in Chile. He meets Juan-Batista, the chief of the company he was sent to evaluate. He grows reluctant to continue with his job as he sees himself as a traitor, “a modern-day janissary*.” (During the Ottoman empire, Janissaries were the most loyal, elite and powerful crops serving the sultan. They were recruited from Christian boys, severed from their families, brought up as Muslims and given the best military education. At the time, they were one of the most effective and best trained soldiers in Europe, well-paid and enjoying high social status, who were actually fighting against their own Christian civilization.) He exclaims,

There could be no doubt. I was a modern-day janissary, a servant of the American empire at a time when it was invading a country with a kinship of mine [Afghanistan] and was perhaps even concluding to ensure that my own country faced the threat of war. (Hamid 173)
Consequently, he refuses to work for Underwood Samson by saying that his “days of focusing on the fundamentals were done” and goes back to New York.

Following his denunciation of America, Changez returns to Pakistan to become a university lecturer and his attitude towards his former adopted home becomes increasingly hostile. The return of Changez to his home nation symbolically reasserts Pakistan as a locus of his belonging.

The mutual suspicion between Changez, who represent eastern, Muslim-based civilization, and the American, representing the western point of view, is a crucial theme in the novel. 9/11 has deepened the divide and had certainly brought in a drastic change in the way people from varied cultures perceive each other. The relation between Changez and the American exhibits the anxieties that have followed in the aftermath of 9/11 where it is difficult to invest faith in each other. Hamid, however has managed to turn the tables in his fictional dialog between the East and the West by displacing the American from his homeland and a narrative and a mouthpiece of the ‘Other’.

The study of identity and representation is associated with the changes in circumstances or one’s personality. The representation of the uneven and often hybrid cultural sites searching for their identity after independence do not resemble the representations of western culture. Among postcolonial theorists, there is a wide consensus that hybridity arose out of the culturally internalized interactions between “colonizers” and “the colonized” and the dichotomous formation of these identities. In this claim, Bhabha aimed to create a new language and mode of describing the identity of Selves and Others. He says:

It becomes crucial to distinguish between the semblance and similitude of the symbols across diverse cultural experiences -- literature, art, music, ritual, life, death and the social specificity of each of these productions of meaning as they circulate assigns within specific contextual locations and social systems of value. The transnational dimension of cultural transformation -- migration, diaspora, displacement, relocation – makes the process of cultural translation a complex form of signification. The natural(ized), unifying discourse of nation, peoples, or authentic folk tradition, those embedded myths of cultures particularity, cannot be readily referenced. The great, though unsettling, advantage of this position is that it makes you increasingly aware of the construction of culture and the invention of tradition (Bhabha 247).

In using words like “diaspora, displacement, relocation,” Bhabha illustrates the dynamic nature of culture, and the flimsy consistency of the historical narratives that cultures rely upon to draw boundaries and define themselves. As a result, culture cannot be defined in and of itself, but rather must be seen within the context of its construction. More significantly, Bhabha draws attention to the reliance of cultural narratives upon the Other. In illuminating this mutual construction of culture, studies of hybridity can offer
the opportunity for a counter-narrative, a means by which the dominated can reclaim shared ownership of a culture that relies upon them for meaning.

Hamid seems to suggest that Changez’s story has its contentions towards the ways that West can produce the so-called “terrorist” through and by false propaganda that construct any Muslim or Arab as outsider to the nation. The novel, poses questions on the various guises fundamentalism takes with regard to domestic and foreign policies that the West adopts post 9/11. In this regard Jean Baudrillard has written,

It is therefore a clash neither of civilizations nor of religions, and this goes far beyond Islam and America, upon which one attempts to focus the conflict in order to give oneself an illusion of a visible confrontation, and solution, by the use of force. (Baudrillard “The Spirit of Terrorism”)

Though Changez has been able to convince his readers of the intensity of his narrative, he implicitly shows his unreliability as a narrator in the very beginning of the story itself,

But it may be that I am inclined to exaggerate these irritants in retrospect, knowing the course my relationship with your country would take. (21)

Later, he goes on to say,

I cannot now recall many of the details of the events I have been relating to you. But surely it is the gist that matters; I am, after all, telling you a history, and in history, as I suspect you – an American – will agree, it is the thrust of one’s narrative that counts, not the accuracy of one’s details. (118)

Throughout the narrative, Changez has been seen wearing a mask hiding his real self from everyone he encounters in the narrative. He tries to assimilate with his fellow friends as an “exotic acquaintance”. He does want his peers to know that he is on a scholarship and works part time to make his ends meet. During his assignment in Manila, he pretends to be one among his fellow American colleagues even though he himself acknowledges that he could relate more with the Filipino driver of the jeep who returned his gaze which “got under his skin.” (67) Pondering upon this incident he says that he shared “sort of Third World sensibility” (67) with him. Later on when he goes out for a drink with his team, he feels that his “Pakistaniness was invisible, cloaked by my suit….” (71) He pretended to be Chris, Erica’s ex-lover while making love to her. This puts his entire narration into focus of critical inquiry.

He claims that America changed his world but he himself lived his entire life in a nostalgia. As he begins to narrate the experience of his stay in America, he claims,
“Princeton made everything possible for me. But it did not, could not, make me forget such things as how much I enjoy the tea in this, city of my birth.” (15)

The novel is about Changez’s change or realization, which transforms him from an American financial analyst from Princeton to an individual reintroduced to his cultural identity. It is about his continuous negotiation with his hybrid identity where at many points in the novel he is torn between multiple identities and its final resolution. It examines “the complexities surrounding interrelated identities of race and national allegiance, in which biological explanations of racial otherness have been reconfigured through various (mis) representations of Islam.”

Morey (2011) argues that The Reluctant Fundamentalist “challenges the orthodoxies of the novel post 9/11”, which generally do seek to promote sympathy for the losses and traumas experienced by their characters. Hamid appears to eschew or transcend the emotional response in order to deal directly and aggressively with reason itself, presenting a framework which, if properly contemplated, elicits an intellectual response. Such a response may, ultimately, be more hopeful and promising with regard to the negotiation of identity and alterity in the post 9/11 world.

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FUTURE TRENDS IN FIBER OPTICS COMMUNICATION - APRIL 2020

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ABSTRACT:
Fiber optic systems are important telecommunication infrastructure for world-wide broadband networks. Wide bandwidth signal transmission with low delay is a key requirement in present day applications. Optical fibers provide enormous and unsurpassed transmission bandwidth with negligible latency, and are now the transmission medium of choice for long distance and high data rate transmission in telecommunication networks. This paper gives an overview of fiber optic communication systems including their key technologies, and also discusses their technological trend towards the next generation.

Index Terms - Bandwidth, Broadband, Fiber optics, Latency, Telecommunication.

1. INTRODUCTION
The major driving force behind the widespread use of fiber optics communication is the high and rapidly increasing consumer and commercial demand for more telecommunication capacity and internet services, with fiber optic technology capable of providing the required information capacity (larger than both wireless connections and copper cable). Advances in technology have enabled more data to be conveyed through a single optical fiber over long distances. The transmission capacity in optical communication networks are significantly improved using wavelength division multiplexing.

A desirable feature for future optical networks is the ability to process information entirely in the optical domain for the purpose of amplification, multiplexing, de-multiplexing, switching, filtering, and correlation, since optical signal processing is more efficient than electrical signal processing. Division Multiple Access networks using optical signal processing techniques have recently being introduced.

Despite the associated benefits of utilizing optical fiber for communication (such as its high reliability over long distances, low attenuation, low interference, high security, very high information capacity, longer life span and ease of maintenance), research is still ongoing to further improve on the present fiber optics communication system, and also to solve some of the challenges facing it. Future optical communication systems are envisioned to be more robust than the present system. This paper is organized as follows. Section II describes the basic principles of fiber optics communication. Section III looks at the history and evolution of fiber optics.
communication while section IV presents some envisioned future trends in fiber optics communication. In section V, we draw the conclusion for the paper.

II. BASIC PRINCIPLES OF FIBER OPTIC COMMUNICATION

Fiber optic communication is a communication technology that uses light pulses to transfer information from one point to another through an optical fiber. The information transmitted is essentially digital information generated by telephone systems, cable television companies, and computer systems. An optical fiber is a dielectric cylindrical waveguide made from low-loss materials, usually silicon dioxide. The core of the waveguide has a refractive index a little higher than that of the outer medium (cladding), so that light pulses is guided along the axis of the fiber by total internal reflection. Fiber optic communication systems consists of an optical transmitter to convert an electrical signal to an optical signal for transmission through the optical fiber, a cable containing several bundles of optical fibers, optical amplifiers to boost the power of the optical signal, and an optical receiver to reconvert the received optical signal back to the original transmitted electrical signal. Figure 1 gives a simplified description of a basic fiber optic communication system.

Fig. 1. Basic fiber optic communication system [5]

Optical fibers fall into two major categories, namely: step index optical fiber, which include single mode optical fiber and multimode optical fiber, and graded index optical fiber. Single mode step index optical fiber has a core diameter less than 10 micrometers and only allows one light path. Multimode step index optical fiber has a core diameter greater than or equal to 50 micrometers and allows several light paths, this leads to modal dispersion. Graded index optical fibers have their core refractive index gradually decrease farther from the centre of the core, this increased refraction at the core centre...
slows the speed of some light rays, thereby allowing all the light rays to reach the receiver at almost the same time, thereby reducing dispersion. Figure 2 gives a description of the various optical fiber modes.

Fig.2. Optical Fiber Modes

III. EVOLUTION OF FIBER OPTICS COMMUNICATION

Optical fiber was first developed in 1970 by Corning Glass Works. At the same time, GaAs semiconductor lasers were also developed for transmitting light through the fiber optic cables. The first generation fiber optic system was developed in 1975, it used GaAs semiconductor lasers, operated at a wavelength of 0.8 µm, and bit rate of 45Megabits/second with 10Km repeater spacing.

In the early 1980’s, the second generation of fiber optic communication was developed, it used InGaAsP semiconductor lasers and operated at a wavelength of 1.3 µm. By 1987, these fiber optic systems were operating at bit rates of up to 1.7 Gigabits/second on single mode fiber with 50Km repeater spacing.

The third generation of fiber optic communication operating at a wavelength of 1.55 µm was developed in 1990. These systems were operating at a bit rate of up to 2.5 Gigabits/second on a single longitudinal mode fiber with 100Km repeater spacing.
The fourth generation of fiber optic systems made use of optical amplifiers as a replacement for repeaters, and utilized wavelength division multiplexing (WDM) to increase data rates. By 1996, transmission of over 11,300Km at a data rate of 5Gigabits/second had been demonstrated using submarine cables.

The fifth generation fiber optic communication systems use the Dense Wave Division Multiplexing (DWDM) to further increase data rates. Also, the concept of optical solitons, which are pulses that can preserve their shape by counteracting the negative effects of dispersion, is also being explored. Figure 3 shows the evolution of fiber optic communication.

IV. FIBER OPTICS BASICS

Optical fiber contains of principally 3 parts: Core, Buffer or Coatings and Cladding cover. Figure 4 shows the fundamental structure of fiber.
1. **Core:** The core is that the cylindrical portion of the fiber. It’s created from material things, and commonly created from glass. The light propagates through primarily core.

2. **Cladding:** The cladding or the protective cover is that the external layer of the core, which is additionally created from dielectric material things with numerous refractive directories. The refractive directory of the cladding or protective cover is a smaller amount than the refractive directory of core material. This portion is often created from glass or plastic material. It reduces the loss of light from core in to close air. It additionally reduces the scattering loss at the surface of the core, and protects the fiber from interesting surface impurities and adds up the strength to the fiber. [1]

3. **Buffer or Coatings:** The outer coating or jacket is outside layer to protect a fiber from any kind of physical harms. This portion is developed from plastic material. This material is versatile in surroundings to preclude scratches. [1]

**V. FUTURE TRENDS IN FIBER OPTICS COMMUNICATION**

Fiber optics communication is definitely the future of data communication. The evolution of fiber optic communication has been driven by advancement in technology and increased demand for fiber optic communication. It is expected to continue into the future, with the development of new and more advanced communication technology. Below are some of the envisioned future trends in fiber optic communication.

**A. All Optical Communication Networks**

An all fiber optic communication is envisioned which will be completely in the optical domain, giving rise to an all optical communication network. In such networks, all signals will be processed in the optical domain, without any form of electrical manipulation. Presently, processing and switching of signals take place in the electrical domain, optical signals must first be converted to electrical signal before they can be processed, and routed to their destination. After the processing and routing, the signals are then re-converted to optical signals, which are transmitted over long distances to their destination. This optical to electrical conversion, and vice versa, results in added latency on the network and thus is a limitation to achieving very high data rates.

Another benefit of all optical networks is that there will not be any need to replace the electronics when data rate increases, since all signal processing and routing occurs in the optical domain [9]. However, before this can become a reality, difficulties in optical routing, and wavelength switching has to be solved. Research is currently ongoing to find an effective solution to these difficulties.
B. Multi – Terabit Optical Networks

Dense Wave Division Multiplexing (DWDM) paves the way for multi-terabit transmission. The world-wide need for increased bandwidth availability has led to the interest in developing multi-terabit optical networks. Presently, four terabit networks using 40Gb/s data rate combined with 100 DWDM channels exists. Researchers are looking at achieving even higher bandwidth with 100Gb/s. With the continuous reduction in the cost of fiber optic components, the availability of much greater bandwidth in the future is possible.

C. Intelligent Optical Transmission Network

Presently, traditional optical networks are not able to adapt to the rapid growth of online data services due to the unpredictability of dynamic allocation of bandwidth, traditional optical networks rely mainly on manual configuration of network connectivity, which is time consuming, and unable to fully adapt to the demands of the modern network. Intelligent optical network is a future trend in optical network development, and will have the following applications: traffic engineering, dynamic resource route allocation, special control protocols for network management, scalable signaling capabilities, bandwidth on demand, wavelength rental, wavelength wholesale, differentiated services for a variety of Quality of Service levels, and so on. It will take some time before the intelligent optical network can be applied to all levels of the network, it will first be applied in long-haul networks, and gradually be applied to the network edge.

D. Ultra – Long Haul Optical Transmission

In the area of ultra-long haul optical transmission, the limitations imposed due to imperfections in the transmission medium are subject for research. Cancellation of dispersion effect has prompted researchers to study the potential benefits of soliton propagation. More understanding of the interactions between the electromagnetic light wave and the transmission medium is necessary to proceed towards an infrastructure with the most favorable conditions for a light pulse to propagate.

E. Improvements in Laser Technology

Another future trend will be the extension of present semiconductor lasers to a wider variety of lasing wavelengths. Shorter wavelength lasers with very high output powers are of interest in some high density optical applications. Presently, laser sources which are spectrally shaped through chirp managing to compensate for chromatic dispersion are available. Chirp managing means that the laser is controlled
such that it undergoes a sudden change in its wavelength when firing a pulse, such that the chromatic dispersion experienced by the pulse is reduced. There is need to develop instruments to be used to characterize such lasers. Also, single mode tunable lasers are of great importance for future coherent optical systems. These tunable lasers lase in a single longitudinal mode that can be tuned to a range of different frequencies.

**F. Laser Neural Network Nodes**

The laser neural network is an effective option for the realization of optical network nodes. A dedicated hardware configuration working in the optical domain and the use of ultra-fast photonic sections is expected to further improve the capacity and speed of telecommunication networks. As optical networks become more complex in the future, the use of optical laser neural nodes can be an effective solution.

**G. Polymer Optic Fibers**

Polymer optical fibers offer many benefits when compared to other data communication solutions such as copper cables, wireless communication systems, and glass fiber. In comparison with glass optical fibers, polymer optical fibers provide an easy and less expensive processing of optical signals, and are more flexible for plug interconnections. The use of polymer optical fibers as the transmission media for aircrafts is presently under research by different Research and Development groups due to its benefits. The German Aerospace Center have concluded that “the use of Polymer Optical Fibers multimedia fibers appears to be possible for future aircraft applications. Also, in the future, polymer optical fibers will likely displace copper cables for the last mile connection from the telecommunication company’s last distribution box and the served end consumer. The future Gigabit Polymer Optical Fiber standard will be based on Tomlinson-HarashimaPrecoding, Multilevel PAM Modulation, and Multilevel Coset Coding Modulation.

**H. High – Altitude Platforms**

Presently, optical inter satellite links and orbit-to-ground links exists, the latter suffering from unfavorable weather conditions. Current research explores optical communication to and from high altitude platforms. High altitude platforms are airships situated above the clouds at heights of 16 to 25Km, where the unfavorable atmospheric impact on a laser beam is less severe than directly above the ground. As shown in figure 4, optical links between high- altitude platforms, satellites and ground stations are expected to serve as broadband back-haul communication channels, if a high-altitude platform functions as a data relay station.
I. Improvements in Optical Transmitter/Receiver Technology

In fiber optics communication, it is important to achieve high quality transmission even for optical signals with distorted waveform and low signal to noise ratio during transmission. Research is ongoing to develop optical transceivers adopting new and advanced modulation technology, with excellent chromatic dispersion and Optical Signal to Noise Ratio (OSNR) tolerance, which will be suitable for ultra-long haul communication systems. Also, better error correction codes, which are more efficient than the present BCH concatenated codes are envisioned to be available in the nearest future.

J. Improvement in Optical Amplification Technology

Erbium Doped Fiber Amplifier (EDFA) is one of the critical technologies used in optical fiber communication systems. In the future, better technologies to enhance EDFA performance will be developed. In order to increase the gain bandwidth of EDFA, better gain equalization technology for high accuracy optical amplification will be developed. Also, in order to achieve a higher output power, and a lower noise figure, high power pumping lasers that possess excellent optical amplification characteristics with outputs of more than +20dBm, and very low noise figure are envisioned to exist in the nearest future.

K. Advancement in Network Configuration of Optical Submarine Systems
In order to improve the flexibility of network configuration in optical submarine communication systems, it is expected that the development of a technology for configuring the mesh network will be a step in the right direction. As shown in figure 5, while a ring network joins stations along a single ring, a mesh network connects stations directly. Presently, most large scale optical submarine systems adopt the ring configuration. By adopting the optical add/drop multiplexing technology that branches signals in the wavelength domain, it is possible to realize mesh network configuration that directly inter-connects the stations. Research is ongoing, and in the future such network configuration will be common.

Fig. 5. Optical Network Configurations

**L. Improvement in WDM Technology**

Research is ongoing on how to extend the wavelength range over which wave division multiplexing systems can operate. Presently, the wavelength window (C band) ranges from 1.53-1.57µm. Dry fiber which has a low loss window promises an extension of the range to 1.30 – 1.65 µm. Also, developments in optical filtering technology for wave division multiplexing are envisioned in the future.

**M. Improvements in Glass Fiber Design and Component Miniaturization**

Presently, various impurities are added or removed from the glass fiber to change its light transmitting characteristics. The result is that the speed with which light passes
along a glass fiber can be controlled, thus allowing for the production of customized glass fibers to meet the specific traffic engineering requirement of a given route. This trend is anticipated to continue in the future, in order to produce more reliable and effective glass fibers. Also, the miniaturization of optical fiber communication components is another trend that is most likely to continue in the future.

VI. APPLICATION OF FIBER OPTICS

- Measurement of physical possessions such as pressure, dislodgment, fever, stress, acceleration and speed inside framework of some mass.
- Watching of the real-time health of the structures in real life.
- Buildings and Bridges: watching of Concrete during setting, long-term deformation (creep and shrinkage) monitoring, crack monitoring, spatial displacement measurement, neutral axis

VII. CONCLUSION

The fiber optics communications industry is an ever evolving one, the growth experienced by the industry has been enormous this past decade. There is still much work to be done to support the need for faster data rates, advanced switching techniques and more intelligent network architectures that can automatically change dynamically in response to traffic patterns and at the same time be cost efficient. The trend is expected to continue in the future as breakthroughs already attained in the laboratory will be extended to practical deployment thereby leading to a new generation in fiber optics communications.

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Analyses of Optical absorption coefficient, Thermal, SEM, TEM and Nonlinear optical properties of Thiourea Sodium Sulphate crystal

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Abstract
Single crystal of Thiourea Sodium Sulphate (TSS) was prepared by a slow evaporation technique. The condition of vibrations of molecular groups present in the TSS crystal was revealed by FTIR spectral analysis. The UV–vis–NIR spectral analysis is used to study the optical behaviors like absorption, transmission and optical absorption coefficient properties of the crystal. The thermal properties of TSS crystal were confirmed by Thermal gravimetric & Differential Thermal analysis and morphology is reported by the SEM & TEM analysis. The Fluorescence emission of light was recorded at 453.3nm. Finally the nonlinear optical property of TSS crystal was confirmed by Second Harmonic Generation (SHG).

Keywords: Thiourea Sodium Sulphate (TSS), Optical band gap, NLO, Photon energy, SHG, SEM, PL

1. Introduction
In present days, the requirement of non-linear optical crystals in many areas like: electronic components, microelectronic devices, smart devices etc. High efficiency, optical quality based non-linear optical materials with doping to polarize the organic molecules the property of semi organics helps charge transfer, larger polarization, enhancing charge density and susceptibilities [1-2]. The advances in nonlinear optical materials are resulted in distinguished progress Optical modulation which leads to the diversified applications such as fiber optical Communication system, holography, optoelectronic devices and laser industries [3-4]. On the other hand, thiourea molecule is an interesting inorganic matrix modifier due to its large dipole moments and its capacity to form extensive nature of hydrogen bonds. Further thiourea, which is Centro-symmetric, yields excellent non-centre symmetric materials when it is incorporated into the respective inorganic salt [5]. It is a useful material for high power laser frequency shifting in a wide spectral range, because of its large transparency window, large birefringence, relatively high damage threshold and low temperature dependence of the refractive indices. In combination with aldehydes it can be made into plastics and resins and is used extensively in the paper industry to soften cellulose fibers [6].

2. Materials and Methods
2.1. Crystal synthesis
Thiourea and Sodium Sulphate were mixed in the ratio of 1:1 at room temperature and stirred well to enable formalization of the solution. The cloud seedling crystals are prepared by the slow evaporation technique. Generous adequate seed was chosen and kept suspended in the super-saturated solution and it ensured by recrystallization and in the span of 32 days the required good quality TSS single crystal was obtained.

2.2 Characterization Studies
The TSS single crystal is wreaked to various methods of FTIR spectrum analysis like; UV spectral analysis, TGA/DTA, SEM, TEM, fluorescence, optical band gap, Second Harmonic Generation (SHG).

3. Results and Discussion
3.1 Fourier transforms infrared spectroscopic studies of TSS crystal
The FTIR spectrum was measured within the 400–4000 cm⁻¹ region using a Perkin-Elmer Spectrophotometer by KBr pellet technique. The FTIR spectrum of TSS crystal is shown in Figure 1. The frequencies at 3754 cm⁻¹ is due to OH bending of water molecules in the grown crystal. The strong absorption bands in the region 3368, 3167, 3145, 1717, 1828
cm⁻¹ corresponds to symmetric and asymmetric stretching vibration of NH₂ group of thionurea [7]. The (NH₃⁻) stretching mode is observed at 2694 cm⁻¹ [8]. The (NCN), NH₃⁻ stretching mode is observed at 2114 cm⁻¹. The (NH₃⁻) bending mode is observed at 1589 cm⁻¹. The (CN) asymmetric stretching mode is observed at 1464 cm⁻¹. The (CS) asymmetric stretching mode is observed at 1403 cm⁻¹. The (C≡S) symmetric stretching mode is observed at 1095 cm⁻¹ [9-10]. The (CS) symmetric stretching mode is observed at 735 cm⁻¹. The (NCN) asymmetric bending mode is observed at 594 cm⁻¹ [11-12].

Figure 1: Fourier transforms infrared spectroscopic spectrum of TSS crystal

3.2 Optical studies of TSS crystal

3.2.1 Optical absorption studies

The Figure 2 shows that the spectra were recorded in the wavelength region 190–1100nm using a Lambda 35 Spectrophotometer. In the UV, visible and NIR regions, the materials were found to be transparent. The transparent nature facilitates the application TSS used in Photonics and Optoelectronics. The UV cut-off wavelength of TSS occurs at 343nm. It is well known that an efficient NLO crystal has an optical transparency lower cut-off wavelength between 200nm and 400nm.

Figure 2: Absorption versus wavelength of TSS Crystal
3.2.2 Optical transmission studies

![Graph showing optical transmission studies](image)

**Figure 3** Transmittance versus of wavelength of TSS crystal

The optical transmission spectrum of TSS single crystal is shown in Figure 3. TSS crystals highly transparent in the considerable region of wavelength. The good transmissions of the crystal in entire visible region recommended its suitability for second harmonic generation devices. The UV absorption edge for the grown crystal was observed to be around 345 nm [13-14]. The dependence of optical absorption coefficient on the photon energy helps to studying the band structure and the type of transition of electrons [15]. The optical absorption coefficient (α) was calculated from the Transmittance using the following relation:

\[
\alpha = \frac{2.303 \log (I/I_0)}{d}
\]

Where, \(T\) is the transmittance and \(d\) is the thickness of the crystal. As a direct band gap material, the crystal under study as an absorption coefficient (\(\alpha\)) obeying the following relation for high photon energy \(h\nu\):

\[
\alpha = A \sqrt{\frac{\hbar \nu - E_g}{\hbar \nu}}
\]

Where \(E_g\) is optical band gap of the crystal and \(A\) is a constant.

![Graph showing optical absorption coefficient](image)

**Figure 4** Optical absorption coefficient versus wavelength of TSS crystal
The optical absorption coefficient versus wavelength of TSS crystal is shown in Figure 4. The Figure 4 shows that the wavelength increases optical absorption coefficient is decreases for straight line. The optical absorption coefficient is very useful to the important significance of nonlinear applications.

![Optical absorption coefficient versus photon energy](image)

**Figure 5** Optical absorption coefficient versus photon energy (eV) of TSS crystal

The optical absorption coefficient versus photon energy of TSS crystal is shown in Figure 5. The Figure 5 shows that the photon energy increases optical absorption coefficient is decreases for a curve. This region is supported to nonlinear applications.

![Optical absorption coefficient](image)

**Figure 6** \((ahv)^2\) versus photon energy (eV) of TSS crystals

The plot of variation of \((ahv)^2\) versus photon energy (eV) is shown in Figure 6. \(E_g\) was evaluated by the extrapolation of the linear Part [16]. The bandgap is found to 3.623eV. As a consequence of wide band gap, the grown crystal has large transmittance in the visible region [17].
3.3 Second Harmonic Generation studies of TSS crystal

The second harmonic generation efficiency was determined by using Kurtz-Perry powder technique [18], using an Nd-YAG, 10ns laser with a pulse repetition rate of 10Hz working at 1064nm. The sample was ground into fine powder and tightly packed in a micro-capillary tube. It was mounted in the path of the laser of 9.8-me pulse energy obtained by splitting the original laser beam. The output light was sent through a monochromator transmitting only the second harmonic (green) light at 532nm[19-20].

3.4 TGA & DTA Studies of TSS crystal

The thermal behavior of single TSS crystal is shown in the Figure 7 was studied in the temperature range from 100°C to using 700°C NETZSCH STA 409C-CD system. Thermal studies are used to understand the thermal stability, decomposition, exothermic and endothermic transitions of a solid sample. Thermo Gravimetric (TG) and Differential Thermal Analysis (DTA) were carried out by using the TG/DTA analyzer (Perkin Elmer make) at a heating rate of 20°C/min.

Nitrogen atmosphere TG/DTA thermal curves of TSS crystal are shown in Figure 7. The first weight loss occurs at 120°C and hence the sample is stable up to this temperature. The first endothermic peak was observed at 320°C the first endothermic peak at 140°C is due to the removal of water molecules present in sample. The endothermic peak at 340°C is due to the disintegration of the sample and there is a huge weight loss is noticed at this temperature. Further weight loss in the temperature range 350-450°C is corresponding to the liberation of gaseous molecules from the sample. The total weight loss occurs at 330°C [21-22].

![Figure 7 TGA & DTA Studies of TSS crystal](image)

3.5 SEM analysis of TSS crystal

SEM images Figure 8(a-d) recorded for Four different magnifications X778, X22.25, 3.55KX and 3.94KX, revealed the morphology and size distribution of Thiourea Sodium Sulphate samples [23]. It is obvious that the size and morphology of crystals are different. The detailed examination of SEM micrograph from a selected region of Thiourea
Sodium Sulphate indicates that these crystals are uneven. The size distribution and size of the particles are not in order. The grain size varies from 2µm to 20µm.

![SEM images of TSS crystal](image1)

![SEM images of TSS crystal](image2)

Figure 8 a, b, c, d, SEM images of TSS crystal

3.6 TEM Analysis of TSS Crystal

The TEM images were recorded using the instrument TECNAI with temperature 20KV at SAIF, AIIMS – New Delhi. The physical and chemical properties of non linear crystal materials rely on their crystal and surface structures. Transmission Electron Microscopy (TEM) is a powerful and unique technique for structure characterization. The most important application of TEM is the atomic-resolution real-space imaging of non linear crystals. This article introduces the fundamentals of TEM and its applications in structural determination of shape-controlled crystals and their assemblies. By forming a different size electron probe, TEM is unique in identifying and quantifying the chemical and electronic structure of individual crystals. TEM is demonstrated for characterizing and measuring the thermodynamic, electric, and mechanical properties of individual crystals from which the structure-property relationship can be registered with a specific crystal structure.
3.6.1 Image Formation

Initially illustrate the image formation process in a TEM. For, TEM is simplified into a single lens microscope, as given in Figure 9(a-d) in which only a single objective lens is considered for imaging and. This is because the resolution of the TEM is mainly determined by the objective lens. The entrance surface of a thin foil specimen is illuminated by a parallel or nearly parallel electron beam. The electron-specimen interaction results in phase and amplitude changes in the electron wave that are evaluated by quantum mechanical diffraction theory [24].

Figure 9(a),(b),(c),(d) TEM images of TSS crystal
3.7 Fluorescence Analysis of TSS crystal

![Fluorescence Spectrum](image-url)

**Figure 10** Fluorescence spectrum of TSS crystal

The emission spectrum is shown in Figure 10. The TSS crystal shows a strong green photoluminescence emission at 453.38 nm indicating that the TSS crystal has potential optical quality needed for the material to be NLO active. Photoluminescence (PL) is the process of emission of light when photons are excited from ground state. The photoluminescence spectrum of TSS was recorded using Cary eclipse photoluminescence spectroscopy with an excitation wavelength of 453.38 nm [25].

4 CONCLUSIONS

Optical single crystals of TSS have been grown successfully by the slow evaporation technique. The presences of functional groups are confirmed by FTIR spectral analysis. The optical absorption studies show that the crystal possesses very low absorption in the entire visible and NIR region. The optical transmittance of the crystal confirms the transparency of the crystal optical absorption coefficient obtained, by tailoring and tuning the optical band gap of the materials. The Thermal analysis of crystal was studied by TG/DTA analysis is calculated and reported. The photoluminescence spectrum of the crystal was noted. The SEM and TEM image analysis was done. Finally, the second harmonic generation for the crystals proposed that the TSS crystals are advisable for Fabrication of nano-materials, optoelectronic, electroscopic and Photonic devices.

References

SELF-DETERMINATION HAVE AN IMPACT ON ACADEMIC ACHIEVEMENT – A STUDY

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Abstract—Educational Data Mining is one of the budding research areas in data mining[1]. The researches in educational data mining focus on improving the quality and profit of educational system by providing insights to understand students’ learning process, their overall involvement in the process and comfort level in the learning environment. Students are core stakeholder of academics, and so the motto of education revolves around the students. The objective of the education is to improve the learners’ knowledge, skills and attitudes under expert surveillance in the academic environment. According to bloom taxonomy, a person undergoing learning improves his/her knowledge and mental abilities (i.e. Cognitive), skillset(i.e. Psycemotor) as well as his/her emotions(i.e.Affective)[2]. Emotions are subjective state of mind associated with thoughts, feelings, behavioural responses, and a level of pleasure or displeasure[5]. Emotions are categorized into positive and negative emotions. Self-determination is the ability to be focused and motivated to achieve one’s ambition. Self – determination is related to the positive emotions of motivation. This paper is to investigate the influence of self-determination in students' academic performance in the learning environment using supervised and unsupervised learning algorithms. Self-determination and students' academic performance is evaluated by self-determination scale and criterion reference model. Multilayer perceptron classification algorithm and Expectation Maximization clustering algorithm are used to group the students based on their self-determination scale and academic performance. The relation between self-determination and academic performance is determined using predictive and descriptive modelling. The research shows the existence of a positive correlation between self-determination and performance. And so this research allows the instructors to understand the students based on their emotions and render their help to enhance the student's academic proficiency.

Keywords: Education, Data mining, Bloom’s Taxonomy, Positive Emotions, Academic Performance, Self-Determination.

I. INTRODUCTION

Educational Data mining is one of the emerging research areas of data mining. Using supervised and unsupervised techniques, it discovers insights by exploring different anomalous data values in a learning environment. These techniques help to establish a better understanding of students during their learning process. Self-determination scale has been used to discover the students' self-determination level. Criterion Reference
Model[7] is used to assemble the students' based on their performance in academics. The continuous assessment marks obtained in the theory and programming is considered as performance. This research focuses on bloom's taxonomy and educational objectives, with which it studies the effect of self-determination on academic performance in the learning environment. Expectation-Maximization clustering technique is employed for characterizing the student according to their self-determination level into classes of similar students. Similarly, the student performances are categorized as high, low and average. The Multi-Layer Perceptron is applied to classify the student's subcategory using the dataset. This approach results in useful learning through mining and determines exciting patterns of the specific category. Student patterns are discovered using Experimental unit variables in the data set. The subcategories of the self-determination and performance are determined using the observational unit variable. This paper researches on the relation between self-determination level of the students and their performance by applying supervised and unsupervised learning process. Apriori rule mining technique has been adopted to infer rules based on the relationship between self-determination and performance.

II. RELATED WORK

Bloom’s Taxonomy:
In 1956, Bloom's Taxonomy [3] was formulated by benjamin bloom and his co-workers Engelhart, Furst, & Krathwohl based on the educational objectives. It is one of the most appreciated learning theories in the field of education. Bloom's Taxonomy includes three learning domains:

1. Cognitive domain - focuses on intellectual skills such as critical thinking, problem-solving, and creating a knowledge base.
2. Affective domain - focuses on the attitudes, emotions, values, interests, and appreciation of learners.
3. Psychomotor domain - encompasses the ability of learners to finish tasks and perform movement and skills physically.

It states that a student grows cognitively, affectively and in skillset parallelly during his learning process.

Self Determination Scale:

The Self-Determination Scale (SDS) [4] was composed to evaluate personal differences based on their self-determined way. It is devised on considering individual personality that reflects (1) being more aware of their feelings and their sense of self, and (2) feeling a sense of choice concerning their behaviour. The SDS is a short, 10-item scale, with two 5-item subscales. The first subscale is the consciousness of self, and the second is the perceived choice in one's actions. The subscales can either be used separately, or they can be combined into an overall SDS score.
Criterion –Reference Model:

The criterion reference model is a model to evaluate (and grade) the students’ academic performance concerning the set of pre-specified qualities or standards, without reference to the achievement of others. The pre-specified qualities or standards are what students have to do during evaluation to demonstrate that they have achieved the goal of the course. The results are expressed in terms of relations that match the students' performance with the given criteria. The result is assigned based on the standard that the student has achieved on the criteria.

Expectation-Maximization clustering algorithm:
The Expectation-Maximization algorithm[8] is an iterative refinement algorithm that can be used to find the parameter estimation. It assigns an object to the cluster that is similar to the cluster mean. Instead of assigning each object to a dedicated cluster, EM assigns each object to a cluster according to a weight representing the probability of membership. There are no restricted boundaries between the clusters. And thus, with the weighted measures, new means are calculated.

Multilayer Perceptron:
Multilayer perceptron(MLP)[9] is one of the classification algorithms. It is a network of simple neurons called perceptrons. The perceptron acts as a linear classifier. Multilayer perceptron has more than one perceptron. It has an input layer, an output layer which allows to make decisions or predictions on input, and certain number of hidden layers are present in between the two layers. Hidden layer is the actual computational engine of the MLP. MLPs with one hidden layer can approximate any continuous function. The perceptron computes a single output from multiple real-valued inputs by forming a linear combination according to its input weights and then possibly putting the production through some nonlinear activation function.

Apriori Algorithm:
Apriori algorithm is an association rule mining algorithm. It finds frequent itemsets in a dataset to derive association rule. It is named as Apriori since the algorithm makes use of prior knowledge of the properties of frequent itemsets. Apriori Property is used to improve the efficiency in frequent itemsets generation level wise. Apriori Property is that all non-empty subset of a frequent itemset must be frequent. The fundamental concept of the Apriori algorithm is its anti-monotonicity of support measure. Apriori assumes minimum support count and minimum confidence.

Step-1: K=1
i. Generate the candidate set C1, by creating a table containing support count of each item present in the dataset.
ii. Compare candidate set item’s support count with given minimum support count. Remove those items whose support count is less than the minimum support. Consider the itemset as L1.

Step-2: K=2
• Create a table by joining Lk-1 and Lk-1 is that it should have (K-2) elements in common and it is called as candidate set C2.
• Check all subsets of an itemset are frequent or not and if not frequent remove that itemset.
• Now find support count of these itemsets by searching in the dataset.
• (ii) compare candidate (C2) support count with minimum support count (here min_support=2 if support_count of candidate set item is less than min_support then remove those items) this gives us itemset L2.

Thus, the above step is repeated until all the frequent item-sets are discovered. Now strong association rules are generated by calculating the confidence of each rule.

III. System Model:

Phase 1: Pretesting of the Questionnaire
In phase 1, the self-determination scale questionnaire is pretested. Then analyze test for self-determination was conducted to postgraduates students of computer applications. Based on the response for the questionnaire, the student participants are categorized as students with high self-determination level and low self-determination level[10]. The continuous assessment marks were collected from the students and treated as a performance factor. Based on the Criterion Reference Model they are categorized under High (Marks >=80), Average(Marks <=79 and Marks>= 50) and Low(Marks<50). The result of the analyze tests of Self Determination Scale and Performance of the students constitutes the student data set.

Phase 2: Expectation-Maximization Clustering
Expectation-Maximization algorithm[8] is employed to discover the clusters among the students with respect to self-determination level and performance. Each cluster groups are designated as High and Low according to self-determination level. And the same is adopted to identify the clusters(high, average and low) based on performance.

Phase 3: Multi-Layer Perceptron Classification:
The multilayer perceptron classification algorithm is applied to classify the student data set under self-determination as high and low. Similarly, the students are sorted based on performance as high, average and low.

Phase 4: Apriori Algorithm
The association between the self-determination level and the performance of the student participants are discovered using the Apriori algorithm as well as best association rules are also mined.
IV. Experimental Study:

Correlation between the self-determination level and Performance of the 600 student participants have been analysed.

<table>
<thead>
<tr>
<th>C0</th>
<th>C1</th>
<th>SDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>188</td>
<td>0</td>
<td>Low</td>
</tr>
<tr>
<td>216</td>
<td>198</td>
<td>High</td>
</tr>
</tbody>
</table>

**Table 1: Cluster Assignments and Self Determination Level (Expectation-Maximization Clustering Algorithm)**

Table 1 represents the various clusters and corresponding self-determination level. It exhibits that students with low self-determination level are grouped in cluster 0. Students with high self-determination are grouped in cluster 1.

<table>
<thead>
<tr>
<th>C0</th>
<th>C1</th>
<th>C2</th>
<th>Academic Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>188</td>
<td>0</td>
<td>Low</td>
</tr>
<tr>
<td>216</td>
<td>0</td>
<td>0</td>
<td>High</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>198</td>
<td>Average</td>
</tr>
</tbody>
</table>

**Table 2: Cluster Assignments and Academic performance Level (Expectation-Maximization Clustering Algorithm)**

Table 2 depicts the different clusters and corresponding academic performance level. It presents that students with low academic performance level as cluster 0, average academic performance level as cluster 1 and high academic performance level as cluster 2, respectively.

<table>
<thead>
<tr>
<th>Cross Validation</th>
<th>Predicted</th>
<th>Self Determination Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>A</td>
<td>188</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>412</td>
</tr>
</tbody>
</table>
Table 3 Confusion matrix for Self-Determination level (Multilayer perceptron classification)

Table 3 shows the confusion matrix for Self-Determination level obtained by Multi-Layer perceptron classification technique. It clearly shows two classes of Self-Determination that is High and Low.

<table>
<thead>
<tr>
<th>Cross Validation</th>
<th>Predicted Academic Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual A</td>
<td>188 0 0 Low</td>
</tr>
<tr>
<td>Actual B</td>
<td>0 216 0 High</td>
</tr>
<tr>
<td>Actual C</td>
<td>0 0 196 Average</td>
</tr>
</tbody>
</table>

Table 4 Confusion matrix for Academic Performance level (Multilayer perceptron classification)

Table 4 displays the confusion matrix for the academic performance level obtained by Multi-Layer perceptron classification technique. It clearly exhibits three classes High, Average and Low of academic performance.

Best Rules Found:
1. PERFORMANCE=HIGH 216==》 DETERMINATION=HIGH 108 conf:(1)
2. PERFORMANCE=AVERAGE 196==》 DETERMINATION=HIGH 98 conf:(1)
3. PERFORMANCE=LOW 188==》 DETERMINATION=LOW 94 conf:(1)

Table 5: Association Rules Mined (Apriori Algorithm)

Table 5 reveals the positive correlation between self-determination level and academic performance by employing apriori algorithm. It also depicts the best association rules mined from the data set. It shows that the performance of the student is high/average for whom self-determination level is high, and the performance is low for whom self-determination level is low.
V. Conclusion:

Model-based clustering and Multilayer perceptron classification algorithms are applied to discover the relationship between self-determination level and academic performance. The clustering algorithm group the student objects as low and high, and models each cluster. It categorizes the students based on their Self-Determination Level. Similarly, the performance level clusters are observed as high, average and low. The classifier unveils that, each student's self-determination level is associated with performance.

From the association rules, it is observed that Students whose self-determination level is high are Very good at their academics. This research reveals the academic proficiency of students having high self-determination and suggests the recommendation to concentrate on students having low self-determination for Psychological transformation. The Correlation analysis discloses the strong association between self-determination and performance.

References:


DIVERSITY MANAGEMENT – AN OVERVIEW

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Abstract
Trends in the increasing globalization of the world and demand more interaction between people of very different cultures, beliefs and origins than in the past. Today, people no longer live and work in an isolated market. The reality is that they are now part of a global (or commonly known as flattened) economy with competition from almost every corner of the world. For this reason, companies must be open to change and accept the concept of diversity to be more creative. In everyday conversation, the word "diversity" has the meaning of differences or variety. However, in the business world and in the business manual, diversity often refers to the many differences between people in the workplace and the market today that were unknown to people in the past. In this article we are discussed about the various advantages and disadvantages of diversity management.

Key words: Diversity, Globalization, Differences, Management, Workforce

Introduction
Diversity management is often seen as recognizing, understanding, accepting, valuing, and celebrating differences between people in terms of age, class, ethnicity, gender, ability, physical and mental state, race, sexual orientation, spiritual practice, and attendance for better performance in the workplace. The term diversity management refers to the implementation of strategies or policies to bring together a network of diverse people in a dynamic workforce.

Diversity management in HRM
Diversity management aims to provide employees with backgrounds, needs, and skill sets that can vary widely with the opportunity to engage with the company and its co-workers in a way that produces an optimal work environment and best results possible commercials for the company. Company hires employees of diverse backgrounds and experience. To reap the benefits of diversity in the workplace, the employee and manager must understand the challenges and know how to effectively tackle them. For example, let's say you had a company and your employees were going to paint pictures. If everyone in your company painted with the color gray, they would be boring paintings that looked similar. However, if some painted with gray and others painted with red, blue, yellow and green, the image would be more interesting and different. That diversity allows your company not only to look at things in one way or from one point of view, but from many points of view.

Managing a diverse workforce is not difficult. It only takes a certain level of sensitivity and awareness to ensure that employees work well together. We have to
remember that we are talking about people from different countries and of different ages and genders. For a manager to manage this workforce in a contemporary business, he must understand some basics to ensure success:

- They need to create a workplace where talent from different backgrounds can flourish and grow.
- Language and communication barriers must be of a high level of importance to ensure that everyone can communicate.
- They must manage the different points of view of each person within the workforce in relation to gender, nationality and age.

Objective of the study

- To know the advantages of diversity management.
- To know the disadvantages of diversity management.
- To know the Steps taken to overcome the diversity problems.
- To analyse the comparison of previous experiences of the diversity management.

Review of literature

1. Mr. David A. Thomas (2004) in his article entitled “Diversity as Strategy” revealed about the IBM expanded minority markets dramatically by promoting diversity in its own workforce. The result: a virtuous circle of growth and progress.
2. Mr. Abey Francis (October 26, 2017) MBA knowledge base, his research focus on the case study of Jack Welch, “Leadership that creates Innovation” revealed about the General Electric company ready to face world competition by managing the diversity throughout the world. Through an analysis of the techniques employed by Welch, one can gain a better understanding of how to motivate outstanding performance by any organization.
3. Azeminamasovic (2018) in his article entitled “socio-cultural factors and their impact on the performance of multinational companies” this paper deals with the concepts of socio-cultural factors and performance of multinational companies. Multinational companies operate in different host countries around the world and have to deal with wide variety of economic, political, legal, socio-cultural and technological factors. This paper is to describe the influence of certain socio-cultural factors on the performance of foreign subsidiaries.

Advantages of Diversity Management

Society and culture have an impact on every aspect of the overseas business of multinational companies. The socio-cultural environment is significant for multinational companies. The key socio-cultural factors that have a major impact on the operation of the multinational companies are 1. culture, 2. Language, 3. Religion, 4. Level of education, 5. Customer preferences, and 6. The attitude of the society towards foreign goods and service. The influence of culture on multinational companies is real and widespread. Multinational companies are affected by more than one culture at a time. Through their subsidiaries located in various countries, they are exposed to different national cultures.
Culture in particular country directly or indirectly, reflects on the achieved performance of multinational companies. Advantages of diversity management are as follows.

- Effective work practices or procedures. Experience, talent, experience, the employees worked in the organization. It helps put the right person in the right position.
- Improve the strength of customer intelligence. We employ a diverse workforce to collect more relevant and efficient market data.
- Capable of producing a more satisfied workforce and, therefore, of generating a more productive workforce.
- Management Effective diversity management helps reduce labor disputes.
- A diverse workforce can enhance creativity and innovation.
- Diversity is a key element of effective people management.
- Improve workplace productivity to an optimal level.
- Guarantee the maximum use of existing resources and capacities.

Disadvantages of Diversity Management

- Main drawback related to the implementation of the short-term diversity management program.
- One of the main problems is communication. Several diverse group employees work together. The language problem was raised in several groups.
- Conflicts between colleagues are possible due to different mentalities.
- A poor program reveals the negative impact on a diverse group.
- Prejudice and discrimination affect employee morale. Discrimination causes great harm and illegal activities.
- It is very expensive to control the diversified group. A high salary allocation for employee experience can cause financial problems for the organization.

Case study

Most of the companies apply the diversity management and succeed their journey. Specifically, cognition and affected of the previous experience in the diversity management. Some of the examples are given below:

1. General Electric (GE)

When Jack Welch became CEO of General Electric in 1981, he was only the 11th CEO the company had seen in its 120 years of existence. Although GE was a $13 billion a year company, it began showing signs of necessary change as it had reached the stage between maturity and decline. After 20 years at the helm, Jack Welch had turned General Electric into one of the world’s most successful companies. He guided the once-struggling company to what was then the biggest corporation in the entire world as well as the most profitable. Through the use of goal setting, empowerment, and communication Welch transformed the gigantic and complacent company into an energized multinational organization ready to face world competition. Welch introduced GE to Six Sigma, a defect reduction program. Six Sigma is a process, which consist of the rigorous application of statistical tool to improve profits, reduce costs.
and improve speed. This program relies on teamwork to propel quality to the highest level.

2. **International Business Machine (IBM)**

IBM’s diversity task forces asked that the company allow employees who were not at the executive level to get more involved in the effort. The company did, and diversity council and employee network groups were born. The diversity councils, group of employees across diverse constituencies, were created specifically to address local or unique diversity issues. Through these 72 councils, IBM seeks to ensure that its workforce represents an environment that visibly encourages and values the contributions and differences of employees from various backgrounds. 30 members of IBM’s Worldwide Executive Council are involved in guiding specific corporate-wide diversity initiatives. They are held accountable for recruitment, retention and advancement of all talent and, most important, linking IBM’s diversity initiatives to the global marketplace, which is in turn the main reason that IBM has been able to stay on top of the business landscape for decades. The objectives include heightening employee awareness, increasing management sensitivity, and making the most out of a diverse workforce.

3. **Sodexo**

Diversity and inclusion; although gender, generation and sexual orientation are all part of the diversity hiring strategy at Sodexo, they state that gender balance is our business, and their mission is to make it everyone else’s business too. 40% of all staff members in Sodexo are women—that’s up from just 17% in 2009. 43% of the members on the board of directors are female and the company runs 14 Gender Balance Networks worldwide. What they have found is that when there is an optimal gender balance within an organisation, employee engagement increases by 4% points, gross profit increases by 23% and brand image strengthens by 5% points. They also show no sign of stopping on their mission to optimise gender balance, vowing that by 2025, 40% of their workforce will be made up of women.

4. **Reebok**

Reebok, the well-known sport company has also been benefiting from a diversity management program, in the year of 1980’s a group of women at Reebok complaint, the fact that they could not find a good aerobics shoe. Listening to that complaint, Reebok began marketing aerobics shoes. The outcome is outstanding—within just a period of two years, the company went from a $12 million a year shoe company to a $3 billion powerhouse. Since the incident, the company started to be aware of the importance of diversity.

**Do and Don’t in Diversity Management**

Diversity is a possible source of competitive advantage and superior performance for companies, but implementing and managing diversity is not easy. Apparently, mismanagement of diversity or the inability of the leader or manager to define and execute an effective diversity management program will cause problems for the organization with a diverse workforce. In fact, for inexperienced managers, diversity is
more of a curse than a blessing. If the presence of diversity is well managed, it can create synergy and improve the performance of the organization. Diversity is believed to be a powerful strategy because managers can build on the strengths of certain people on the team while making the weaknesses of others irrelevant. One person’s strengths can offset another person's strengths, which is essential for a high-performing team.

The first thing a manager in diversity management must do is ensure the effectiveness of the diversity management programs, managers must constantly communicate with employees, managers, customers, shareholders and other parties. Stakeholders’ at all stages of the program. Keeping people informed is essential as their support is necessary for the successful implementation of a diversity management program. Execution must involve everyone; As such, the program is not a problem solely for staff service or a responsibility of senior management. In addition, it is also extremely important to apply a change management process to implement the program. The leader driving change must be aware that a long-term perspective is required to implement a diversity management program (that is, that change involves attitudes and does not happen overnight, and leaders must expect the program to last for years rather than a few weeks or months), leaders must also have the correct expectations that resources are needed for the program. Leaders must be prepared to invest money, time, and resources to successfully complete the diversity management program. Managers should not confuse equal opportunity with managing diversity. The equal opportunity approach can be part of any diversity initiative, but a successful diversity management program should go far beyond traditional equality issues. Managers should not design diversity goals and policies for themselves (minorities), but should think of us (everyone involved in the organization).

Steps for Successful Managing Diversity

1. Good communication
   All employees must understand the company's policies, procedural rules and regulations and everything related to the business. In practice, there are cultural and linguistic problems. This is overcome by translating the information in a sophisticated way. Use common symbols, pictures to convey information.

2. Analyse employees individually
   To avoid stereotypes, discrimination between employees. The success and failures of each employee are analysed individually. Encourage employees working in the group and discuss work-related factors, not personal ones.

3. Encourage employees to work in a diverse group.
   In various groups, experience and talented people work together. It emphasizes the transfer of new ideas and innovative thinking. A diverse work team allows employees to get to know each other individually. Various teams also extend the experiences and perspectives of all team workers and help them recognize the strength of their talents and perspectives combined.

4. Base decisions on objective criteria.
   Expect all employees from all walks of life to meet the required standards and perform to the best of their ability. Do not define different criteria for different groups.
Do not apologize or allow employees to make excuses for deficiencies. Base all employment actions, including discipline, on specific performance-related criteria. Always focus on work-related matters, not personal matters when dealing with employees.

5. Be open-minded

Acknowledge and encourage employees to recognize that their own experience, background and culture are not the only ones of value to the organization. Set an example of promoting diversity by developing relationships with colleagues whose backgrounds differ from yours. Find ways to integrate diverse perspectives and talents into efforts to achieve the organization’s goals.

Conclusion

If the presence of diversity is well-managed, it can create synergy and improve organizational performance. It is believed that diversity is a powerful strategy as managers can leverage on the strengths of some people in the team while making the weaknesses of others, while his weaknesses are covered by others ‘ strengths and this is essential for a high performing team. Consistent with such a view, this section will outline some do and don’t for practitioners to follow. It may serve as a general guideline for managers to refer to in applying the concept of diversity management to daily management tasks.

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A STUDY ON USAGE OF SOCIAL NETWORK SITES AS SOURCE OF TALENT ACQUISITION

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Abstract:  
The purpose of this study is to present an initial exploratory investigation on e-recruiting and the role or relevance of social network sites (hereafter SNSs) during the process. Particularly, the aim is to identify if companies use social media during their recruitment processes to attract and screen application. Beyond the information generated through the literature review, primary data were collected among recruiters in the city of Bengaluru.  
The findings of this research endeavour indicate that using social media in recruitment has a lot of benefits but also pitfalls of which recruiters should be aware. Furthermore, it seems that the contemporary practice of employee screening through social media can highly affect the hiring decision. On the contrary, a well-designed system and strategic utilization of available information about potential candidates may significantly assist the recruitment of employees with the most suitable skills and competencies.  
Keywords: Employee screening, Employee Selection, Social networking, Recruitment, Relevant skill

Introduction:  
Talent management has played a decisive role in the success of any organisation. Being a tech-intellect based business world today, finding the right talent hiring them and retaining them has been a huge challenge. Talent acquisition with the right skill sets to fill positions is a herculean task for HR recruiters. Moreover, the process of screening resumes and shortlisting them turns out to be a waste of time when interviews are done. To avoid this pitfall, many organisations are using social network sites to gather information about the job applicant.  
The millennial workforce which out in the market is highly tech savvy and communicative. Their presence is dominant in all the social media sites like Facebook, Twitter, LinkedIn. Recruiters can post the available jobs on the websites and go through the profiles and find a good fit. HR teams also form groups of former employees, professionals’ acquaintances who can act as secondary connections of the job seekers. Once a network is established, they can simply post the job openings in the status box – this will ensure that all the groups will be notified about these announcements. They can personalise their target viewers and groups as well. Social media hiring not only enables a business to access a vast pool of potential talent, but it also helps HR recruiters get to know a candidate before schedule an interview. HR professionals would be able to gauge the candidates working style, interests, character traits, work ethics etc by going through their profile well in advance before scheduling the interview.
Review of Literature:

- Helena Pleinert, Bernhard Kolb (2015) in their study “Sourcing in Recruiting Strategy and ROI with a focus on knowledge workers” speaks about the two main recommendations concerning strategy and ROI optimization in sourcing in recruiting, with a focus on knowledge workers, presented in this paper are Active sourcing through cultivating talent communities and direct search can be likened to the neolithic revolution: farming instead of hunting – more efficient, more effective and more sustainable.

- Dr. A Kumudha, Saranya Priyadarshini (2016) in their study “A Conceptual study on challenges and Innovations in Talent Acquisition Process” speaks about how Talent Acquisition has emerged with lot many innovative changes and world is getting ready for the Talent Hunt with all its new innovative strategies in Global perspective. But in developing country like India, there is a huge potential seen with us to become the global hub for talent and our talents are being easily attracted globally for various reasons. But it becomes necessary for us to acquire the potential talent and retain them with us so that we can grow even faster than the present growth rate. Social media is one of the sources which is accepted for reference checks of applicants.

OBJECTIVE OF THE STUDY

1. To understand the relevance of skill/competencies of candidates sourced through social network sites.
2. To study the extent of social media usage by recruiters for sourcing talent.
3. To understand the satisfaction level of recruiters in sourcing through social media

RESEARCH METHODOLOGY:

This study is Descriptive in nature and methods of Data collection were in two forms. They are:

1. Primary data
2. Secondary data

Primary data : Primary data is of first hand data in nature and it does not exist anywhere. It has to be collected as for the problem chosen. Survey methods and questionnaires are some of the methods used to collect the primary data from the respondents. The data thus collected from the primary sources of information are arranged systematically and sequentially to form simple tables.

Secondary data Secondary data is that type of data, which already write and had gone through some statistical analysis. Secondary data has been collected from various books, internet downloads, business articles, journals, business periodicals etc.
Sampling:

Design: purposive sampling as recruiters who are into initial screening of candidates were selected to identify if they used social media as well.

Size: 158 recruiters in recruiting agencies whose job profile is to select, source, screen and shortlist the candidates were identified to give response. In most of the HR consultancy, the recruiters were given autonomy to design their work and not restricted to a specified process of recruitment depending on the client requirements.

Scope of the study

This study is done to identify the effectiveness of social media in sourcing talent used in various organizations. It identifies various ways to increase the effectiveness of sourcing which in turn helps for entire recruitment cycle. This study also authenticates the use of social media in identifying and selecting employees for an organisation.

Social media usage among millennials:

Millennials are the ones born between 1985 to 1999. They are the majority workforce in today’s organisation. They have unique qualities and they have redefined life and products in their own way.

Some of the nature of these millennials are:-

- They are loyal to brand
- They are smart and calculated
- Millennials grew up in the digital era. They utilize technology for everything—grocery shopping, GPS, remote controls, communicating, working.

Their social media habits are also very unique. They divide into a lot of platform, some platforms that should be high on your consideration list.

Facebook:- 87% of millennials use Facebook at least once a week. This number is much higher than other generations—for example, only about 36% of Gen Z use Facebook once a week. Facebook is has a heavy usage of this generation till now. It has convivence of visuals, posts and texts.

YouTube: 86% of millennials use YouTube at least once a week. This number is huge, especially when considering that video making and sharing has been very common among millennials.

Instagram: 71% of millennials use Instagram at least once a week. Many younger generations love platforms like Instagram for its lack of content and text. Two hundred million users actively visit business profiles at least once a day.

Snap Chat, Twitter, Pinterest: 52% of millennials use Snapchat at least once a week. Twitter is generally used for marketing purpose.
**Blogging:** Blogging is used as an entrepreneurial venture. Blogs provide space and can give youngsters power of freedom to speak and express feelings about happenings around them. It is relatively inexpensive.

**Analysis and Discussion:**

**Table No-1: Gender wise classification:**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>76</td>
<td>49</td>
</tr>
<tr>
<td>Women</td>
<td>82</td>
<td>51</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>158</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 can be interpreted as almost 50% of each gender of the respondents. This finding reveals that gender has no impact on the profession of recruitment.

**Table No 2: Sector working for:**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-Commerce</td>
<td>35</td>
<td>22</td>
</tr>
<tr>
<td>IT</td>
<td>28</td>
<td>17</td>
</tr>
<tr>
<td>Product/ Retail related</td>
<td>31</td>
<td>24</td>
</tr>
<tr>
<td>Hospitality and travel</td>
<td>38</td>
<td>26</td>
</tr>
<tr>
<td>BFSI</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>Logistics</td>
<td>25</td>
<td>16</td>
</tr>
<tr>
<td>Health care/pharma</td>
<td>37</td>
<td>25</td>
</tr>
<tr>
<td>others</td>
<td>56</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>158</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 indicates the sectors in which recruiters are generally engaged in. There are multiple fields that recruiters work in and that is the reason for higher total to be depicted. The common industry the recruiters work are Health care, Hospitality/pharma, Retail.

**Table No-3**

External Source of recruitment generally used by companies (opinion by respondents)

<table>
<thead>
<tr>
<th>Source</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertisement in media</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>Agencies</td>
<td>28</td>
<td>17</td>
</tr>
<tr>
<td>Online recruitment</td>
<td>31</td>
<td>19</td>
</tr>
<tr>
<td>Job portals</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>Company website</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Data banks</td>
<td>32</td>
<td>20</td>
</tr>
<tr>
<td>others</td>
<td>27</td>
<td>17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>158</td>
<td></td>
</tr>
</tbody>
</table>
Table 3 indicates multiple options of source of recruitment used by companies in sourcing talent. Online recruitment, recruitment agencies, and data banks are some of the common sources to tap talent according to recruiters who were contacted.

Table No-4: Usage of social media

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>98</td>
<td>62</td>
</tr>
<tr>
<td>No</td>
<td>60</td>
<td>38</td>
</tr>
<tr>
<td>Total</td>
<td>158</td>
<td></td>
</tr>
</tbody>
</table>

To a question asked if the recruiters use social media for sourcing employees, 38% of them were negative, saying they do not use social network sites but majority of them 62% of them agreed to use SNSs as source of recruitment but majority of them agreed to the fact SNSs were only used for reference checks and less for hunting candidates. Once the candidates are shortlisted before final selection, some references of the candidates are done on SNSs. 54% of respondents were of the opinion they do source from SNS, LinkedIn, blogging, was the most popular SNS that were used to source talent of particular type.

Table No 5: Popular Social media sites used for recruitment:

<table>
<thead>
<tr>
<th>Source</th>
<th>number</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>LinkedIn</td>
<td>87</td>
<td>55</td>
</tr>
<tr>
<td>Facebook</td>
<td>46</td>
<td>29</td>
</tr>
<tr>
<td>Twitter</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>YouTube</td>
<td>27</td>
<td>17</td>
</tr>
<tr>
<td>Blogging</td>
<td>67</td>
<td>42</td>
</tr>
<tr>
<td>Podcast (audio)</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Instagram</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Others</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>158</td>
<td></td>
</tr>
</tbody>
</table>

The above table depicts the common or popular social network sites, these sources are also multiple that is at a given time recruiters tend to use more than one SNSs, the most popular of them being LinkedIn and Blogs. They both being professional website sourcing from them are credible. Most of the respondents were of the opinion that SNSs are used for reference checks rather than sourcing.

Table No 6-Levels to be hired:

<table>
<thead>
<tr>
<th>Level</th>
<th>Number</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive level</td>
<td>38</td>
<td>24</td>
</tr>
<tr>
<td>Mid- level seniors</td>
<td>49</td>
<td>31</td>
</tr>
<tr>
<td>Entry level juniors</td>
<td>71</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td>158</td>
<td></td>
</tr>
</tbody>
</table>
The above table depicts that entry level jobs are sources through SNSs, 45% agree entry level jobs are sourced, and 31% of them feel SNSs are used for mid level jobs also.

Table No 7:- Relevance of competence acquired through social media

<table>
<thead>
<tr>
<th>Degree</th>
<th>number</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrelevant</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Somewhat relevant</td>
<td>26</td>
<td>16</td>
</tr>
<tr>
<td>Just relevant</td>
<td>89</td>
<td>56</td>
</tr>
<tr>
<td>Highly relevant</td>
<td>31</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>158</td>
<td></td>
</tr>
</tbody>
</table>

56% of respondents feel that they get ‘just relevant’ skills/competence through SNSs, 19% of them feel applicants are highly relevant, and 16% of them feel they are ‘somewhat relevant’. SNSs give info about applicant in adequate relevance to the required job.

Table No-8: Candidates showed up for interview:

<table>
<thead>
<tr>
<th>Number</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>49</td>
</tr>
<tr>
<td>No</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>158</td>
</tr>
</tbody>
</table>

Table 7 indicates the response from the applicants sourced through SNSs. 49% of them turned out for interview by cold calling potential candidates after being sourced through various social network sites. This finding indicates that there is 50% chances that job incumbent will take the interview call seriously and attend the same.

Table No-9 : Benefits of sourcing from social media:

<table>
<thead>
<tr>
<th>Benefits</th>
<th>number</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less cost</td>
<td>32</td>
<td>20</td>
</tr>
<tr>
<td>Time saving</td>
<td>62</td>
<td>39</td>
</tr>
<tr>
<td>Relevance is high</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Easy reach/communication</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Easy selection process</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Wider choice of applicants</td>
<td>29</td>
<td>18</td>
</tr>
<tr>
<td>Others (if any)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>158</td>
<td></td>
</tr>
</tbody>
</table>

The above table illustrates the benefits realised through acquiring candidates through SNSs. Majority of then feel multiple benefits. But time saving and wide choice are the common accepted benefits of the respondents.

Table no 10: Time taken to source/map a profile on social media

<table>
<thead>
<tr>
<th>Timings</th>
<th>number</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 6 mins</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>7 to 12 mins</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>13 to 18 mins</td>
<td>69</td>
<td>43</td>
</tr>
<tr>
<td>18 mins</td>
<td>81</td>
<td>51</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>158</td>
<td></td>
</tr>
</tbody>
</table>
Time taken to source or use SNSs of talent acquisition is not short, it takes more than 15 minutes for map or source candidates in the internet.

Table No-11:- Satisfaction towards hiring through Social media

<table>
<thead>
<tr>
<th>Degree</th>
<th>number</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly satisfied</td>
<td>32</td>
<td>20</td>
</tr>
<tr>
<td>Satisfied</td>
<td>73</td>
<td>46</td>
</tr>
<tr>
<td>Average</td>
<td>39</td>
<td>24</td>
</tr>
<tr>
<td>Inefficient</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>158</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 11 shows the satisfaction level of recruiters regarding information available for sourcing through SNSs. 66% of them seemed to be satisfied about the available information on the SNSs for talent acquisition, while 32 % of them feel inadequate and average about the information available.

Chi-square testing:
H0: There is no significant difference in association between levels to be hired and relevance of competency of the applicant
H1: There is significant difference in association between levels to be hired and relevance of competency of the applicant

Table-12 Chi Square test Cross tabulation

<table>
<thead>
<tr>
<th>Level of hiring</th>
<th>Relevance of competency of applicant</th>
<th>IRR</th>
<th>SR</th>
<th>JR</th>
<th>HR</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive level</td>
<td></td>
<td>0</td>
<td>11</td>
<td>16</td>
<td>11</td>
<td>38</td>
</tr>
<tr>
<td>Mid level</td>
<td></td>
<td>5</td>
<td>9</td>
<td>21</td>
<td>14</td>
<td>49</td>
</tr>
<tr>
<td>Entry level</td>
<td></td>
<td>7</td>
<td>9</td>
<td>49</td>
<td>6</td>
<td>71</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>12</td>
<td>29</td>
<td>86</td>
<td>31</td>
<td>158</td>
</tr>
</tbody>
</table>

Table 13: Chi-Square Test:

<table>
<thead>
<tr>
<th>Variable compared</th>
<th>Calculated value(X2)</th>
<th>Critical Value (5% Level)</th>
<th>Critical Value (1% level)</th>
<th>remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of hiring and relevance of competency of applicant</td>
<td>0.0215</td>
<td>P&lt;0.05</td>
<td>P&lt; 0.01</td>
<td>Significant</td>
</tr>
</tbody>
</table>

It should be noted that the observed value of Chi-Square (X2) is 0.021 is less than the critical values both at 5% and 1% level of significance, therefore the null hypothesis is rejected. So, we can conclude that there exists statistically significant association between the level of hiring and the competence relevant for the jobs.

Hypothesis 2-
Ho- There is no significant difference in association between relevant skill acquired and satisfaction of sourcing through SNSs.
H1- There is significant difference in association between relevant skill acquired and satisfaction of sourcing through SNSs.

Table 14: cross tabulation:

<table>
<thead>
<tr>
<th>Relevant skill acquired</th>
<th>Satisfaction of hiring through Social media</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HS</td>
</tr>
<tr>
<td>Irrelevant</td>
<td>2</td>
</tr>
<tr>
<td>Somewhat relevant</td>
<td>5</td>
</tr>
<tr>
<td>Just relevant</td>
<td>17</td>
</tr>
<tr>
<td>Highly relevant</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
</tr>
</tbody>
</table>

Table 15- Chi-square test

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp.Sig (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>25.897a</td>
<td>9</td>
<td>.045</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>25.965</td>
<td>9</td>
<td>.035</td>
</tr>
<tr>
<td>Linear-by-Linear Association</td>
<td>.095</td>
<td>1</td>
<td>.758</td>
</tr>
<tr>
<td>N of Valid cases</td>
<td>158</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It is observed that the test value 0.045 is less than 0.05 at 95% confidence level. Hence, we reject the null hypothesis (H0) and accept the alternative hypothesis (H1). It is inferred that there is significant difference in association between Relevance of skill acquired and satisfaction level of hiring through social networking sites. Higher the relevance of the skill acquired higher will be the satisfaction of the hiring team towards social network sites as a sourcing tool for talent. The social network sites should have relevant information about the right skill sets and competencies acquired by applicants.

Findings and suggestions:
- Gender of the respondents was 49% and 51% respectively of men and women.
- The industry the respondents worked were Healthcare/Hospitality and Retail Industry.
- 62% of respondents were affirmative about using SNSs for recruitment of talent.
- LinkedIn and Blogs were the most popular SNSs sourced by respondents.
- 56% of respondents feel that the skill/competence acquired through SNSs are ‘Just relevant’.
- 39% & 20% of respondents fell time saving and Cost are the major benefits of sourcing through SNSs and most of them agree that they have a wide choice of applicants.
- 66% of the respondents are satisfied with using SNSs for sourcing their talent.
- There is significant association between ‘level of hiring’ and skill/competence relevant to the jobs.
Higher relevance of skill acquired higher will be the satisfaction of the hiring team towards SNSs.

Recommendations:

- It is observed 66% are satisfied with information available in the social network sites, to make a choice of the applicants. To increase the satisfaction level, professional debates, discussions, and threads can be initiated in SNSs to increase the visibility of skills and talents of the users.
- Professional groups in the SNS can be initiated to make it easy for recruiters to identify the applicant.

Conclusion:
Sourcing through social media cuts down on time and resources and allows employers to schedule interviews quickly. Using social media empowers companies to step up their talent acquisition strategy, build great talent networks and hire only the top candidates. Social media are good measures to gauge and take references of the candidates even before interviews are scheduled. There is higher level of satisfaction towards the social media used when the competency of the candidates is relevant to the job they are hired for. People should be aware and cautious about what information they upload on there are social media as they are subject to scrutiny of employers for references of the ideal jobs. It is likely that this practice will increase among the recruiters of using social media as a source of talent identification and acquisition.

Scope of further research:
- This study highlighted on use of only SNSs, the study can be enhanced to larger platforms of the digital economy
- Artificial Intelligence is used to make recruitment and selection more precise and accurate. A study on using this technology is also an emerging area of study.

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A STUDY ON CUSTOMERS PERCEPTION TOWARDS E-GOVERNANCE THROUGH AKSHAYA CENTRES IN THRISSUR DISTRICT WITH SPECIAL REFERENCE TO VALAPAD PANCHAYATH

Anila Balan
Assistant Professor in Commerce, Sree Narayana College, Alathur, Palakkad

ABSTRACT
E-governance is the application of information and communication technology for delivering government services, exchange of information, communication transactions and integration of various sub alone systems between government to citizen (G2C), government to business (G2B), government to government (G2G), government to employees (G2E) as well as back office processes and interactions within the entire government framework. Through E-governance, government services are made available to citizens in a convenient, efficient and transparent manner.

The citizens of a country can choose how they want to interact with government. There are, however, contradictions as to how citizens feel about using e-government services. According to researches there continues to be high expectations of governments in respect of improved delivery of services and of close consultation with citizens. Such expectations are not unique to one country. This indicates a possibility of malfunctioning e-government services making continuous citizen perception evaluation important. The continuous evaluation of the present e-government systems is therefore necessary with the aim of improving these systems and indirectly satisfying citizens and gaining citizen buy-in for improved access to e-government information services. Hence, the present study “perception of customers on the e-governance through akshaya centers” is undertaken to analyze the perception, awareness level and level of satisfaction customers who approach akshaya centers for availing various government services.

Key Words: E-governance, (G2C), (G2B), (G2G), (G2E), e-government services, akshaya centres

INTRODUCTION
The ‘Akshaya’ has been a high profile project of the state government of Kerala, in the southern-most state of India which has been hailed as one that has achieved phenomenally high levels of ‘gender development’ compared to other states of India, in terms of all the standard indicators of education and health. The current research attempts an assessment of the Akshaya Project in the district of Malappuram in Kerala where it was piloted in 2002-2003, in order to see if it has indeed been gender neutral in its impact.

As a citizen of this democracy, everyone is entitled to the fulfillment of certain basic needs by the government. Physical resources have to be duly complimented by an optimum communication infrastructure. The relevance of physical resources is
limited by the accompanying information structure. It takes little knowledge of management to realize that we first need to make better use of existing physical infrastructure before adding more to it. Obviously, the aim should be to first overhaul the communication infrastructure. In fact, information and communication infrastructure are the next frontier for seeking the survival and the growth of democratic government. With the coming of Internet, it has thrown open the reach of government and citizens 24 hours a day, 7 days a week and 365 days a year. This needs to be exploited and an overall perspective needs to be presented focusing various related issues to e-governance Egovernance promises to fulfill the dream every Indian dreams of – a progressive country. Prosperity through IT is at our doorstep. We must open the door fully, and not keep it shut. We have lived in the past, in the dark, for far too long. e-Governance is the future, and we must go in for it, to make the future secure for our future generations.

The sole objective of the Akshaya program is to provide government services online and make the people e-literate. An Akshaya center serves the people in all means through its various services which are readily accessible and functions as a medium between the government and the people. Some of the services provided are:

1. Aadhar Enrolment- Akshaya is one of the UDI enrolment agencies under the Govt of Kerala.
2. E-grants- Application for Post metric scholarship of Scheduled Caste/Scheduled Tribe category.
3. E-pay services- Online payment of bills.
4. Online Application for Ration card.
5. E-manal- Online registration for sand dealings for construction purposes.
7. E-vidya course- Advanced computer training course.
8. e-ticketing- Online ticket reservation services.
9. Birth-Death certificates
10. Kiosks Banking- Banking services to the public available through Kiosks.
11. E-District- An integrated, seamless, online delivery of citizen services at the district level.
12. E-Krishi- For farmers to provide online agriculture trading and information portal.
13. Election ID card services.

Scope of the study

The project focuses on the perception and awareness level of customers in akshaya centers. The study will also reveal the quality of the services provided through akshaya centers. For this study respondents are selected from valappad panchayath only. It may provide an insight in to the satisfaction level received by customers from the services. The result of this research will potentially contribute to the better delivery of e-governance services, and its improved quality.

Objectives

The general objectives of the study are to evaluate the perception of the customers of the akshaya centers.
Following are the specific objectives

- To assess customer’s perception regarding service quality of akshaya centers.
- To understand the awareness level of customers regarding service delivery

**Research Methodology**

This study is both analytical and descriptive in nature, with the support of both primary and secondary data. Primary data is collected with the help of a questionnaire. Secondary data is collected from magazines, books, journals, newspaper and different social networking sites. The descriptive research design is considered as the ideal design to examine the perception customers in akshaya center in valappad panchayath.

**Sample design:**
A sample of 70 respondents was selected from customers who approach akshaya centers for availing various e-governance services.

**Tools Used for Analysis:**
Percentage Analysis, T-test and Chi Square Test has been used for the study.

**REVIEW OF LITERATURE**

1. Murthy Narayana (2010)\(^1\), has published an article on “e-governance can help improve accountability” IT major Infosys Chairman Narayana Murthy has said that the Indian government must take tough action against corrupt people and that e-governance has a great potential to improve accountability. He said that by making the data of major public projects available online, corruption can be curbed and accountability enhanced in the country.

2. Dwivedi Sanjay Kumar (2010)\(^2\), Bharti Ajay Kumar have published their article on “egov-ernance in India – Problems and Acceptability. Governments and public sector organizations around the world are facing a lot of pressure to reform their public administration organizations and deliver more efficient and cost effective services, as well as better information and knowledge to their stakeholders. e-governance is the effective use of ICT to improve the system of governance that is in place, and thus provide better services to the citizens.

3. Driss Kettani, Bernard Moulin & Asmae Elmahdi (2009)\(^3\), have published their article on “A framework to assess the impact of e-government systems on governance”. The Fez e-government Project aims to develop a pilot e-government system to provide the municipal government of the city of Fez in Morocco with an advanced ICT platform that enables online delivery of citizen-oriented services to the local community.

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main research goals of this project include the elaboration of a road map to support the development of e-government systems in Morocco and the assessment of the impact of such systems on Morocco’s everyday life and on governance in general.

4. M. Ramchandran (2008) has published a research article on “e-Governance in Municipalities: A Boon”. According to M. Ramchandran the MMP on e-governance in municipalities focuses on improving the national element of citizen services by defining service levels and outcomes; facilitating effective interaction between local government, citizens and other stakeholders; improving the quality of internal operations of the local government; enhancing transparency and accountability; enhancing citizen interface and improving service delivery to citizens.

DATA ANALYSIS

Chi Squire Test I

H0: There is no relationship between gender and sources of information regarding e-governance

H1: There is a relationship between gender and sources of information regarding e-governance

Chi-square table of sources of information regarding e-governance

<table>
<thead>
<tr>
<th>Observed Frequency</th>
<th>Expected Frequency</th>
<th>(O-E)²/E</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>6.343</td>
<td>0.01</td>
</tr>
<tr>
<td>9</td>
<td>8.986</td>
<td>.0</td>
</tr>
<tr>
<td>11</td>
<td>11.1</td>
<td>.001</td>
</tr>
<tr>
<td>11</td>
<td>10.571</td>
<td>.017</td>
</tr>
<tr>
<td>6</td>
<td>5.657</td>
<td>.021</td>
</tr>
<tr>
<td>8</td>
<td>8.014</td>
<td>.0</td>
</tr>
<tr>
<td>10</td>
<td>9.9</td>
<td>.001</td>
</tr>
<tr>
<td>9</td>
<td>9.429</td>
<td>.019</td>
</tr>
</tbody>
</table>

Calculated value = .078

Degrees of freedom = (r-1)(c-1) = (4-1)(2-1) = 3
Level of significance = .05 Table Value = 7.815
Calculated value = .078

Decision: Calculated value .078 < Table value 7.815
Accept H0. There is no relationship between gender and sources of information regarding e-governance

Chi-square Test II

H0: There is no relationship between age and opinion about staff of akshaya

H1: There is relationship between age and opinion about staff of akshaya

---

Chi-square table for opinion about staff of akshaya

<table>
<thead>
<tr>
<th>Observed Frequency</th>
<th>Expected Frequency</th>
<th>(O-E)²/E</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>11.186</td>
<td>.003</td>
</tr>
<tr>
<td>16</td>
<td>15.814</td>
<td>.002</td>
</tr>
<tr>
<td>9</td>
<td>8.7</td>
<td>.01</td>
</tr>
<tr>
<td>12</td>
<td>12.3</td>
<td>.007</td>
</tr>
<tr>
<td>9</td>
<td>9.114</td>
<td>.001</td>
</tr>
<tr>
<td>13</td>
<td>12.886</td>
<td>.0</td>
</tr>
<tr>
<td><strong>Calculated value</strong></td>
<td></td>
<td><strong>.025</strong></td>
</tr>
</tbody>
</table>

Degree of freedom = (r-1)(c-1), = (2-1)(3-1)=2

**Level of significance = .05 Table Value = 5.991**

Calculated value = .025

**Decision:**
Calculated value .025 < Table value 5.991

Accept H0. There is no relationship between age and opinion about staff of akshaya

**T-test- I**

H0: There is no significant difference in perception about security of data among male and female.

H1: There is significant difference in perception about security of data among male and female.

Table showing Perception regarding security of data based on gender

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree (5 points)</th>
<th>Agree (4 points)</th>
<th>Neutral (3 points)</th>
<th>Dis agree (2 points)</th>
<th>Strongly disagree (1 point)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male</strong></td>
<td>8</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>11</td>
<td>13</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**Mean of male** \((x_1) = 3.81\)

**Mean of female** \((x_2) = 4.03\)

Calculated value of \(t = 1.13\)

Table Value = 1.960

Decision:

Calculated value 1.13 < Table value 1.960

Calculated value is less than the table value. So, we accept the null hypothesis that there is no significant difference in perception regarding security of data among male and female.

**T-test- II**

H0: There is no significant difference in perception about clarity and simplicity of process and procedure among male and female.
H1: There is significant difference in perception about clarity and simplicity of process and procedure among male and female.

Table showing Perception regarding clarity and simplicity of process and procedure based on gender

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree (5 points)</th>
<th>Agree (4 points)</th>
<th>Nuetral (3 points)</th>
<th>Disagree(2 points)</th>
<th>Strongly Disagree (1 point)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>9</td>
<td>10</td>
<td>15</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>14</td>
<td>8</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Mean of male \((x1)\) =3.75  
Mean of female \((x2)\) =3.48  
Calculated value of \( t = 1.125 \)  
Table Value =1.960  
Decisi on:  
Calculated value 1.125 < Table value 1.960  
Calculated value is less than the table value. So, we accept the null hypothesis that there is no significant difference in perception regarding regarding clarity and simplicity of process and procedure among male and female.

FINDINGS OF THE STUDY
The present study is confined to valappad panchayath of Thrissur district. This study is conducted to assess the customer’s perception regarding the e-governance services provided through akshaya centers.

Demographic details of Respondents:
- The study discloses that the male respondents (52.85%) are more than female respondents (47.14%).
- The majority of the customers belongs to the age group of 20-30 (38.57%).
- The study discloses that most of customers are degree holders (41.42%), and least customers are with SSLC (12.85%).
- Majority (51.42%) of the customers in akshaya centers are staying in rural areas and remaining (30%) and (18.57%) are staying in semi urban and urban areas respectively.
- The study confines that the majority (11.48%) of the customers in akshaya centers are unemployed.

Other findings
- The study shows that majority of the people came to know about e-governance services through family (30%) and friends (24.28%).
- The study reveals that e-governance service is mostly used for the certificates (28.57%) then for E-payment (24.28%) and E-vidhya (20%) least for RSBY (2.85%).
- 88.57% of the customers says that the fee charged for getting the services done
are fair and remaining 11.42% says fee is unfair.

- Trustworthy (31.42%) and transparency (31.42%) are the most important factor for the customers regarding e-governance services.
- 47% of the customers agreed that the staffs of akshaya center is cooperative, and 41% says they are friendly.
- 30% said that Akshaya staffs not providing adequate information regarding the documents needed to avail services to avoid delay in getting service.
- 45% of respondents said that Akshaya Centre’s Staff needed more training.
- 57% of respondents said that infrastructure facilities of Akshaya Centres are poor.
- Chi-square test 1 reveals that There is no relationship between gender and sources of information regarding e-governance.
- Chi-square test 2 reveals that there is no relationship between age and opinion about staff of akshaya.
- T-test 1 reveals that there is no significant difference in perception regarding security of data among male and female respondents.
- T-test 2 reveals that there is no significant difference in perception regarding clarity and simplicity of process and procedure among male and female respondents.

SUGGESTIONS

Akshaya is one of the project developed in the state of Kerala to provide e-governance services and digital literacy to people. But most of the people are still not aware about the various e-governance services provided through akshaya centers. E-payment, certificate and e-vidya are the most used services in the program. The lack of awareness about these e-governance project and various services provided by the government among many rural people creates a gap between initiative and the public.

Akshaya centers can improve their e-governance services by:

- Majority knows about akshaya centres through family and friends so awareness programmes should be conducted among the rural people to provide information about its objectives and services.
- The staffs should provide clear information regarding the documents required for the purpose of concerned, at a time, to avoid delay in service delivery.
- Provide proper training programs to akshaya staffs in order to deal with variety of services they have to provide.
- Improve the infrastructural facilities of akshaya centers.
- Fee charged for the service delivered should be adequate.

CONCLUSION

Based on the analysis and interpretations made, it is clear that majority of the people are aware and satisfied with various E-governance services provided government through Akshaya Centres. The Akshaya project was introduced with the objective of helping villagers in obtaining the services of government in a speedy, reliable and efficient manner. As the majority of the respondents agree that the fees charged by Akshaya
Centres for delivering various services are fair and their services are delivered without any delay, it is clear that customers are satisfied with services of Akshaya Centres in Valappad Panchayath. But measures should be taken to make its services more user friendly and the staffs should be more efficient and experienced. For the purpose of making it more convenient, counters and resources have to be improved. Akshaya Centres provides various e-governance services in the field of e-vidhya, e-payment, online services etc, it is surely act as instrument for social and economic growth.

REFERENCES

- N. S. Kalsi, Ravi Kiran and S. C. Vaidyain (2008), Effective E-Governance for Good Governance in India.
DIVERSITY ASSESSMENT OF BENTHIC MACRO INVERTEBRATE COMMUNITIES OF SAGAR TAL, GWALIOR, MADHYA PRADESH, INDIA

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1Research Scholar S.M.S Model Science College, Gwalior
2Professor, K.R.G. College, Gwalior

Abstract:
Sagar Tal is a part of historical, cultural, economical, and recreational life of Gwalior. It is facing multifold pressure due to urbanization, domestic and industrial waste discharge, washing, agricultural practices, Idol immersion (Ganesh, Mata and Tajiya) and city encroachment. The diversity patterns and occurrence of benthic macro invertebrate families encountered in Sagar tal, since there is no available research work done in this area. The primary objective of this study was to identify the fresh water Benthic Macro invertebrates including aquatic insects, crustaceans, molluscs, platy helminthes etc. Microsoft Excel and PAST software were employed to investigate the abundance and diversity of macro-invertebrates. A total of 57 species belonging to 49 families and 15 orders were collected from the four stations of the pond during winter season, summer season and rainy season. The most dominant taxa found in this pond were Arthopoda. The results can be use as a biological indicator for pond water quality assessment.

Keyword: Diversity Assessment, Benthic Macro invertebrates, Sagar Tal

Introduction:
Within recent decades aquatic ecosystems have been altered at different scales, and registered as negative consequences of anthropogenic activities (e.g., mining, dam construction, artificial eutrophication, river canalization, and recreation). Detection of resulting impacts on streams depends on the use of biomonitors combined with physical (e.g., temperature, suspended solids) and chemical (e.g., nutrient levels, concentrations of potential toxins) data (Dudgeon, 1994). The benthic macro fauna resides on or inside the deposit of bottom soil and feed on debris. They play a vital role in the circulation and recirculation of nutrients in aquatic ecosystem by accelerating the breakdown of decaying organic matter into simpler inorganic forms. They also serve as food for a wide range of fishes (Idowu and Ugwunmbo, 2005).

Because of their sessile and sedentary behavior macrobenthos are known to be the common indicators of time integrated environmental conditions (McLusky and Elliot, 2006). The community of benthic organisms is strongly affected by its environment, including sediment and water quality, and hydrological factors that influence the physical habitat. Because the macrobenthos are dependent on its surroundings, it serves as a biological indicator that reflects the overall condition of the aquatic environment (RAMP, 2017).

The variety and abundance of macrobenthos also vary with latitude, depth, water temperature, salinity, locally determined such as the nature of the substrates, and ecological circumstances such as predation and competition. Physical, chemical and
biological qualities of water are some of the factors that influence species composition, diversity, productivity and physiological conditions of local populations of a body of water (Boyd, 1979). Macrobenthos are mostly found in the standing water body where the concentration of organic carbon higher than the others. Environmental condition is mostly responsible for the variation of benthos in different area those are substratum type, food availability and predation (Dance and Hynes, 1980).

Macrobenthos communities are considered as a pollution index into the water body where they live and the quantity of macro invertebrates vary with the change of physiochemical factors and available habitats. Soft-bottom macrobenthos are used as the tools of bio assessment due to some special characteristics such as limited mobility, comparatively long life cycles and differential sensitivity to pollution of various types and they reflect the impact of cultural eutrophication on aquatic habitats quite satisfactorily (Gordon, 2000).

Material and Methods:

Study area:

The present study was carried out in the Sagar Tal, a perennial urban pond, a small wetland in the outskirt of Gwalior City in Madhya Pradesh. Sagar Tal is a man-made pond. It can be classified as non-drainage type artificial reservoir having regular inflow of sewage water from nearby settlements without any outflow. The main source of water is rainwater and sewage. The total area of the lake is 0.45 sq km. Area under Temple and lawn is 22.37 hectare and area under scrubland is 24.56 hectare. The boundary of the lake is artificially constructed into temple-like structures. The soil type is loamy to sandy loam. Among the plants Prosopis species is very frequent. Besides, there are numerous other species which are either natural or artificially planted. They are Ficus infeltoria, Lantana camara, Bougainvillea etc. The average depth of the lake is 10 feet (Fig. 1).
Sample collection and laboratory treatments:
Benthic fauna samples were collected using the methods earlier used by Hynes, (1971) and Olomukoro, (1996), an Ekman Grab operated by hand in shallow waters was forced into the sediment within a radius of 1m2 to a depth of about 20cm. The content trapped by the grab was processed by using the techniques earlier described by Hynes (1971) and Olomukoro, (1996). The kick sampling method was used to sample macrophytes for benthos as earlier described by Olomukoro, (1996). Sieved and sorted organisms were preserved in 70% buffered alcohol, identification of the organisms were carried out using the appropriate keys of Olomukoro,(1996).

Benthic fauna samples were collected using the methods an Ekman Grrab operated by hand in shallow waters was forced into the sediment within a radius of 1m2 to a depth of about 20 cm. The content trapped by the grab was processed by using the techniques. The kick sampling method was used to sample macrophytes for benthos by Hynes, (1971) and Olomukoro, (1996). To increase the visibility of benthic macrofauna, a small amount of “Rose Bengal” was added within the formalin solution of the plastic container in the laboratory. Sieved and sorted organisms were perserved in 70% buffered alcohol, identification of the organisms were carried out using the appropriate keys of Olomukoro, (1996).

Results and Discussion:
The macrobenthos communities of pond represented mainly 4 phylum (viz; Platehelmithies, Annelida, Arthropoda and Mollusca) belonging to 5 class, 15 orders, 49 family with their common name and presence status (table 1). Presence of macrobenthos and seasonally numbers of recorded individual was recorded in different season during both the years of study period (Table 2 & Table 3). Total of recorded species of macrobenthos 39% were common, 26% rare, 21% very rare and 14 % very common (Fig. 2). While among all the recorded macrobenthos most dominant were recorded 75% Arthropoda, 16% mollusca, 5% annelida and 4% platehelminthies (Fig. 3).

For Statistial analysis the macrobenthic fauna was analysed for species diversity, specis richness, and evenness which showed great variations. Simpson index shows with highest value 0.9731 during the year 2012-13 in rainy season while lower value 0.0272 recorded in winter season during the year of 2013-14. Shannon diversity index shows the higher in 0.0425 in 2013-14 in rainy season and lower value 0.0390 in summer season during the years 2011-13. Evenness recorded 0.0244 were higher in rainy season during 2013-14while lower recorded 0.0222 in summer season during the years of 2012-13 (Fig.4). Such biodiversity and abundance in the benthic macroinvertebrate community have already been put in record in various aquatic ecosystems (Adedeji et al., 2012 and Sharma et al., 2010).

Table 1: Checklist of Macro benthos with their presence status in Sagar Tal
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Phylum</th>
<th>Class</th>
<th>Order</th>
<th>Family</th>
<th>Common Name</th>
<th>PS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plathelminths</td>
<td>Turbellaria</td>
<td>Tricladida</td>
<td>Planariidae</td>
<td>Planaria</td>
<td>VR</td>
</tr>
<tr>
<td>2</td>
<td>Annelida</td>
<td>Clitellata</td>
<td>Haplotaxida</td>
<td>Tubificidae</td>
<td>Clitellate</td>
<td>R</td>
</tr>
<tr>
<td>3</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Nepidae</td>
<td>Water scorpions</td>
<td>R</td>
</tr>
<tr>
<td>4</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Corixidae</td>
<td>Water Boatmen</td>
<td>C</td>
</tr>
<tr>
<td>5</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Mesovellidae</td>
<td>Pondweed bugs</td>
<td>R</td>
</tr>
<tr>
<td>6</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Vellidae</td>
<td>Riffle bugs</td>
<td>C</td>
</tr>
<tr>
<td>7</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Small water striders</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Gerridae</td>
<td>Water striders</td>
<td>VR</td>
</tr>
<tr>
<td>9</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Pliedae</td>
<td>Pygmy</td>
<td>VR</td>
</tr>
<tr>
<td>10</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Oligochaeta</td>
<td>Worms</td>
<td>C</td>
</tr>
<tr>
<td>11</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Flat Worms</td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>12</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Water striders</td>
<td>VR</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Water striders</td>
<td>VR</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Water striders</td>
<td>VR</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Water striders</td>
<td>VR</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Water striders</td>
<td>VR</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Water striders</td>
<td>VR</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Arthropoda</td>
<td>Insecta</td>
<td>Hemiptera</td>
<td>Water striders</td>
<td>VR</td>
<td></td>
</tr>
<tr>
<td>19</td>
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Table 2: Presence of Macro benthic invertebrate in different season at Sagar Tal

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AS= Abundance Status, VR= Very Rare, C= Common, R= Rare
Table 3: Abundance of Macrobenthic Invertebrate in three different seasons at Sagar Tal

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**Total** | **1525** | **1948** | **1400** | **1378** | **1768** | **1301** | **9320**
Fig. 2: Shows the presence status of macro benthos in Sagar Tal

Fig. 3: Shows the four major group of Macrobenthos
Conclusion:

In this study, seasonality of the environmental conditions explained the major variations of the macrobenthos. Seasonal variations occurred not only in total abundance and diversity but also in the structure of the species assemblage of Sagar Tal. A total of 49 families under 4 major groups/taxa were identified that yielded a total of 9,320 ind./m² from all stations of the study areas. Besides, the abundance and diversity of macrobenthos of the intertidal zone of the Sagar Tal is seemed to be influenced by hydrological conditions.

References:


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HIGH SPEED PACKET ACCESS- APRIL 2020

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ABSTRACT
In this paper we present the main concepts of High Speed Packet Access Evolution currently being standardized in 3GPP. In general HSPA Evolution consists of introduction of MIMO, higher order modulation, and protocol optimizations and optimizations for voice over IP. We describe these improvements in detail and show that HSPA Evolution can reach performance comparable to those of Long Term Evolution of UMTS Terrestrial Radio Access Network in a 5MHz deployment.

INDEX TERMS: WCDMA, HSPA, HSDPA, UMTS

I. INTRODUCTION

The demands of packet data applications have resulted in several improvements over the original WCDMA release 99. The downlink was improved in Release 5 with High Speed Packet Data Access (HSDPA), which provided high speed shared channel with fast link adaptation and scheduling, hybrid ARQ, and a short 2 ms transmission time interval (TTI). The corresponding uplink enhancements were done in Release 6 with Enhanced Dedicated Channel (E-DCH), which allow Node B controlled scheduling of the uplink transmission, Hybrid ARQ, short 2ms TTI, and fast inter-cell interference suppression.

Recently work has started to evolve the UTRAN with Long Term Evolution (LTE), providing a new air interface. LTE will supporting flexible spectrum allocation from 1.5 MHz up to 20 MHz, and will provide significant performance improvements in application performance and system capacity.

For operators with existing HSPA deployments, the possibility to evolve HSPA should provide an easy way to update the system. For this reason work on HSPA Evolution has started in 3GPP. In this paper we will look at the main technologies used to evolve the HSPA system, compare the reachable performance to the performance goals of the LTE in 5 MHz bandwidth, and summarize the concept of HSPA Evolution. The performance of selected technical improvements to the HSPA system has been evaluated in [4]. In this paper we collect the various individual improvements to provide a comprehensive overview of HSPA Evolution.
TABLE I
SUMMARY OF PERFORMANCE GOALS FOR UTRAN LONG TERM EVOLUTION

<table>
<thead>
<tr>
<th>Performance metric</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak data rate</td>
<td>100 Mbps downlink, 50 Mbps uplink</td>
</tr>
<tr>
<td>Control plane latency</td>
<td>100 ms idle to active</td>
</tr>
<tr>
<td>50 ms dormant to active</td>
<td></td>
</tr>
<tr>
<td>Control plane capacity</td>
<td>At least 200 users in active state</td>
</tr>
<tr>
<td>User plane latency</td>
<td>5 ms for small IP packet</td>
</tr>
<tr>
<td>Average user</td>
<td>Downlink 3-4 times HSDPA</td>
</tr>
<tr>
<td>Throughput</td>
<td>Uplink 2-3 times enhanced uplink</td>
</tr>
<tr>
<td>Spectrum efficiency</td>
<td>Downlink 3-4 times HSDPA</td>
</tr>
<tr>
<td>Uplink 2-3 times enhanced uplink</td>
<td></td>
</tr>
</tbody>
</table>

II. PERFORMANCE GOALS

The performance goals for the LTE of UTRAN have been agreed upon in 3GP [1] and are summarized in Table I. In addition to the performance goals listed in Table I, LTE should work with high mobility, provide large coverage, allow flexible spectrum allocation, easy migration, and coexistence with earlier UTRAN releases. One of the design goals for LTE work is to minimize the complexity by not allowing redundant mandatory features or options. The performance of HSPA Evolution should target LTE performance with two major differences: the bandwidth is limited to 5 MHz, and the transmission time interval is 2 ms compared to 1 ms (with possibility to use only half a TTI transmission for small amounts of data) for LTE. The longer TTI will not allow HSPA Evolution to reach the User Plane latency target of LTE. The LTE target is 5 ms one way delay from the UE to the edge of the radio access network. As a rough estimate for the effect of the TTI on the latency, it is possible to assume that the UTRAN network delays for HSPA Evolution are the same as for LTE. Then the impact of the TTI on latency can be roughly estimated as

\[
\text{Latency}_{TTI} = \text{TTI alignment delay} + \text{TTI dependant TX processing} + \text{TTI dependant RX processing}.
\]

On average the TTI alignment is 0.5*TTI. For TTI dependant processing delay it is possible to assume that the processing delays is in general less than one TTI, resulting in the total dependency on the TTI as \(\text{Latency}_{TTI} = 1.5 - 3.5 \text{ TTI}\)

Based on this we can expect that the user plane latency target for HSPA Evolution should be 2.25 – 5.25 ms longer than the LTE target, which could correspond to a possible user plane latency target of 10 ms for HSPA Evolution.

The effect of the smaller bandwidth can (in principle) be straightforwardly estimated by assuming a similar spectrum efficiency for LTE and HSPA Evolution. This results in peak throughput targets of 25 Mbps in downlink and 12.5 Mbps in the uplink.
All other targets from [1] should in principle apply unmodified for HSPA Evolution as well as for LTE.

III. TECHNIQUES

In this section we examine the techniques used to achieve targets derived in Section II.

A. MIMO

Increasing data rates can be achieved by transmitting multiple parallel transport blocks to a single user. This is often referred to as Multiple Input Multiple Output (MIMO). The preferred use for MIMO is in conditions with favorable signal-to-noise ratio distribution and for channels with favorable correlation properties, e.g., small cells or indoor deployments.

The receiver has the possibility to separate the multiple data streams by using the channel properties and knowledge of the coding scheme. In order for the receivers to solve this task it is necessary to standardize the used multi-layer transmission scheme. The MIMO scheme chosen for HSPA evolution is based on the multiple codeword principle allowing for transmitting two separately encoded streams to a UE. This will facilitate the use of successive interference cancellation receivers which is expected to boost the performance compared to linear receivers such as e.g. MMSE based receivers. Hence the data on each stream is separately encoded, modulated and spread. The up to 15 spreading codes (of spreading factor 16), available for HSDPA, are reused over both streams. Before transmitted on the antennas, the modulated and spread signal is spatially weighted (pre-coded) using an unitary transform. The weights are taken from the same codebook as used for closed-loop transmit diversity mode 1.

The link adaptation is a mix of spatial and temporal adaptation. For each TTI, or rather at a rate set by the network, the UE reports the number of streams, the spatial weight (precoding index) and transmission rate that it prefers. This information is used in the Node B scheduler to select a suitable transport format. To inform the UE about the actual parameters of a transmission, the downlink control channel, HS-SCCH, has been adapted to incorporate MIMO information. At each TTI when a particular user is scheduled, the Node B includes the used pre-coding weight, the number of streams and the modulation used on each stream to the first part of the HSSCCH. For MIMO transmission, two versions of the second part of the HS-SCCH exist. One is used for single stream transmission containing the transport block size and HARQ processing information. When transmitting two transport blocks (dual stream) the same information about the second transport block is also signaled. Since the information about number of streams is allocated in the first part, the UE can use this information when detecting the second part. HARQ is operating independent between the streams. Thus, each stream is separately (not) acknowledged and retransmission of not yet detected blocks can be done independently between the two streams.

In order to introduce MIMO, the uplink signaling has been modified slightly. The Release 5/6 HS-DPCCH has been expanded to accommodate the new MIMO signaling. Since two transport blocks can be transmitted, each with its own HARQ process, the HARQ ACK/NACK field of the HSDPCCH has to be expanded to accommodate signaling for the second stream. In Release 5/6 the ACK bit is repeated to 10 bits. For MIMO, pure repetition would give a
code with Hamming distance 5. However, if the ACK/NACK is jointly encoded, a code with Hamming distance 6 can be found [14].

The CQI evaluation is slightly modified compared to Release 5. The main reason for this is the code-reuse interference term that is present when transmitting two streams. Since this term will be dependent on the actual channel realization and code allocation, only the UE can estimate the influence on the experienced SINR. However, since the UE is unaware of the actual code allocation it will be given at the moment the CQI is estimated, two different types of CQI has been defined.

The Type A CQI report is referred to as the preferred single/dual stream CQI, while Type B reports are single stream CQI reports. The network can configure the reporting period of these two CQI reports e.g. every second or third report may be of Type B. If the network receives Type A reports indicating that the user prefers dual stream transmission while the network may not have sufficient resources (power and/or codes) to support dual stream transmission, the information in Type B reports can be used to select the proper modulation and coding format.

To support precoding, the CQI reports also contain PCI (precoding control indication) which indicates the preferred precoding vector for the primary stream. Due to the construction of the codebook, the weight for the secondary stream is well defined. The weights are taken from the closedloop transmit diversity mode 1 alphabet and consists of phase shifts applied to the second antenna. The possible entries are given by

\[ w \in \left\{ \frac{1+j}{2}, \frac{1-j}{2}, \frac{-1+j}{2}, \frac{-1-j}{2} \right\} \]

From this, it is seen that if e.g. the first entry is preferred for the primary stream, only one other entry exists giving an orthogonal weight for the secondary stream.

The possible gains achieved from MIMO can be found in Figure 1 where the 90th percentile throughput is depicted. Further explanations and simulation assumptions are given in the next section.

B. Higher order modulation

Release 6 HSPA systems support the use of 16QAM in the downlink and QPSK in the uplink. These modulation schemes may provide high enough data rates given the received symbol SNRs of macro cell environments, however, for indoor or small-cell system deployments, higher SNRs and higher order modulation (HOM) can be supported.

Modulation and coding scheme (MCS) tables determine the best combination of modulation and coding rate for a given SNR. With existing MCS tables, high symbol SNRs may “max out” the choice of MCS, giving the highest order modulation with the least amount of coding. As a result, these high SNR systems become peak rate limited. Besides MIMO, another means to increase this peak rate is to extend the MCS tables into higher SNRs with the introduction of even higher order modulations: 64QAM in the downlink and 16QAM in the uplink. While HOM can be used in conjunction with
MIMO, it is important in its own right in those cases where deployment of MIMO systems is prohibited by physical, zoning, or budgetary limitations at the transmitter. In the downlink, the MCS table would be modified to include 64QAM. While the present downlink MCS table has a maximum rate entry of QPSK modulation with rate $r = 1$ coding (4 information bits per symbol) at 14.5 dB SNR, 64QAM with various coding rates would be added to extend the table up to 64QAM with $r = 1$ coding (6 information bits per symbol) at 22.5 dB SNR. A proposed MCS table can be found in the appendix of [6].

As presented in [6] and [7], an “SNR/rate-lookup” simulation was used to evaluate the impact on throughput of introducing 64QAM and MIMO into the HSPA downlink. This method allows an expedient yet accurate assessment of the radio link in question. Essentially, this simulation consists of generating the appropriate channel realization, determining a G-RAKE [8] or MIMO G-RAKE [9] combining weight solution as a function of this channel realization, analytically calculating the output symbol SNR for the each stream in the receiver, looking up the maximum supportable rate of the output SNR from the MCS table, and averaging this maximum supportable rate over many channel realizations (assumes ideal link adaptation).

While the MCS table gives us the modulation and coding scheme which is best for a given operating condition, it does not give us the transport format, which includes the number of spreading codes employed. Throughout, we will assume that 15 spreading codes are available at spreading factor 16, and all codes will be used by the UE. Further, we assume 80% of the downlink power to be devoted to the high-speed data channel, and 20% devoted to other (pilot channels, control channels, and voice channels). We assume ideal timing recovery, delay, channel, and impairment covariance estimation. As we are logging the maximum supportable information rate for a given realization, ideal link adaptation is also assumed.

![Figure 1. 90th percentile throughput in Pedestrian A channel for HOM and MIMO.](image-url)
Figure 1 shows the 90th percentile throughput of the downlink for 1000 realizations of the Pedestrian A dispersive channel [10], for systems employing techniques for peak rate improvement. For purposes of comparison, SISO and SIMO systems are shown employing the existing MCS table (16QAM). We can see that, as expected, the peak rate with the addition of 64QAM increases to 21.6 Mb/s as compared to the 16QAM case. The use of multiple receiver branches (SIMO vs. SISO) extends the benefits of HOM into lower SNRs. MIMO with 16QAM doubles the peak rate to 28.8 Mb/s, while the combination of MIMO and 64QAM increases the peak rate to 43.2 Mb/s: essentially giving a similar data rate as Long Term Evolution (LTE) in a 5 MHz bandwidth. While the combination of MIMO and 64QAM are not proposed in the next 3GPP release, the combination is being considered for future releases.

In the uplink, the introduction of 16QAM allows the peak data rate to reach about 11.5 Mbps, featuring an increase of 100% in peak rate compared with the enhanced uplink in release 5, where the highest peak rate with QPSK is 5.74 Mbps with coding rate equal 1. In the 3GPP study item on uplink HOM, 8PSK was also considered, however only 16QAM is part of the work item for introduction in release 7 because of the higher peak rate and better performance for all rates when HOM is used.

Link-level simulations are shown here to illustrate the data rates achievable with 16QAM. In order to reach such high rates in dispersive channels, the receiver needs to suppress the interference generated by the code multiplexed channels (spreading factor is equal 2 or 4). The receiver used is the GRake receiver [8] with 2 antennas. The simulator models inner loop power control and HARQ with a maximum of 4 transmission attempts. The TTI is 2ms. The power settings are \( c_\beta = 0.446 \), \( e_\beta = 0.233 \), and \( ed_\beta = 1.16 \) for the DPCCH, EDPCCH and E-DPDCH, respectively. Transport block sizes 821 from 6 000 to 22 000 bits are simulated. The receiver assumes knowledge of the channel coefficients. More simulation details can be found in [11].

Figure 2 shows the throughput for the pedestrian A channel at 3 km/h as a function of Ec/N0, where Ec is the total receiver chip energy and N0 is the noise power spectral density. For rates lower than 4 Mbps, QPSK is more power efficient than 16QAM. As the rate increases, 16QAM outperforms QPSK. In the region between 4 Mbps and 5.5 Mbps, although both modulations can reach those rates, 16QAM uses more realistic coding rates and is more power efficient. Note that at 5 Mbps, the coding rate is 0.86 for QPSK and 0.43 for 16QAM. Rates higher than about 5.7 Mbps can be reached only with 16QAM.

The high rates provided by 16QAM are reached at high power and therefore the likely scenario for uplink HOM is when the user experiences favorable channel conditions. The impact on 3GPP specifications for supporting uplink HOM concerns mostly the physical layer and is expected to be minor. Changes will involve support for additional signalling and larger transport block sizes. The need for an improved phase reference to enable high rate transmission with 16QAM is currently under discussion in RAN1[12]. In Layer 2 specifications, the transport block size tables will be modified.
C. Continuous Packet Connectivity

The increasing deployment of applications, which send small packets either continuously (e.g. Voice over IP) or intermittently (e.g. presence information of the messaging applications, push email) require efficient support for continuously connected applications. Both the battery life of the mobile terminal and the capacity of the cellular system will benefit from the introduction of discontinuous transmission and reception in active state. In addition the possibility to transmit small packets without out-band control signaling used normally to schedule transmissions on HSDPA ("HS-SCCH less operation") will improve the system capacity. Both the discontinuous transmission and reception and the "HS-SCCH less operation" can only be used with HSPA (i.e. they do not apply to the Release 99 dedicated channels).

Discontinuous transmission and reception can be applied in either uplink or in downlink. The downlink discontinuous reception is configured by the RNC, but can be turned on and off by the base station with physical layer signaling. It allows the UE to restrict the downlink reception times. Note that the UE is also allowed to receive continuously; discontinuous reception is not required even if it is configured. If the UE has not been scheduled for a predetermined time, the UE is not required to receive downlink channels except at designated time instances and in some special cases (e.g. reception of the HARQ ACK/NACK of an uplink transmission). The downlink discontinuous reception will allow the UE to enter power saving mode between the downlink receptions, and thus reduce the UE battery consumption in the active state.
In the uplink, the RNC can configure the UE to transmit discontinuously the power control commands (on DPCCH). The base station can also enable the uplink discontinuous transmission with a physical layer command. The UE will autonomously enter the discontinuous transmission mode, in which there are two transmission cycles \text{UE\_DTX\_cycle\_1} and \text{UE\_DTX\_cycle\_2}. The latter is used whenever there is no uplink data transmission activity, whilst the former is applied depending on the duration of E-DCH inactivity. This allows uplink DPCCH transmission to adapt to the data transmission activity. Similar to the downlink discontinuous reception, the uplink discontinuous transmission will allow the UE to enter power saving mode between uplink transmissions. In addition, the reduced power control transmission will reduce the uplink interference, and increase the system capacity.

The uplink discontinuous transmission will only impact the transmission of the power control commands. At any point of the time, the UE is able to transmit higher layer data (e.g. signaling or user plane data). The actual transmissions are followed by a preamble and a postamble to maintain correct power control level. However, it is also possible to configure discontinuous reception, for example, if the base station would like to share the receiver units between several discontinuously transmitting users. In that case the possible time instances for initial uplink transmission after the UE has entered discontinuous transmission are restricted. The “HS-SCCH-less transmission” allows initial transmission of small packets without scheduling the UE with the HS-SCCH in advance. The retransmissions are still scheduled and the retransmission formats are restricted to four different transport block sizes.

If the UE does not detect HS-SCCH, it will try to decode the packet received on HSDSCH. If the reception is successful, the UE will send a HARQ ACK. If the reception does not succeed, the UE will store the received soft bits, but will not send a NACK. For subsequent retransmissions, both ACK and NACK signals are transmitted normally, and thus the retransmissions do not require blind detection. For simplicity the number of retransmissions is limited to a maximum of two retransmissions.

The packets are protected with a 24-bits long UE specific CRC. In addition, the UE continues to attempt reception of the legacy HS-SCCH in the configured HS-SCCH set.

D. Enhanced CELL_FACH operation

To get the full advantage of the increased bit rates offered by MIMO and Higher Order Modulation, focus in HSPA evolution is also to improve signaling and state transition performance in the system, following the analogy: “What is the use of a highway if it takes too long to reach it”? Analysis in [13] has shown that the setup delays and channel switching times in WCDMA considerably affect the user perceived performance, and that the use of HSPA for transport of the signaling messages can significantly decrease the delays.

Another observation is that the control signaling and synchronization overhead of moving a user to CELL_DCH state, where dedicated or shared channels with high bit rates are available, is significant for small amounts of data. As a result of these findings, a new work item was started in 3GPP to enable the use of HSPA also in the...
CELL_FACH state, where UEs with lower activity typically camp, to improve packet data and signaling performance when common channels are used.

In Enhanced CELL_FACH operation, HSDPA is activated also for users in CELL_FACH. Connected UEs in CELL_FACH monitor the HSDPA control channels for scheduling information with their user specific identity (HRNTI), much in the same way as in CELL_DCH. The difference is that in CELL_FACH, no dedicated uplink channel exists. This means that continuous transmission of Channel Quality Indicator (CQI) and HARQ feedback will not be supported, and that link adaptation and HARQ need to be modified. Link adaptation will be based on measurements provided in the Radio Resource Control protocol (RRC) on the random access channel in the uplink, and HARQ will be replaced by blind repetition on MAC. Simulations in [5] have shown that with link adaptation based on initial CQI and fixed number of repetitions, average throughputs in the order of 300-500 kbps can be achieved.

Another feature of Enhanced CELL_FACH is the target to have the same layer 2 header format as in CELL_DCH, described in section E. This means that data transmission can continue uninterrupted on the user specific H-RNTI during the channel switch procedure between CELL_FACH and CELL_DCH, and provides a significant improvement in the user perception compared to the current solution, where data transmission is suspended during the channel switch. The work item also includes an option to transmit paging messages on HSDPA. Most aspects and definitions of the paging procedure remain as specified in Rel-6, e.g. usage of paging indication, paging occasions, paging groups, paging message format etc. When the paging indication has been given for a certain paging group, the UEs of that group start to monitor the HSDPA control channels for a common H-RNTI used to schedule the paging message. The benefit with this approach is that it can be extended to support also data transmission to users in the cell paging state (CELL_PCH), without the need of first moving the users to CELL_FACH with the Cell Update Procedure. This way, latency and especially control signaling overhead for delivering background traffic to inactive UEs is reduced.

E. Layer 2 protocol enhancements

It is known from work on HSDPA (e.g. [2]) that the Acknowledged Mode RLC downlink peak data rate is limited by the RLC PDU size, the RLC round trip time (RTT) and the RLC window size. For reasonable RLC PDU sizes, such as 320 or 640 bit, the RLC protocol can not sustain the peak data rate of the physical layer in HS-DSCH, let alone the peak data rate targeted for HSPA evolution. There are several solutions to solve this protocol stalling problem, such as increasing the RLC PDU size or sequence number space. However, a slightly different approach, Flexible RLC, has been adopted for Rel-7.

The Flexible RLC concept is based on the Packet Centric RLC concept presented in [3] with necessary modifications to fit the specific properties of HSPA evolution. In [3] it was proposed that the RLC PDU size could be variable such that the PDU size is selected to exactly match the incoming SDU size (e.g. IP packet). This allows for high peak data rates since the IP packet size for high data rate applications typically is large.
and results in low header overhead and completely eliminates the padding that is present in Rel-6 due to the fixed RLC PDU size. The difference in overhead between fixed and flexible RLC PDU sizes is shown in Figure 3 with the RLC headersizes taken from the Rel-6 RLC protocol. As can be seen, the flexible RLC solution provides lower overhead for all SDU sizes. The relative improvement in terms of padding is particularly large for small SDU sizes when an SDU segments unfavorably into a fixed RLC PDU.

Figure 3. The sum of the padding and header overhead relative to the IP packet size for fixed and flexible RLC PDU sizes.

In HSPA evolution the RLC segmentation possibility is kept, and the RLC SDUs are segmented if the SDU size exceeds an upper limit. The main reason for this is to increase the retransmission efficiency in cases of MAC HARQ failure. Segmentation has been introduced in MAC such that the RLC PDUs are segmented into MAC PDUs with size that is adapted to the momentary radio conditions. It would appear natural that RLC directly creates RLC PDUs with a size adapted to the radio conditions. This is, however, not feasible since the momentary radio conditions are not known in RLC. Rel-7 also introduces the possibility to multiplex data from different radio bearers in the same TTI through MAC multiplexing which increases the resource efficiency for mixed-service scenarios.

IV. CONCLUSION

We have presented a detailed overview of the HSPA Evolution, which consists of a number of enhancements. The enhancements include Multiple Input Multiple Output (MIMO), Higher order modulation, Control channel improvements, and Protocol
enhancements. With these improvements it should be possible to reach performance close to the performance goals of the Long Term Evolution. However, due to smaller bandwidth and longer transmission time interval, some LTE targets will not be reachable.

REFERENCES

[1] 3GPP TR 25.913, “Requirements for Evolved UTRA (EUTRA) and Evolved UTRAN (E-UTRAN)”.
A STUDY ON THE EFFECTIVE USAGE OF MOBILE BANKING APPLICATIONS WITH SPECIAL REFERENCE PATHANAMTHITTA DISTRICT

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Abstract
The banking industry is a large and highly diverse service industry than other services. Recent world wide technological revolution influenced the banking industry than other service sector in India. With the rapid growth of smart phones, PDAs (Personal Digital Assistant), tablets, and iPhones and the development of technologies like 2.5G (GPRS), 2.75G (EDGE), 3G, and 4G, mobile banking will emerge as a potential channel for banking. Mobile application based banking is the next frontier for banking in India. It will be a profitable option for financial institutions to offer banking services through mobile devices rather than setting up a new bank branch in both rural and urban India. The present study offers meaningful insights for policy implications to be proved better for customers satisfaction through improved mobile banking app facilities. The main concern of the study is to understand the level of usage, satisfaction, effectiveness and factors contributing and limiting to the adoption of mobile banking in Pathanamthitta District.

Keywords: M – Banking, Banking Services, Technology

Introduction
India is one of the fastest growing countries in terms of mobile user. Now mobile phones are not only a medium of voice communication but also widely used for mobile services. Mobile based services or M-services are defined as electronic services that are delivered to the consumers via mobile technologies using mobile devices. M-services is limited concept of E-services which is able to provide services anywhere at any time. Investments in M-services are growing and these services stand to offer the promise of creating a social impact in the area of healthcare, agriculture, financing, governance, education and banking. The m-banking is fast growing with its multitude features offered with mobile apps. Indian Banking Association is urged to heavily invest in technologies that can evolve and protect against future threats, as well as tackle current pressures from malware and social engineering. The Reserve Bank of India (RBI) has given approval to 80 banks to start mobile banking services, which includes apps and 64 banks have commenced operations. Users are becoming more comfortable doing banking transaction with their smart phones. With the increase of trend in m-banking new users shows more confident in banking on mobile applications in their handsets. The rapidly growing users and wide variety of mobile phone network service providers have made this channel an important platform for extending banking services to customers. Moreover, banks are using these mobile phone applications as an alternative channel of delivery of banking services. The top five mobile banking apps...
1. iMobile from ICICI Bank
2. SBI Anywhere Personal – Yono Lite
3. Axis Mobile
4. M- Connect Plus from Bank of Baroda
5. Fedbook from Federal Bank

**Significance and scope of the study**

With the increase of trend in m-banking new users shows more confident in banking on mobile applications in their handsets. Many banks have introduced banking apps which help people to make online transactions, pay bills, recharge mobile phones, etc. The objective of using mobile banking apps may be different from person to person. This study is basically aimed at finding the effectiveness of mobile banking apps. The study attempted to find the effective usage and customer satisfaction of mobile banking app services, which is gaining popularity in India after digitization and demonetization period. For academia, the findings of this research will provide empirical evidence and may add to a new knowledge to the existing literature of business economics and banking for understanding the impact of complex relationship between customer satisfaction and mobile banking services. Not only this but also the outcome of this study can also be used by the banking customers who hesitate to switch to mobile banking apps because of safety fear.

**Objectives**

- To analyse the reasons for using M Banking applications by the respondents.
- To find out the factors to be improved in mobile banking app services.
- To evaluate the mostly used m-banking application services by the respondents

**Hypothesis**

H0: There is no significance relationship between type of bank and customer satisfaction on service provided to m banking application

**Research methodology**

The data for the study is collected from both primary and secondary sources. The primary data for this survey are collected from 143 banking customers using Google Forms. Random sampling methods was used for the selection of respondents. We have done online survey with the help of Google Forms where the questions are uploaded and their response has been taken into Google Sheet. The secondary data was collected from various published books, journals and websites. Both descriptive and analytical study was conducted for the study. The statistical data analysis was conducted using percentage analysis, mean comparison test, Likert’s scaling technique and Chi square test.

**Limitations of the study**

- This study focused only technology enabled banking services, which is available in mobile banking applications only. The study had not discussed technology enabled banking services available in internet banking and its quality and safety perception of customers compared to mobile banking apps.
The method used for data collection was a survey method using a questionnaire. Researchers have limitations with this kind of data collection, because of low response rate, complex and confusing questions and surveys that might be too long.

Review of Literature

- **B. Arthi and E. Kavitha (2018)** conducted a study on customer satisfaction towards Mobile Banking. The study found that banks conduct financial services through wireless and instant as per the convenience of customers between smart phone and tablet. Mobile banking penetration in the country is greater than the global average of 40% at more than 50%. The customers are more concerns about the security and risk associated with technology adoption.

- **Suoranta. M (2016)** in her descriptive research approach tried to determine the dimensions regarding adoption of M-Banking apps. The M-Banking technology adoption model explains that age and education among the several demographic variables have an influence on the adoption of mobile banking application services. Further, relative advantage, compatibility, communication and trial ability are influencing factors on the adoption of M-Banking apps. But, complexity, security and trust worthiness of m-services are not major obstacles for adopting M-Banking apps.

Analysis of data

### Table 1
Gender wise classification of respondents

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>85</td>
<td>59%</td>
</tr>
<tr>
<td>Female</td>
<td>58</td>
<td>41%</td>
</tr>
<tr>
<td>Total</td>
<td>143</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Source: Primary data*

*Interpretation:* Table 1 indicates that 59% of the respondents are male and remaining 41% are female. Out of 143 respondents 85 were male and 58 were female. Majority of the respondents are male.

### Table 2
Amount of transaction by using M-banking apps per month by respondents

<table>
<thead>
<tr>
<th>Amount</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1000</td>
<td>43</td>
<td>30</td>
</tr>
<tr>
<td>1000-2500</td>
<td>48</td>
<td>34</td>
</tr>
<tr>
<td>2500-5000</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>5000-7500</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>7500-10000</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>10000 and above</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>143</td>
<td>100</td>
</tr>
</tbody>
</table>
Interpretation:
Table 2 analyse the amount of monthly transaction using mobile banking applications. From the study it is clear that 34% of respondents are carrying monthly transaction in between 1000-2500 rupees using mobile banking applications. Only few are comes under the category of 5000-7500 and 7500-10000 rupees.

Table 3
Descriptive statistics on Reasons for using Mobile banking apps by respondents

<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Reasons</th>
<th>Mean</th>
<th>SD</th>
<th>MPS</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Time saving</td>
<td>4.42</td>
<td>.745</td>
<td>88.4</td>
<td>Agree</td>
</tr>
<tr>
<td>2</td>
<td>Convenience</td>
<td>4.38</td>
<td>.649</td>
<td>87.6</td>
<td>Agree</td>
</tr>
<tr>
<td>3</td>
<td>Easy to pay</td>
<td>4.32</td>
<td>.853</td>
<td>86.4</td>
<td>Agree</td>
</tr>
<tr>
<td>4</td>
<td>Usefulness</td>
<td>4.32</td>
<td>.600</td>
<td>86.4</td>
<td>Agree</td>
</tr>
<tr>
<td>5</td>
<td>Reliability</td>
<td>4.27</td>
<td>.704</td>
<td>85.4</td>
<td>Agree</td>
</tr>
<tr>
<td>6</td>
<td>Easy to learn</td>
<td>4.25</td>
<td>.755</td>
<td>85</td>
<td>Agree</td>
</tr>
<tr>
<td>7</td>
<td>Security</td>
<td>4.25</td>
<td>.746</td>
<td>85</td>
<td>Agree</td>
</tr>
<tr>
<td>8</td>
<td>Satisfaction level</td>
<td>4.22</td>
<td>.586</td>
<td>84.4</td>
<td>Agree</td>
</tr>
<tr>
<td>9</td>
<td>Easy to use</td>
<td>4.10</td>
<td>.802</td>
<td>82</td>
<td>Agree</td>
</tr>
<tr>
<td>10</td>
<td>Easy to access</td>
<td>4.08</td>
<td>.586</td>
<td>81.6</td>
<td>Agree</td>
</tr>
</tbody>
</table>

Source: Primary data, using SPSS version 17.00

Interpretation:
The table 2 shows that the highly viewed reasons for using M-Banking app services among the respondents is times saving since its mean score is 4.42 and mps 88.4 receptively. Along with it; time saving, convenience, easy to pay, usefulness are some of other reasons for preferring M-Banking applications as compared with traditional method of banking.

Table 4
Mostly used M- banking application services by the respondents

<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Services</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Balance checking in the account</td>
<td>2.90</td>
<td>1.681</td>
</tr>
<tr>
<td>2</td>
<td>Domestic fund transfers</td>
<td>2.55</td>
<td>1.626</td>
</tr>
<tr>
<td>3</td>
<td>Bill payment processing</td>
<td>2.31</td>
<td>1.709</td>
</tr>
<tr>
<td>4</td>
<td>Mobile recharging</td>
<td>2.31</td>
<td>1.540</td>
</tr>
<tr>
<td>5</td>
<td>Access to card statements</td>
<td>1.33</td>
<td>1.393</td>
</tr>
<tr>
<td>6</td>
<td>Commercial processing</td>
<td>1.12</td>
<td>1.568</td>
</tr>
</tbody>
</table>
Access to loan statements & 1.09 & 1.278 \\
8 & Mutual funds / equity statements & 0.77 & 1.232 \\
9 & Insurance policy management & 0.74 & 1.118 \\
10 & Forex Services & 0.63 & 1.304 \\

Source: Primary data, using SPSS Version 17.00

Interpretation:
The table 3 indicates that among m-banking app services mostly used mobile banking application service is balance checking in the account since its mean value is 2.90. Least used mobile banking application service is insurance policy management, mutual fund transaction and forex services and their mean scores are 0.74, 0.77 and 0.63 respectively.

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Services</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>Wide range of services</td>
<td>122</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>Improved security</td>
<td>117</td>
<td>26</td>
</tr>
<tr>
<td>3</td>
<td>Better education</td>
<td>119</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>Better integration of mobile and online services</td>
<td>119</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>Cheaper subscription</td>
<td>112</td>
<td>31</td>
</tr>
</tbody>
</table>

Interpretation:
Table 5 depicts that majority of respondents that is 85% are in the opinion that mobile banking application services can be improved by providing wide range of services.
within the application. Only 78% of respondents are in the opinion that subscription need to be cheaper.

Testing of hypothesis

**H01:** There is no significance relationship between type of bank and customer satisfaction on the service provided on M banking apps.

**Chi square**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Type of bank</th>
<th>Chi-Square value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministatements and checking of account history</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public (%)</td>
<td>24.4</td>
<td>.918</td>
<td>Accept H0</td>
</tr>
<tr>
<td>Private (%)</td>
<td>18.1</td>
<td>.922</td>
<td></td>
</tr>
<tr>
<td>Both (%)</td>
<td>3.9</td>
<td>.085</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>20.5</td>
<td>.060</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>4.7</td>
<td>.922</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>.085</td>
<td></td>
</tr>
<tr>
<td>HDS</td>
<td>0</td>
<td>.060</td>
<td></td>
</tr>
<tr>
<td>Balance checking in the account</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS</td>
<td>15.2</td>
<td>6.589</td>
<td>Accept H0</td>
</tr>
<tr>
<td>S</td>
<td>24.2</td>
<td>.361</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>9.1</td>
<td>.223</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>.158</td>
<td></td>
</tr>
<tr>
<td>HDS</td>
<td>1.5</td>
<td>.085</td>
<td></td>
</tr>
<tr>
<td>Bill payment processing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS</td>
<td>7.1</td>
<td>15.130</td>
<td>Reject H0</td>
</tr>
<tr>
<td>S</td>
<td>29.2</td>
<td>.019</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>15.9</td>
<td>.366</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>.259</td>
<td></td>
</tr>
<tr>
<td>HDS</td>
<td>1</td>
<td>.085</td>
<td></td>
</tr>
<tr>
<td>Mobile recharging</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS</td>
<td>13</td>
<td>22.674</td>
<td>Reject H0</td>
</tr>
<tr>
<td>S</td>
<td>19.5</td>
<td>.004</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>9.8</td>
<td>.429</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>3.3</td>
<td>.0304</td>
<td></td>
</tr>
<tr>
<td>HDS</td>
<td>3.3</td>
<td>.273</td>
<td></td>
</tr>
<tr>
<td>Domestic fund transfers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS</td>
<td>7.1</td>
<td>15.166</td>
<td>Accept H0</td>
</tr>
<tr>
<td>S</td>
<td>17.5</td>
<td>.056</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>18.3</td>
<td>.347</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>3.2</td>
<td>.245</td>
<td></td>
</tr>
<tr>
<td>HDS</td>
<td>0</td>
<td>.085</td>
<td></td>
</tr>
<tr>
<td>Cheque book and card requests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS</td>
<td>6.2</td>
<td>18.701</td>
<td>Reject H0</td>
</tr>
<tr>
<td>S</td>
<td>22.5</td>
<td>.005</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>12.5</td>
<td>.483</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>.342</td>
<td></td>
</tr>
<tr>
<td>HDS</td>
<td>0</td>
<td>.085</td>
<td></td>
</tr>
<tr>
<td>PIN provision, Change of PIN, Blocking of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS</td>
<td>13.1</td>
<td>9.401</td>
<td>Accept H0</td>
</tr>
<tr>
<td>S</td>
<td>20.2</td>
<td>.310</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>14.1</td>
<td>.308</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>6.1</td>
<td>.273</td>
<td></td>
</tr>
<tr>
<td>HDS</td>
<td>1</td>
<td>.085</td>
<td></td>
</tr>
<tr>
<td>Commercial payment processing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS</td>
<td>5.5</td>
<td>22.375</td>
<td>Reject H0</td>
</tr>
<tr>
<td>S</td>
<td>9.6</td>
<td>.004</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>20.5</td>
<td>.554</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>8.2</td>
<td>.391</td>
<td></td>
</tr>
<tr>
<td>HDS</td>
<td>0</td>
<td>.085</td>
<td></td>
</tr>
</tbody>
</table>
### Interpretation:

On test it is found that **null hypothesis (H0) is rejected** in bill payment processing, mobile recharging, cheque book and card requests, commercial payment processing and access to loan statements as its **p values are .019, .004, .005, .004 and .006** which are less than **.05 (p < .05)**. Hence it is concluded that there is a significant relationship between type of bank and satisfaction level of customers in using these mobile banking application services. Null **hypothesis is accepted** in all other variables which includes mini-statements and checking of account history, balance checking in the account, domestic fund transfers, PIN provision, Forex Services, Transferring accounts, Access to card statement, mutual funds / equity statements, insurance policy management and real-time stock quotes since its **p values are .922, .361, .056, .310, .422, .260, .641, .140, .110, .578** respectively are greater than **.05 (p > .05)**.

### Source:

*Primary data, Using SPSS Version 17.00 (HS-Highly Satisfied, S-Satisfied, N-Neutral, DS-Dissatisfied, HDS-Highly Dissatisfied)*

<table>
<thead>
<tr>
<th>Service</th>
<th>HS 16.7</th>
<th>S 12.5</th>
<th>N 4.2</th>
<th>D 2.1</th>
<th>HDS 0</th>
<th>p</th>
<th>F</th>
<th>Accept/H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forex Services</td>
<td>18.8</td>
<td>4.2</td>
<td>0</td>
<td>2.1</td>
<td>0</td>
<td>6.010</td>
<td>.422</td>
<td>.354</td>
</tr>
<tr>
<td>Access to loan statements</td>
<td>10.1</td>
<td>2.5</td>
<td>1.3</td>
<td>2.5</td>
<td>0</td>
<td>21.430</td>
<td>.006</td>
<td>.521</td>
</tr>
<tr>
<td>Transfering accounts</td>
<td>15.4</td>
<td>12.8</td>
<td>0</td>
<td>1.3</td>
<td>0</td>
<td>7.715</td>
<td>.260</td>
<td>.314</td>
</tr>
<tr>
<td>Access to card statements</td>
<td>17.4</td>
<td>15.1</td>
<td>2.3</td>
<td>0</td>
<td>4.265</td>
<td>.641</td>
<td>.223</td>
<td>.157</td>
</tr>
<tr>
<td>Mutual funds / equity statements</td>
<td>18.2</td>
<td>3.6</td>
<td>1.8</td>
<td>0</td>
<td>9.653</td>
<td>.140</td>
<td>.419</td>
<td>.296</td>
</tr>
<tr>
<td>Insurance policy management</td>
<td>11.3</td>
<td>14.5</td>
<td>0</td>
<td>6.5</td>
<td>0</td>
<td>10.362</td>
<td>.110</td>
<td>.409</td>
</tr>
<tr>
<td>Real-time stock quotes</td>
<td>9.1</td>
<td>12.7</td>
<td>0</td>
<td>1.8</td>
<td>0</td>
<td>6.622</td>
<td>.578</td>
<td>.347</td>
</tr>
</tbody>
</table>

Source: Primary data, Using SPSS Version 17.00 (HS-Highly Satisfied, S-Satisfied, N-Neutral, DS-Dissatisfied, HDS-Highly Dissatisfied)
Findings

- From the study it is clear that 34% of respondents were carrying monthly transaction in between 1000-2500 rupees by using mobile banking applications. Only 4% and 6% were comes under the category of 5000-7500 and 7500-10000 rupees.
- All the respondents were agreed that time saving, convenience, quickness, easy to pay, usefulness, reliability, easy to learn, security, satisfaction level, easy to use, and easy to access were the reasons for using the mobile banking applications. Among them highly viewed reasons for using M-Banking app services among the respondents is times saving since its mean score is 4.42.
- The study reveals that among m-banking app services mostly used mobile banking application service is balance checking in the account since its mean value is 2.90. Least used mobile banking application service forex services and its mean scores is 0.63.
- All the respondents have agreed that all the services provided by the banks for the smooth functioning of the mobile banking applications were effective. The accurate performance of the services at the first time its self by the bank is least effective since its mean percentage is 72.4%.

Suggestions

- The acceptance level of M-Banking apps is found to be moderate among the various groups of the customers in the public and private sector banks. They have to put extra efforts in popularizing m-banking application services amongst their customers. So, Banks should take proper steps to organize more seminars, workshops, and other awareness programs in order to create awareness in the minds of the customers regarding the M-Banking applications.
- The banks must confirm secure financial transactions through recent technological advancements under M-Banking applications. It creates and increase confidentiality, integrity, and reliability to ensure customer acceptance.
- It will be better if the banks could provide financial services to the customers based on their regional language under M-Banking applications.

Conclusion

Banks are constantly adopting technology to expand its business and to reach different level of customers. Apart from ATM, Internet banking and other technology enabled services Mobile Banking applications is one of the services provided by banks to its customers. The present research, ‘study on the effective usage of mobile banking application among its customers’ attempts to measure the overall effectiveness of mobile banking application services with regards to usage and customer satisfaction. With the view point of customers it was able to understand that how they are satisfied with the mobile banking application services, how they measure the effectiveness of the services provided by the banks for the smooth functioning of the mobile banking
application etc. For improving its services banks will have to become more customer-centric, offering a wide range of financial products through M-Banking apps that would bring financial inclusion.

References


IoT BASED SMART E-MIRROR WITH RASPBERRY PI

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Veena K Visvam[5], B Tech students/1[1][2][3][4] Associate Professor[5]
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ABSTRACT

Internet of Things (IoT) could be conception wherever associated degree object has the flexibility to transfer data over a network without the requirements for human interaction to human or human need to give directions to the system orally to acquire the system’s response. IoT is known for their advantages that may facilitate modify people’s everyday routine. Relevant information can be traced such as time and date, weather, newsfeed, sticky notes and video display. A prototype is constructed to evaluate and deliver feedback. Over the years, there has been a gradual decline within the quantity of your time spent by peoples to read newspaper on a daily life due to their busy schedules, hence delay behind to catch up with daily news. This busy routine subsumes a sheer amount of time spent on dynamic appearances in front of a mirror. The target of building a “Smart Mirror” is to save time by help people to save time whereas conjointly enabling them to update them with current news. This would be achieved by the device as it ensures valuable information on the display, while also acting as a conventional mirror.

1. INTRODUCTION

There are several things to be done at once and at certain purpose, users aren’t able to multitask such discouraging Internet of Things (IoT) could be a term used to describe “systems, technologies and design principles associated with the missing wave of Internet-connected things that are related on the physical environment”. It introduces the network of obvious identifiable objects and their virtual representations is associated with an Internet-like structure, which are ready to collect and exchange information and are remotely controlled across existing network infrastructure. It contains major components including sensing function, information processing, security, privacy, and applications and services. As per the International Telecommunication Union (2018), the term Internet of Things (IoT) could be defined as a world structure for society that allows Internet service available to connect physical matter based on data and communication technologies. IoT is also seen in a more broader perspective and yet brings huge implication of technology on society. Along with the development of technologies, various data can be found easily and the emergence of the thought of Smart Mirror Smart Home has become more on more widespread.

The smart Mirror system that is predicated on the thought of Internet of Things (IoT) is developed specifically to permit users to realize the recent features. In this busy life managing such daily features has been known because the main drawback faced by most of the people. chores. For example, once a to-do-list with variety of housekeeping has been recorded on a paper, however the
paper is lost as a result of its misplaced. To solve this case, a smart mirror is developed to provide convenience for users in managing things and notifying the to do list, news feed, weather. Users are needed to give directions to the system written, and also the system’s sensors can reply to users’ demands.

II. LITERATURE SURVEY

[1] Mohammad Ghazali explained in this paper that printed at 5th International Conference on Future Internet of Things and Cloud Workshops 2017 describes the look and development of interactive smart mirror that provides simple and customizable services to the user which can be used in the house for home automation. The smart mirror controls the home applications and it can display the weather details, news feed, and video calling etc. And this smart mirror is controlled by the mobile app “iMirror”. For the proper working of a smart mirror it should be connected to this mobile app that is the input to the smart mirror is given by the mobile app like sticky note and reminder.

[2] Rohamuyid Hasman is explained in this paper that printed by IEEE Conference publications which explains the evaluation and dominant of house primarily based devices with the mirror. To make the human task easy and fast and also to develop the interaction with IOT based system to the human vision technology is used as the medium to the mirror. The smart mirror can take voice as input command and present response and scene could be a speed to that memory which will quickly and simply add Value User Interface(VUI) to any hardware and package. Security of an IOT device is not much stronger. Smart mirror is also a IOT based device so to make sure the smart mirror secure we use personality alternatives identity verification algorithm program is used.

[3] In this paper they explain that the design and development of a smart mirror that represents an unconventional interface for the home environment. The mirror helps a natural capacity of interaction through which the residents will manage and coordinate the household smart equipment and access personalized services. A service-oriented design has been adopted to develop and deploy the numerous services, where the mirror interface, the appliances, and the information and news feeds all use internet service communication mechanisms. The smart
mirror functionalities are designed by developing an easily extendible home automation system that allows the mixture of household home equipment and numerous custom services.

[4] Over the years, there has been a gradual decline within the quantity of your time spent by individuals in reading a newspaper on an everyday because of their busy operating schedules, thus insisting material behind to catch up with daily news. This busy routine subserves a sheer quantization of your time spent on dynamical appearances before a mirror. Then this problem is solved with the establishment smart system in a house that may permit one to try and do additional work in leastime. The main objective of building a “Smart Mirror” is to assist save time by serving individuals save time whereas coquently sanctionative them to update them with current news.

[5] The smart Mirror supported traditional household mirror belongs to the house automation system to fulfill consumers’ needs towards intelligent life. It provides occupants with a series of intelligent experiences like appliance management, data acquisition, environmental observance, recreation and remote operation. The smart Mirror is aimed to unravel the matter of smart home communication and knowledge integration within the family.

III. PROPOSED METHODOLOGY

![Fig 2. Architecture of smart mirror using raspberry-pi](image)

1. Weather API
The mirror can show weather forecast from open weather API and it can show relevant details. The given figure depicts the home page of the weather API in the login. Location is also given with the weather details. Displays current weather including temperature, feels like temperature, wind speed and direction. Also sunrise/sunset and 5 day forecast. Inside temperature which is retrieved from a DS18B20 temperature sensor connected to the Raspberry Pi in the Mirror. Gives the accurate local weather forecast easily with live weather updates. The sunrise/sunset values are also available in the display. The display and icons in the mirror including:
- Sunrise
- Sunset
- Humidity
- Wind
- Pressure

2. News Feeds
Mirror can show news feeds from the internet. The headlines of the daily news are passed in the mirror display. When the mirror is enabled and user is in front of the mirror the news headlines will be scrolled horizontally.

3. sticky Note
Mirror can show sticky notes. [2 or 3 latest notes] added from the user controller app. The reminders and notifications are the features provided in this sticky note section. Reminders can be made in various ways in Swedish language, but here translated it in to English.

- Remind [user] in 20 minutes/hours/days to take a walk.
- Remind [me] to walk the dog in 2 minutes/hours/days.
- Remind [user] tomorrow at 12:30 to do the dishes.
- Remind [me] on weekday to wash the car.

4. Notification Area
Shows notification of the date and time for the user. Whenever the user login to the account and requests for the enabling the time show API connects with the cloud and then establishes the connection. After that the response is send and displays the live time and date.
5. Video Display

According to the user needs, videos can be stored in the Raspberry Pi. Whenever they need to play the video, they can control it by the mobile itself. So, custom requirement is the prior factor in this section: it varies with the sense of the user.

IV. FUNCTIONAL PROCESS

The basic style of a smart mirror starts with the glass that is to be used. Two-way glass is that it suggested because if the mirror or monitor is not facing you, the image will not be seen clearly. Usually, vision glass was used because it is associated with the need for the mirror to integrate into the wall. A smart mirror could be a two-way mirror with the user's image reflected. The glass surface will show the current time, weather, and news feeds, approaching appointments, and more.

There are major 4 components in a smart mirror:
- Two-Way Mirror
- Display (monitor)
- Speaker
- Raspberry Pi 4B

Let's look at every section and how they run the smart mirror.

(i) Two-Way Mirror:
A normal mirror features a film behind the glass that reflects 100% of incoming light from the glass. If you explore a mirror, you see your reflection. A two-way mirror reflects light from one direction, allowing the user to experience the opposite direction.

You've in all probability seen two-way mirrors within the movies in police interrogation rooms. Smart mirrors use two-way mirrors to permit the light from the show to experience the mirror.

(ii) Display:
Behind the two-way mirror sits a monitor screen/TV/tablet. This can be accustomed show any information or modules for your smart mirror. The show will be constant size because the mirror, or it will be smaller than the mirror. Throughout this website, you'll see totally different sized displays employed in smart mirrors.

(iii) Speaker:
In order to take care of the conversations a lot can be done we want to ensure a speaker. It is embedded within the mirror itself. So, the speaker within the mirror is employed to deliver the audio from the opposite face of the communication.

(iv) Raspberry Pi 4B:
Something has got to run the content you see on your smart mirror. A small computer device like a Raspberry Pi 4B is quite enough to power a smart mirror. The type of computer device you wish depends on what you would like your smart mirror to try and do.

V. ADVANTAGES OF SMART MIRROR

Like several smart devices, it's hard to imagine however helpful they will be till you use one. The massive advantage of a smart mirror is that the ability to show helpful information with no need to open apps or do something. You merely inspect your smart mirror and therefore the information is there.

For example, imagine the mirror in your rest room could be a smart mirror. Every morning, you might likely a wash and interchange front of that mirror as you brush your teeth or prepare for the day. Imagine whereas you go through your morning routine you'll inspect your mirror and see a weather outlook for the day, and your day's schedule. The ability to require all of this useful information without interrupting your daily routine is extremely liberating. You can customise your mirror to show something you discover useful.
VI. CONCLUSION

In this busy regular life individuals might not be able to be aware of the daily news of the society. Smart mirror provides a platform for such persons to grasp or read the daily news enclose their smart mirror without the wastage of time. Everyday we have a tendency to spend hours in front of the mirror for different purposes. Throughout this point the news feeds, weather, time, date and reminders are displayed. When in the case of conferences and different purpose together with the four modules a video playing facility is additionally provided. Connecting the video conferencing aptly primarily the user will access decision the other person visualized through this facility. The reminders are very helpful for the business persons and etc. To avoid this kind of issues, we have a tendency to developed a software system platform for smart mirrors that provides the subsequent advantages. First, our platform is meant to be lightweight. It runs on a small computer, like the Raspberry Pi 4B. Without the wastage of time the recent features are provided by the smart mirror.

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Transforming Smart Phone into Women Safety Device via Face Identification Technique

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ABSTRACT

In today’s planet it is fantastically unsafe to take a trip alone, principally for women. Since masses of unexpected and appalling incidents are event around the globe, harms may reach from everywhere and anytime, as women are as well increasing similarly like men subsequently for that target they enclose to journey solitary at night anywhere forever they go, they tend to take a trip unaccompanied in freely available delight as well, and for that infer we neediness to empathize and get to the bottom of this difficulty of women accordingly they too must not touch any be scared of as regards their safety.

This article represents an machine attention which will perform the tenacity to rescue the women from unsafe conditions, though a fortune of women shelter systems are before now obtainable in the bazaar but even a added experienced system is necessary to give new shelter and security, as follows in this broadsheet an choice sense is anticipated for women defense that may attend as a excel out of the ordinary to support of the obtainable safety methods, at this point the machine app is calculated around which helps the female in need. This treatment sends the relief me letter to the entire the registered contacts. “face identification “is the exceptional piece of this concentration which helps the women to guarantee that their jump back in is completely safe. This be included captures the image of the criminal and checks whether he has a number of crime soundtrack against him. Other skin texture are “Sharing user’s location”, “Danger-alarm” etc. This propel is industrial in Java developmentkit by means of Android Studio.

Keywords – Android App, Help me-Message, Savior, Women Security, face identification.

INTRODUCTION

Women security is a extraordinarily life-size affect in a country like INDIA anywhere women are before a live audience an outstanding position in every and every field.

India is a stillness loving country and one of the nontoxic destination for the tourists across the world. However, a hardly any incidents in fresh onwards brings to awareness that at hand is a necessitate for women safety, several women’s in residential countries static horror to proceed outside unaccompanied fitting to digit of hand baggage of violence against women. To find time for women protection safer numerous attempts say been ended but nonetheless a safer and confident system is required that container guarantee shelter during communal enrapture and in general. This, tabloid presents a system that is proficient of on condition that added protection and safety (Ravi Sekhar Yarbro, 2014).

Women’s protection resources a safer, in good health kinship for everyone. This is a participatory manage listening carefully on altering cooperative spirit norms, patterns of do interaction, values, customs and institutions in customs that will much get better the excellence of go in a identity for every one of its members. This is a geological by-product of hard work that make an attempt to take up issues such as family dynamics, relationships, poverty, racism and/or conclusion sexual violence shop a healthy, sound neighborhood is everyone’s job.

The answer skin of our devotion is that (i) Initially, we tolerate to indication up in the attention by
means of big the signup side (ii) we give birth to to join up the two figures of our relatives or associates and click on the prevent button.

(iii) after nearly episode occurs it make available self-confidence to Women at crisis Situations put forward a set aside Our Souls (SOS) app to provides the protection on a solitary click of SOS pin for the women travelling at night or alone, emphatically from the on its own click on msg send off fasten it is second-hand to send out the disaster idea as well as the scene in the document of opportunity and longitude to the registered contacts. (iv) It plus has an “siren” feature, in which by clicking on the siren, surroundings suit awake of the condition . (v) It has as well a “face recognition” report which will capture the image of the criminal and detect whether he has criminal facts against him (Robi Gruga, Brestovac, Tihana Galnic Grcac, 2011).

In today’s world, it is not not dangerous for a individual to take a trip and no-one else at night notably for women; it will be unsafe to move abandoned as a female is not very well fervent as men. To offer shelter for women the fine respect to shrink odds in flattering a victim of violent crime is to single out and call up on wealth to comfort you out of unsafe situations. Having security app on your drop a dime on be able to moderate our expose and fetch assistance what time we necessitate it dissimilar the other applications available, which exertion simply at the time of disaster or Danger, this app be able to be old as a security or precaution measure. As it is supposed that precaution is improve than cure. Our motto is in the increase this app is to impart a anodyne environment through smart call as now mainly of the inhabit are haulage smart phones to where they go. (R.E Anderson, A Poon, C Lustig, W Brunette, G Borriello, B.E Kolko, 2009)

LITERATURE SURVEY

As a role of a good survey, we investigated a little applications of women shelter that by now be existent in market. The ambition is to watch how these applications happen as expected and to look at how they be able to be enhanced and how are they different. To go out with it is identified that the next machine Apps of women self-confidence are beneficial and are donation more or less parallel service.

A. WOMEN’S SECURITY. This app is urban by AppSoftIndia. The solution facial appearance of the app are: the client has to set aside more or less details. These minutiae include: piece of mail focus on and password of the user, send a reply to tackle and mobile digit of the recipient and a manuscript message. Then, app is well-heeled as a “widget”, consequently that once the client touches the app, it alerts the recipient. An alternative crucial piece of app is that it proceedings the assert of surroundings for about 45 seconds and this recorded voice, book idea containing locality coordinates of the consumer is sent to the recipient mobile number.

R. RSAPP- individual protection APP. This app is residential by Rinner Inc. On March 6, 2015 The app’s motto is “Never pace Alone”. This app helps the addict to invent a gang of ‘Guardians’ and SOS communication will be expected by them once the addict is in trouble. moreover any more agreeable figure of this app is one of the guardians will be called. The SOS note additionally includes scene of abuser stopping at GPS. The addict preserve as well make possible the GPS shadow and accede to the associates comprehend place at any time.

C. SAFETYPIN- COMPLETE SAFETY APP. This is a privy safety app having the troop of features; GPS tracking, emergency, main phone numbers, commands to not dangerous locations, pins displaying unsafe and free from likelihood areas and a protection Space. It drives in expand of typical women protection apps, and presents a immeasurable collection of features, hence that they will comfort to sensibly intend and bottle produce a deal with most to individuals in the locality. at what time a ego is on offer to move about to a new environment that is unfamiliar to him and if he or she plan to live through the non-toxic areas, at that time this app will be greatly cooperative ISSN (Online), 2456-1804 intercontinental Journal of Science, commerce and Management (USEM) Vol 2, installment 12, December 2017 the complete constitutional rights snobish © 2017 IJSEM 190 on condition that the client a plan based view of the setting all along with its security score. Also, the qualities know how to limited the areas on folks he or she excited to leave and bottle make learning about the risks of hassles
about the area, hence they container to finish interpret shelter measures.

D. POLICE NEARBY: This app is residential by roomy Systems in 2013. The law close scanner machine app is built with the want to associate citizens & students to their nearby supervise stations capital prudent at one click and will authorize the society to turn into other complicated in shape from your machine Smart phones. Any local, state, or school, school monitor responsibility as in any case as other edict enforcement agencies container practice supervise scanner machine App to impart you with enhanced once-over and understand top communication. control near app is free to download without signup.

E. SCREAM ALARM: Scream-Alarm, an machine devotion urban by leave comrade App Maker in November 2013. By clicking this app, it generates a fantastically soaring quantity scream in epoch of distress at what time the lungs of a individual go bankrupt in screaming in trouble. The generated scream is in a woman's influence is relentlessly of use in daunting the latent bright snug makers. The single labor prepared by this relevance is when on earth the self pushes or touches the application, the call screams brashly with a woman's voice.

F. This tabloid presents an machine App for Women protection and protection which container be accessible by a lone snap. The crack play a part of this appliance differentiates the total geographical matter with the prevent of GPS and sends selected exclusive facet counting the area’s even reserve Locator (URL) to the major enlisted associate saved in the application. The rare goods of this effort is its eternal letter conveyance feature. This hard work sends the non-stop point to the enlisted contacts without a break until the “Stop” close is clicked by the character in need. These continual e-mail segment the victim’s incessant geographical constituency details. This non-stop aspect of field provides a platform for non-stop tracking of locale by via the facts of the letters and the victim know how to be saved at an apposite time. This story makes the rescue business of the injured female faster and reliable.

PROPOSED SYSTEM

As women's constitute a very large part of our total population and also play a vital role in the upbringing of a child their security is a matter of global concern. Our application is a step to contribute in the noble cause of preventing women from rape, molestation, dowry, domestic violence, prostitution, stalking etc. and empower women in the society and support feminism. (C. Yi and Y. Tian, 2012)

Overall, this app is a twenty-four hour bodyguard which will try to shield the women with the best of its ability. It is a type of self-defence tool for women. It will also act as a location tracker tool and thus provide you an all in one solution. As mobile phones have become the fundamental unit of our living, this application is the bliss for women's to safeguard themselves from unethical people of this society. As this application can be operated through our smart phones it is easy to carry and quite handy. Women’s are not supposed to carry some extra stuff to use this application and they can use with the means available to them.
Figure 1. Flow-Chart

Figure 2. Block Diagram of women safety app

EXPERIMENTAL RESULTS

![Face Recognition Image]
FUTURE SCOPE

As greatly as India is concerned, benefit of technology for aiding women’s self-confidence is important. Today, apps capacity not joke about a most important function in security, but its unremitting value and set updates as apiece the must and awareness about defense will aid the apps establish talented time in the future.

Presently, apps labor on inputs certain by women themselves. Since they are not in a get ready to endow with inputs at the entire times, outer monitoring and integration of numerous users on the equivalent app canister relieve give beat results. Integration of SOS capacity and GPS know how to substantiate beneficial for the users. (Vaijayant Pawar, 2014)

Scope of this foretell is exceptionally broad in provisos of other tracking system. It is online as precisely as offline system. This container be second-hand in safety measures earth of women. It helps to efficiently expansion the collateral and shelter of women’s.

As an sovereign nation, we have to make certain value and safekeeping of women and we cannot deny them this main right. It is at this time time to initiate action to remove the peril of defense issues with women. Violence against women vestiges embedded in our societies, mutually as a everyday certainty and a arduous situations. Gender honesty is intolerable in a earth someplace at
slightest one in three women faces violence in her lifetime, in any case of her culture, religion, socioeconomic class, or teaching next to Our country know how to be a devoted democracy no more than as every part of women gain the precautions and self-determination from violence.

This is the "Android hard work for women defense system" which is especially effective submission above all

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Image Classification Model
Using Deep Residual Network

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Abstract—As the Neural Network goes deeper, gradient descent starts vanishing, this makes them difficult to train and stacking layers degrade the network performance as well as lead to overfitting. So, in case training we have deep residual network.

In this paper, we tried to do analysis on Deep Residual Network with different layers such as 34 layers, 50 layers, 101 layers and 152 layers of convolution layers. The analysis is performed on CIFAR-10 dataset containing 10 classes. The RESNET models are trained such that it can suggest which class it belongs from 10 different classes.

Keywords—Convolution Neural Networks; RESNET; CIFAR-10; Image Classification

I. INTRODUCTION

A. Deep Neural Network
Deep Neural Network naturally integrate low, average and high-level features to classify in an end to end multi-layer fashion and layers are stacked one over another so that the levels of features can be enriched.

B. Image Classification
Classification of image is a big problem in computer vision for decades. For us, to understand and classify image is very simple and easy task but when it comes to computers this becomes very expensive task. As, each image consists of set of pixels and each pixel is represented with different values. So, to classify image we have to perform lots of calculations.

C. Deep Residual Network
They are classical neural network which allowed to train neural network that are extremely deep such as with 150-layers. Before RESNET, training deep neural network was difficult due to vanishing gradient. To make residual network, skip connection is added between layers in simple network this diminishes the problem of vanishing gradient as well as the problem of overfitting. So, instead of direct mapping of x -> y with a function f(x) we use Residual Function R(x) = f(x) + x, this is very easy to optimize and train.

II. DATASET
CIFAR-10 dataset consists of ten different classes. Each class consists of 6000 32*32 color images in which 5000 are training images and 1000 are test images. The classes are mutually exclusive such that there is no overlap between any of classes. Each image is labelled ranging from 0 to 9 such as 0 for airplane, 1 for automobile, 2 for bird and so on. Here, the sample data is shown with 5 random images from each class.

Table 1: SAMPLE DATASET

airplane

automobile

bird

cat

deer
III. BLOCKS

Convolution and Identity Residual Blocks are used to construct different architectures of RESNET. In these blocks, the concept of Skip connection is used and this gives strength to RESNET.

Figure 1: Skip Connections

In the fig. Left diagram shows stacking convolution layer one after another and on the right of diagram, convolution layers are stacked as before but here the original input to the output of the convolution block is also added. Therefore, by allowing shortcut path for gradient to flow through diminishes the problem of vanishing gradients.

A. Convolution Block

The Convolution Block comprises 2 ways i.e. main way and shortcut way. At the end both are added using Add layer then passed through activation layer relu which produces output. The main path or way consists of 8 layers which are stacked as shown in figure and the shortcut path consists of input which is directly passed to Add layer.

B. Identity Block

The Identity Block comprises 2 ways i.e. main way and shortcut way. At the end both are added using Add layer then passed through activation layer relu which produces output. The main path or way consists of 8 layers which are stacked as shown in figure and the shortcut path consists of 3 layers conv2d and Batch Normalization which is passed to Add layer.

Figure 2: Convolution Block

Figure 3: Identity Block

IV. RESNET ARCHITECTURE

A. RESNET 34

RESNET 34 model initially contains ZeroPadding2D layer and after that it consist of 5 stages. Stage 1 contains 3 stacked layers i.e. Conv2D with 64 filters, 7x7 kernel size, (2,2) strides after that it has Batch Normalization, then Activation relu applied and then MaxPooling2D with 3x3 kernel size. Now, Stage 2 contains 3 stack blocks: the upper one is Convolution Block with filters [64, 256] and strides 1 and other two are identity blocks with filters [64, 256] and stride 1. Stage 3, 4 and 5 are shown in figure 3 with filters having [128, 512], [256, 1024], [256, 2048]. After these five stages AveragePooling2D is applied then Flatten and after that Dense Layer with number of classes required. Here, Middle Component i.e. second Conv2D, Batch Normalization and ReLu is removed from both Convolution and Identity Block.

B. RESNET 50

RESNET 50 model initially contains ZeroPadding2D layer and after that it consist of 5 stages. Stage 1 contains 3 stacked layers i.e. Conv2D with 64 filters, 7x7 kernel size, (2,2) strides after that it has Batch Normalization, then Activation relu applied and then MaxPooling2D with 3x3 kernel size. Now, Stage 2 contains 3 stack blocks: the upper one is Convolution Block with filters [64, 256] and strides 1 and other two are identity blocks with filters [64, 256] and stride 1. Stage 3, 4 and 5 are shown in figure 3 with filters having [128, 512], [256, 1024], [256, 2048]. After these five stages AveragePooling2D is applied then Flatten and after that Dense Layer with number of classes required.
D. RESNET 152

Architecture of RESNET 152 is same as RSENET 50 model except Stage 3 contains 8 layers of Identity Block and Stage 4 contains 36 layers of Identity Block.

C. RESNET 101

Architecture of RESNET 101 is same as RESNET 50 model except Stage 4 contains 23 layers of Identity Block.

V. DISCUSSION

All of the models were assessed on how well they performed on the task, and these results are analyzed. The impetus for trying such a large number of models was to analyze how the assumptions underlying each of the respective models could affect the model's performance. Models are trained on optimizer as adam and categorical_crossentropy as loss.

We have performed analysis on different layers of Deep Residual Network using CIFAR-10 dataset to classify different objects such as airplane, ship, etc. We found that according to our analysis RESNET 50 is best fit for our dataset. The analysis is shown in Table II on four layers of Deep Residual Network.

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<th>Metrics/Model</th>
<th>RESNET 34</th>
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Min-Max Dom Saturation Number of a Graph

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Abstract

Let \( G = (V, E) \) be a graph and let \( v \in V \). Let \( \gamma^{\text{min}}(v, G) \) denote the minimum cardinality of a minimal dominating set of \( G \) containing \( v \). Then \( \gamma^{M-m}(G) = \max\{\gamma^{\text{min}}(v, G) : v \in V(G)\} \) is called the min-max dom saturation number of \( G \). In this paper we present results on min-max dom saturation number for some special classes of graphs.

Key Words. Domination, min-max dom saturation number.

1 Introduction

By a graph \( G = (V, E) \) we mean a finite, undirected graph with neither loops nor multiple edges. The order and size of \( G \) are denoted by \( n \) and \( m \) respectively. For graph theoretic terminology we refer to Chartrand and Lesniak [4].

One of the fastest growing areas in graph theory is the study of domination and related subset problems such as independence, irredundance, covering and matching. An excellent treatment of fundamentals of domination in graphs is given in the book by Haynes et al. [5]. Surveys of several advanced topics in domination are given in the book edited by Haynes et al. [6].

Let \( G = (V, E) \) be a graph. A subset \( S \) of \( V \) is said to be a dominating set in \( G \) if every vertex in \( V - S \) is adjacent to some vertex in \( S \). A dominating set \( S \) is called a minimal dominating set if no proper subset of \( S \) is a dominating set of \( G \). The domination number \( \gamma(G) \) is the minimum cardinality taken over all minimal dominating sets in \( G \). The maximum cardinality of a minimal dominating set in \( G \) is called the upper domination number of \( G \) and is denoted by \( \Gamma(G) \). Further a subset \( S \) of \( V \) is said to be an independent set in \( G \) if no two vertices in \( S \) are adjacent. An independent set \( S \) is called a maximal independent set if no proper superset of \( S \) is an independent set of \( G \). The independence number \( i(G) \) is the minimum cardinality taken over all maximal
independence sets in $G$. The maximum cardinality of a maximal independent set in $G$ is called the upper independence number of $G$ and is denoted by $\beta(G)$.

Acharya [1] introduced the concept of dom-saturation number $\delta_s(G)$ of a graph, which is defined to be the least positive integer $k$ such that every vertex of $G$ lies in a dominating set of cardinality $k$. Arumugam and Kala [2] observed that for any graph $G$, $\delta_s(G) = \gamma(G)$ or $\gamma(G) + 1$ and obtained several results on $\delta(G)$. Motivated by this concept Arumugam and Sudha [3] introduced the concept of Min-Max and Max-Min Dom saturation number of a graph.

Definition 1.1. Let $G = (V, E)$ be a graph and let $v \in V$. Let $\gamma_{\min}(v, G)$ denote the minimum cardinality of a minimal dominating set of $G$ containing $v$. Then $\gamma_{\min}(G) = \max\{\gamma_{\min}(v, G) : v \in V(G)\}$ is called the min-max Dom saturation number of $G$. In this paper we present results on min-max Dom saturation number for some special classes of graphs.

Definition 1.2. The open neighborhood $N(v)$ of a vertex $v$ in a graph $G$ is the set of all vertices adjacent to $v$ in $G$. $N[v] = N(v) \cup v$ is called the closed neighborhood of $v$.

Definition 1.3. A cycle is a graph with an equal number of vertices and edges whose vertices can be placed around a circle so that two vertices are adjacent if and only if they appear consecutively along the circle. The cycle of order $n$, is denoted by $C_n$, it is also referred to as an $n$-cycle.

Definition 1.4. The corona of two graphs $G_1$ and $G_2$ is defined to be the graph $G = G_1 \circ G_2$ formed from one copy of $G_1$ and $|V(G_1)|$ copies of $G_2$ where $i^{th}$ vertex of $G_1$ is adjacent to every vertex in the $i^{th}$ copy of $G_2$.

Definition 1.5. The wheel graph denoted by $W_n$ is a graph with $n$ vertices ($n \geq 4$), formed by connecting a single vertex to all vertices of an $(n-1)$-cycle.

Definition 1.6. The Crown graph is obtained from a graph $G$ by attaching a pendant vertex from each vertex of the cycle graph $C_n$.

Definition 1.7. The Helm $H_n$ is the graph obtained from a wheel graph $W_n$ by attaching a pendant edge at each vertex of the $n$– cycle.

Definition 1.8. The Flower graph is a graph obtained from a Corona of a Wheel in which the end of the pendant vertices are connected to the center of a Wheel. It is denoted by $F_l_n$.

Definition 1.9. The Friendship graph $F_n$ can be constructed by joining $n$ copies of the cycle graph $C_3$ with a common vertex.

Definition 1.10. A Book graph $B_n$ is the graph constructed by drawing multiple cycles sharing a common edge.
Definition 1.11. One edge union of cycles of same length is called a book. The common edge is called spine of the book. If we consider \( t \) copies of cycles of length \( n \geq 3 \), the book is denoted by \( B_n^t \). If \( n = 4 \), then the book \( B \) is called book with rectangular (or quadrilateral).

Definition 1.12. A bipartite graph \( G \) is a graph whose vertex set \( V \) can be partitioned into two subsets \( V_1 \) and \( V_2 \) such that every edge of \( G \) joins a vertex of \( V_1 \) and a vertex of \( V_2 \).

If \( G \) contains every edge \( uv \) where \( u \in V_1 \) and \( v \in V_2 \) then \( G \) is called a complete bipartite graph and is denoted by \( K_{m,n} \) where \( |V_1| = m \) and \( |V_2| = n \). The complete bipartite graph \( K_{1,n-1} \) is called a star.

Definition 1.13. The bistar graph \( B_n,m \) is the graph obtained from \( K_2 \) by joining \( n \) pendant edges to one end and \( m \) pendant edges to the other end of \( K_2 \).

Definition 1.14. A splitting graph is a graph whose vertices can be partitioned into two sets \( V_1 \) and \( V_2 \), where the vertices in \( V_1 \) from a complete graph and the vertices in \( V_2 \) are independent.

2 Main Results

Theorem 2.1. For any graph \( G \), we have \( \gamma(G) \leq \gamma^{M,M}(G) \leq \Gamma(G) \).

Proof. Let \( \gamma(G) \) denote the minimum cardinality of a minimal dominating set in \( G \) and \( \Gamma(G) \) denote the maximum cardinality of a minimal dominating set in \( G \). Let \( v \) be any arbitrary vertex of \( G \), then the minimum cardinality of a minimal dominating set containing \( v \) is \( \gamma^{min}(v,G) \). Clearly \( \gamma^{min}(v,G) \) is a dominating set. Hence \( \gamma^{M,M}(G) \) is a dominating set. Therefore \( \gamma(G) \leq \gamma^{M,M}(G) \) and \( \gamma^{M,M}(G) \leq \Gamma(G) \). This implies \( \gamma(G) \leq \gamma^{M,M}(G) \leq \Gamma(G) \).

Example 2.2. For the graph \( G \) given below, we have \( \gamma = 4 \), \( \gamma^{M,M}(G) = 6 \), \( \Gamma = 12 \).

![Graph](image)

Theorem 2.3. For any graph \( G \), \( \gamma(G) = \gamma^{M,M}(G) = \Gamma(G) = 1 \) iff \( G = K_n \).

Proof. We know that \( \gamma(G) = \Gamma(G) = 1 \) iff \( G = K_n \) and also, \( \gamma(G) \leq \gamma^{M,M}(G) \leq \Gamma(G) \). Hence \( \gamma^{M,M}(G) = 1 \) iff \( G = K_n \).
Theorem 2.4. For any graph G, \( \gamma(G) = \gamma^{M,m}(G) = \Gamma(G) = n \) iff G = \( K_n \).

Proof. We know that, \( \gamma(G) = \Gamma(G) = n \) iff G = \( K_n \)
and also, \( \gamma(G) \leq \gamma^{M,m}(G) \leq \Gamma(G) \). Hence \( \gamma^{M,m}(G) = n \) iff G = \( K_n \). \( \square \)

Theorem 2.5. For any connected graph G, \( \gamma^{M,m}(G) \leq n - \text{deg}(v) \). The inequality
\( \gamma^{M,m}(G) = n - \text{deg}(v) \) holds if and only if \( V - N[v] \) is an independent set.

Proof. Let G be a graph with vertex set V. Let S be the Dom saturating set containing v
for every v \( \in \) V. If we choose a vertex v from a graph G, the neighboring vertices N[v] need
not be considered for finding the domination number. Clearly, \( \gamma^{min}(v, G) \leq n - \text{deg}(v) \).

The inequality \( \gamma^{M,m}(G) = n - \text{deg}(v) \) hold only if \( V - N[v] \) is an independent set. \( \square \)

Observation 2.6. For the Peterson graph \( K_{10,15} \), \( \gamma(K_{10,15}) = \gamma^{M,m}(K_{10,15}) = 3 \).

Theorem 2.7. Let G be any graph of order n. For the graph corona \( G \circ K_1 \), we have
\( \gamma^{M,m}(G \circ K_1) = n \).
Proof. Let G be a graph of order n. The graph corona $G \circ K_1$ with the vertex set $V$. The set $V = \{u_i, v_i\}$ where $i = 1, 2, ..., n$ and $|V| = 2n$. Let $S$ be the Dom saturating set containing $v$ for every $v \in V$. Let $S$ be the Dom saturation set containing $u_i$ is $S = \{u_i\}$ where $i = 1, 2, ..., n$ and $\gamma^{min}(u_i, G \circ K_1) = n$ and let $S$ be the domsaturation set containing $v_i$ is $S = \{v_i\}$ where $i = 1, 2, ..., n$ and $\gamma^{min}(v_i, G \circ K_1) = n$. Since, $\gamma^{M,m}(G \circ K_1) = \max\{\gamma^{min}(v_i, G \circ K_1) : v \in V\}\cdot \gamma^{M,m}(G \circ K_1) = n$.

Theorem 2.8. For any Friendship graph $F_n$, $\gamma^{M,m}(F_n) = n$.

Proof. Let G be a Friendship graph $F_n$ with the vertex set $V$. The set $V = \{v, u_i, u'_i\}$ where $i = 1, 2, ..., n$ and $|V| = 2n + 1$. Let $S$ be the Dom saturating set containing $v$ for every $v \in V$. Let $S$ be the Dom saturating set containing $v$ is $S = \{v\}$ and $\gamma^{M,m}(v, F_n) = 1$, let $S$ be the Dom saturation set containing $u_i$ is $S = \{u_i\}$ where $i = 1, 2, ..., n$ and $\gamma^{min}(u_i, F_n) = n$ where $i = 1, 2, ..., n$ and let $S$ be the Dom saturating set containing $u'_i$ is $S = \{u'_i\}$ where $i = 1, 2, ..., n$ and $\gamma^{min}(u'_i, F_n) = n$ where $i = 1, 2, ..., n$. Since $\gamma^{M,m}(F_n) = \max\{\gamma^{min}(v, F_n) : v \in V\}$, $\gamma^{M,m}(F_n) = n$.

Theorem 2.9. For any Book graph $B_n$, $\gamma^{M,m}(B_n) = n + 1$.
Proof. Let $B_n$ be the Book graph with the vertex set $V$. The set $V = \{u, v, u', v'\}$ where $i = 1, 2, ..., n$ and $|V| = 2n + 2$. Let $S$ be the Dom saturating set containing $v$ for every $v \in V$. Let $S$ be the Dom saturation set containing $u \in S = \{u, v\}$ and $\gamma^{\text{min}}(u, B_n) = 2$.

Let $S$ be the Dom saturation set containing $v$ is $S = \{v, u\}$ and $\gamma^{\text{min}}(v, B_n) = 2$. Let $S$ be the set containing $u' \in S = \{u', v\}$ where $i = 1, 2, ..., n$ and $\gamma^{\text{min}}(u', B_n) = n + 1$ where $i = 1, 2, ..., n$ and $\gamma^{\text{min}}(v', B_n) = n + 1$ where $i = 1, 2, ..., n$.

Since, $\gamma^{M,v}(G) = \max\{\gamma^{\text{min}}(v, B_n) : v \in V\} \cdot \gamma^{M,v}(B_n) = n$.

\[ \square \]

Theorem 2.10. For any Helm graph $H_n$, $\gamma^{M,v}(H_n) = n + 1$.

\[ \square \]

Proof. Let $G$ be a Helm graph with vertex set $V$. The set $V = \{v, u, u'\}$ where $i = 1, 2, ..., n$ and $|V| = 2n + 1$. Let $S$ be the Dom saturating set containing $v$ for every $v \in V$. Let $S$ be the Dom saturation set containing $v$ is $S = \{v, u\}$ where $i = 1, 2, ..., n$ and $\gamma^{\text{min}}(v, H_n) = n + 1$. Let $S$ be the set containing $u \in S = \{u, v\}$ where $i = 1, 2, ..., n$ and $\gamma^{\text{min}}(u, H_n) = n$ where $i = 1, 2, ..., n$ and let $S$ be the set containing $u' \in S = \{u'\}$ where $i = 1, 2, ..., n$ and $\gamma^{\text{min}}(u', H_n) = n$ where $i = 1, 2, ..., n$.

Since, $\gamma^{M,v}(H_n) = \max\{\gamma^{\text{min}}(v, H_n) : v \in V\} \cdot \gamma^{M,v}(H_n) = n$.

\[ \square \]

Theorem 2.11. For the Flower graph $F_{1,n}$, $\gamma^{M,v}(F_{1,n}) = n$.
Proof. Let $G$ be a Flower graph $F_{\ell n}$ with vertex set $V$. The set $V = \{v, u_i, v_i\}$ where $i = 1, 2, ..., n$ and $|V| = 2n + 1$. Let $S$ be the Dom saturating set containing $v$ for every $v \in V$. Let $S$ be the Dom saturating set containing $v$ is $S = \{v\}$ and $\gamma_{\min}(v, F_{\ell n}) = 1$, let $S$ be the set containing $u_i$ is $S = \{u_i\}$ where $i = 1, 2, ..., n$ and $\gamma_{\min}(u_i, F_{\ell n}) = n$ where $i = 1, 2, ..., n$ and let $S$ be the set containing $v_i$ is $S = \{v_i\}$ where $i = 1, 2, ..., n$ and $\gamma_{\min}(v_i, F_{\ell n}) = n$ where $i = 1, 2, ..., n$. Since $\gamma_{M,m}(F_{\ell n}) = \max\{\gamma_{\min}(v, F_{\ell n}) : v \in V\}$. \hfill $\Box$

**Theorem 2.12.** For any graph $P_n + 2K_1$, $\gamma_{M,m}(P_n + 2K_1) = 2$.

Proof. Let $G$ be a $P_n + 2K_1$ graph with the vertex set $V$. The set $V = \{v, u, v_1\}$ where $i = 1, 2, ..., n$ and $|V| = n + 2$. Let $S$ be the Dom saturating set containing $v$ for every $v \in V$. Let $S$ be the Dom saturating set containing $v$ is $S = \{v, u\}$ and $\gamma_{\min}(v, P_n + 2K_1) = 2$, let $S$ be the Dom saturating set containing $v$ is $S = \{v, u\}$ and $\gamma_{\min}(v, P_n + 2K_1) = 2$, let $S$ be the Dom saturating set containing $u_1$ is $S = \{u_1, v\}$ and $\gamma_{\min}(u_1, P_n + 2K_1) = 2$, let $S$ be the Dom saturating set containing $u_2$ is $S = \{u_2, v\}$ and $\gamma_{\min}(u_2, P_n + 2K_1) = 2$, and so on let $S$ be the Dom saturating set containing $v_n$ is $S = \{v_n, v\}$ and $\gamma_{\min}(v_n, P_n + 2K_1) = 2$. Since $\gamma_{M,m}(P_n + 2K_1) = \max\{\gamma_{\min}(v, P_n + 2K_1) : v \in V\}$. \hfill $\Box$

$\gamma_{M,m}(P_n + 2K_1) = 2$. 

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Theorem 2.13. For any two complete graph of same order with the perfect matching $K_n = K_n$ for $n > 3$, $\gamma^{M,m}(K_n = K_n) = 2$.

Proof. Let $G$ be a $K_n \equiv K_n$ graph with the vertex set $V$. The set $V = \{u_i, v_i\}$ where $i = 1, 2, ..., n$ and $|V| = 2n$. Let $S$ be the Dom saturating set containing $v$ for every $v \in V$. Let $S$ be the Dom saturating set containing $u_i$ is $S = \{u_1, v_1\}$ and $\gamma^{\text{min}}(u_1, K_n = K_n) = 2$, let $S$ be the Dom saturating set containing $u_2$ is $S = \{u_2, v_2\}$ and $\gamma^{\text{min}}(u_2, K_n = K_n) = 2$ and so on let $S$ be the Dom saturating set containing $u_n$ is $S = \{u_n, v_n\}$ and $\gamma^{\text{min}}(u_n, K_n = K_n) = 2$. Let $S$ be the Dom saturating set containing $v_1$ is $S = \{v_1, u_1\}$ and $\gamma^{\text{min}}(v_1, K_n \equiv K_n) = 2$, let $S$ be the Dom saturating set containing $v_2$ is $S = \{v_2, u_2\}$ and $\gamma^{\text{min}}(v_2, K_n \equiv K_n) = 2$ and so on. Let $S$ be the Dom saturating set containing $v_n$ is $S = \{v_n, u_n\}$ and $\gamma^{\text{min}}(v_n, K_n \equiv K_n) = 2$. Since $\gamma^{M,m}(G) = \max\{\gamma^{\text{min}}(v, K_n \equiv K_n) : v \in V\}$, $\gamma^{M,m}(K_n \equiv K_n) = 2$. $\square$

Theorem 2.14. For the splitting graph $S(K_{1,n})$, $\gamma^{M,m}S(K_{1,n}) = n + 1$. 

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Proof. Let $G$ be a splitting graph $S(K_{1,n})$ with the vertex set $V$. The set $V = \{u, v, u_{i}, v_{i}\}$ where $i = 1, 2, ..., n$ and $|V| = 2n + 2$. Let $S$ be the Dom saturating set containing $v$ for every $v \in V$. Let $S$ be the Dom saturating set containing $u$ is $S = \{u, v\}$ and $\gamma_{\min}(u, S(K_{1,n})) = 2$, let $S$ be the Dom saturating set containing $v$ is $S = \{u, v\}$ and $\gamma_{\min}(v, S(K_{1,n})) = 2$, let $S$ be the Dom saturating set containing $u_{i}$ is $S = \{u_{i}, v\}$ where $i = 1, 2, ..., n$ and $\gamma_{\min}(u_{i}, S(K_{1,n})) = n + 1$, let $S$ be the Dom saturating set containing $v_{i}$ is $S = \{v_{i}, v\}$ where $i = 1, 2, ..., n$ and $\gamma_{\min}(v_{i}, S(K_{1,n})) = n + 1$, and so on let $S$ be the Dom saturating set containing $u_{i}$ is $S = \{u_{i}, v\}$ where $i = 1, 2, ..., n$ and $\gamma_{\min}(u_{i}, S(K_{1,n})) = n + 1$. Let $S$ be the Dom saturating set containing $v_{i}$ is $S = \{v_{i}, u\}$ and $\gamma_{\min}(v_{i}, S(K_{1,n})) = n + 1$, let $S$ be the Dom saturating set containing $v_{i}$ is $S = \{v_{i}, u\}$ and $\gamma_{\min}(v_{i}, S(K_{1,n})) = n + 1$, and so on let $S$ be the Dom saturating set containing $v_{i}$ is $S = \{v_{i}, u\}$ where $i = 1, 2, ..., n$ and $\gamma_{\min}(v_{i}, S(K_{1,n})) = n + 1$. Since $\gamma^{M,d}(S(K_{1,n})) = \max\{\gamma_{\min}(v, S(K_{1,n})) : v \in V\}$, $\gamma^{M,d}(S(K_{1,n})) = n + 1$. □

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Advaitha Elements In Sri Jagannatha Sthotra Kavyas

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अय्यर्यः— यस्य भासा अर्येन इदुना ताराज्ञान च सहिष्ठि अर्यिने विख्य विभाति। यस्य विख्यिती पुलेरिक्टक्षणः कर्मणा नात्रं, उद्ववं फालन्तम। तं नीलक्ष्यार्यिनेव वन्ये अय्य प्रक्षम्येत्रः अर्येन्तततेन संपरिष्ठितं विचलेन्त— तथाहि—

अर्येन्तततेन

'न तदत सूर्यो महते, न चन्द्राशरकः, केवल विश्वुवो महति कृतध्यय्मधि। केवल मातमकुमारि सवि, तत्थ प्रासा सविभिन्द्रिविभाति इति मुरुक्कोपिनितत्व वाक्यम्। तथाहि न तदत तस्मिन् वाक्यमुनि भाषणि राज्यभाषाभाषोपत्ति सूर्यो महति। त्रूहसं न प्रकाशगतीपर्यं द्राह्मके न भवे ग्रासम् भाषा संर्ववादनर्मेतात् प्रकाशगतीपर्यं। न तु तस्य व्यति: प्रकाशनसंयंत्यम्। तथा न चन्द्राशरकः केवल विविभिन्द्रिविभाति कृतध्यय्मधि रेग्रुरेगृणाथर्धिपुरुषेऽवर्तमान्यम्। कः भवा। कदिमं ज्ञाताभिति तत्रस्मेव परमेश्वरं वस्तो भाषाकुवालस्त्राह्मके दीर्घाममनमुभावतुः। तथा ज्ञातामुच्चारणस्वयंगार्दशिः दीर्घाममनुस्ति न व्यतरङ्गतमयेव भाषा दीर्घामसविभिन्द्रिविभाति। न्यत एवं तदेव भाषा महति च विभाति च कार्यमेवति विविभेन्त भासा, अत्तत्त्य अस्वाग्नि भाषापति स्वतःदण्डमयेते। न हि व्यतान्यविभाने

भाषाममनम् कहुतु शकाये। न्यादींमन्यायाभाषाकुवालस्त्राह्मारुपाणि चाशितान्यादातिमारं तह्यंगाि। अव ज्ञातामुच्चारणस्वयंगार्दशिः भासा सवि विख्य कुक्तं जगतु सुपुरुष प्राक्ताते इत्युतम। कृतध्यय्म जगताः भाषाभाषाः: भाषागतम् न संभवति, सुपुरुषादातिमारं स्वतं: भाषाक्षेत्रे इति शाका उदेश्य हतपि तथाः: स्वतं: भाषाभाषाः नारिति, न हि सुपुरुषांम् स्वतं: भाषाभाषाः न वा स्वाभाषण जगदभाषणाः। अर्थ तु भाषाभाषाः भाषामानाः तदसुपुरुषीता एव ज्ञाताभाषाः: इति श्रुत्यं: समयः अत्र वर्णिते। एववेत् "पदाविक्षमप्रेते जगतु भाषपते अविष्कारे।चन्द्राशरकुमार्यादाति ततोन्येत्र विख्य महाकक्षीरः इति समयाविक्षमचः अर्थाविनिर्देश अत्र वर्णिते: तत्र च शाकाभाषायामपि सारं: गीतात्त्वाय वर्णिते। पवेष लघुतुपि अदिशायो एवं द्वितीयां मुनि, स्वयंसरस्वस्व व्यासवलि समयः निराशाय वति। अविद्याद्वितिमतानाम्येव अर्थ शेषः: लिखितो वति: इति विभाषायम्।

अय्यप हितीय: शेषः—

चं हिष्ठु मूलयः सुरासुर्यमणा गाम्बेडंख्योगाः

सेवाना: श्रीकुमुखः प्रतिनिध क्षणि वो प्राप्ये।

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प्रथान्य जम्बलादनकारणम् अन्युगमनत्वम्। ब्रह्माकाव्यार्थात्श्रृवित्थश ब्रह्मणो निमित्तते पवकस्वति—इति पूर्वः पशः।

सिद्धान्ततरु— ब्रह्म निमित्तकारणभावादनकारणम् च इति अभीक्षत्वम्। "८ उत तमादेशमार्गो फेनेश्चुः श्रृंवं भवन्त्यं मतमविशालं विश्वाम्” इति वियोजानेन सर्वविष्णुं श्रुपते। कार्यस्य उपादानकारणायत्तेयाु उपादानकारणविष्णुं सर्वविष्णुं श्रुपते। कार्यस्य कार्यच निमित्तकारणादृश्येष्मेव अनुसूचितः। "७यो वा दमानि मूतानि जापन्ते” इत्यत् "पत्” इति पत्वमी "१० अथिमकेतुः प्रकृति” इति पाणिन्युपस्नानानिलं सर्वपाणिकारणये च। ब्रह्माकाव्यायं बनायस्य अविश्वातु भावावातु तरय निमित्तकारणं भविष्यते। यदृपि चेतनमिश्रणं जनताः, न चेतनप्रकृतिकृतिति, तस्तः। चेतनातु पुरुषान्त तत्स्पष्टत्त्वानां नस्तोमाहादीनामुपरिनिश्चर्चाताः— इति।

सुधार्यं— ब्रह्म प्रकृतिः उपादानकारणम् च निमित्तकारणमपि। कूटः।

प्रतिकार्याद्यावर्तानलोपाया, "फेनेश्चुः श्रृंवं भवति” इत्यायाप्रविशानेन सर्वविष्णुनातिष्ठा, "५१ यथा सोम्य पलेन मृदुक्षणं सर्व मृदुत्वे विशालं स्यात्” इत्यदेशात्वस्तं तथोः अनुसूचित साभार्यताः।

तथा च जम्बलादनकारणं च। वहुः चाये रसरूपं च अनेकं जम्बलादनकारणं जम्बलादनकारणं श्रव्यं श्रवः श्रवः। असौभाग्यं तद्कल्पितं शुद्धिकृतं श्रवणं फेनेश्चुः श्रवणं च। अवस्थ में चेतनातु पुरुषात्त्वस्य उदाहतमं विस्तर भवति विस्तरः।

\[1\] वार. १. ६.
\[2\] सूर. २.
\[3\] वर. १. ३.
\[4\] वर. १. ३.
\[5\] वर. १. ३.

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