JOURNAL OF APPLIED AND EMERGING SCIENCES

Balochistan University of Information Technology
Engineering and Management Sciences, Quetta

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Acknowledgement: Financial Support of BUITEMS through the forum of Directorate of Research is gratefully acknowledged.
Preface

This is the issue number 2 of the third volume of the Journal of Applied and Emerging Sciences published and distributed by the Balochistan University of Information Technology, Engineering and Management Sciences BUITEMS, a leading university of Balochistan Pakistan, with vision and mission statements as follows:-

Vision
To be among the leading universities of the world – accessible to all, imparting quality education and promoting cutting edge research.

Mission
We are committed to providing quality education with focus on research and to equip students with the art of living as productive members of society, contributing to the socio-economic uplift of Pakistan in general, and Balochistan in particular.

The original work of researchers published here in this issue is yet another effort of the university to meet its mandate expressed in the vision and mission statements for the promotion of research despite all circumstances. The editorial committee selects quality papers which fulfill the minimum criteria required for the submission of papers prescribed by the editorial board and subsequently the papers are forwarded to referees and subject experts for evaluation. Present issue publishes 14 papers, but the editorial committee and referees have recommended many more which will appear in following issues for the reason of time constraints in the processing.

The editors wish to express their sincere gratitude to Engr. Ahmed Farooq Bazai, Vice Chancellor for his personal involvement and participation in BUITEMS publications including the Research Journal of the university.

The editors also wish to express thanks to all those who helped and provided their services in publishing this issue.

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Title should be brief and informative, typed in 14 pts. First alphabet of each word except prepositions should be capital and the rest in small letters. Names of authors should be followed by address of Institutions. The address for communication (along with e-mail address and telephone, telex and fax numbers), should also be given.

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Results and Discussion
Results followed by discussion can be included under the same heading of Results and Discussion or as separate.

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Few lines of any desired acknowledgement of research support or other credit should be added if required.
Tables and Graphs
All tables must be numbered consecutively in Arabic numerals in the order of appearance in the text. Tables and graphs representing the same set of data should be avoided. All tables, figures, illustrations should be self-contained and have a descriptive title or creatively prepared so that their size can be adjusted as desired. Details of experiments (not mentioned in the text) may be indicated in brief below the table as a legend.

Figures and Photographs
Figures and photographs can be included as jpg, bmp or pdf attachments. Photographs should be numbered consecutively along with the figures in Arabic numerals in the order of appearance in the text. Photographs should be sharp, with an indication of the scale. Do not include line drawings and photographs in the same plate.

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References should be cited in the text by author and year, not by number. If there are more than two authors, reference should be made to the first author followed by et al in the text. References at the end of the paper should be listed alphabetically by authors’ names, followed by initials, year of publication, full title of the paper, name of the journal volume number, initial and final page numbers. References to books should include: name(s) of author(s), initials, year of publication, title of the book, edition if not the first, initials and name(s) of editor(s) if any, preceded by ed(s), place of publication, publisher, and pages referred to.

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Reference pattern Journal

Reference pattern Book
OR
Blumenfeld H (2001) Neuroanatomy through Clinical Cases. Yale University School of Medicine, New York.

Reference pattern Conference

Authors are requested to prepare the manuscript carefully before submitting it for publication so as to minimize the corrections. Proofs of articles will not be provided. If there is any Editorial revision, it must be made while your article is still in manuscript form.
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Evaluating Cultural Web Usability in Global E-commerce Sites

Abdul Rehman, Asad Ali, Irfan Ahmed Magsi

Faculty of Information and Communication Technology, Balochistan University of Information Technology and Management Sciences, Quetta

Abstract

E-business has become the focus of multinational business due to enhancement and advancement in information and communication technology. The web sites are being designed on the bases basis of localization, but the cultural usability is still not the main concern of designer of e-commerce web sites. The culture plays vital rule in acceptance of web site by users. The purpose of study is to diagnoses cultural usability of global web sites.

Keywords: E-commerce, E-business, www, Web usability

Corresponding Author’s email: abdul.rehman1@buitms.edu.pk,

INTRODUCTION

Internet is the most emerging technology & source of communication and information in this age. Most of the entrepreneur are looking forward for establishing their e-business. E-commerce sites the main source, for facilitating customer in an electronic environment. The web usability plays greater role in the success or failure of any site. Most of the e-commerce site focus on target market.

There are many dimensions of the web usability and HCI, that affect the acceptance of any web site by the users, culture is one of them and most important because of its broad parameters and geographic variation. Cultural characteristics of web site users are a key factor to determining the user acceptance of a web site (Daniel, 2011). The culture has a variety of dimensions that impact on usability of the site. The problem with culture is that it is not a tangible characteristic, but it has different definitions in different cultures, liking of one culture can be a dislike of another culture. Studies proved that users are more comfortable in their native language; web sites designed without culture consideration are likely to offend other cultures (Tina, 2011).

To study culture and apply it as web usability it is necessary to define it from some prospects. The culture can be classified in two main categories objective and subjective (Daniel, 2011). The objectives characteristics of a culture are tangible properties like (color, text, language etc) on other hand subjective characteristics are properties that are intangible (values, religion, psychology thinking pattern). The e-commerce sites have uniqueness as they are designed to do online sales and purchases and it is important for a business to ensure its usability, the other challenges issue of e-commerce sites is that they are mostly applied in global market rather than focusing on local market with limited users, that increases the culture dimensions in term of variety of different cultures. E-commerce sites have high chances of success if their web sites are created with multiculturalism as the design focus (Tina, 2011). Daniel, 2011 in their paper examined cultural issues that influence web usability, by conducting a thorough study of cultural dimensions. Based on Hofstede’s cultural dimensions, they categorized the culture characteristics in two parts that is, Objective and Subjective. They showed that the acceptance of any web site depends upon cultural characteristics of the users too.

Tina, 2011 in her research document examines the characteristics of culture, focusing on language and iconography. On the bases of studies she presents two design
techniques i. Localization ii. Shared meaning approach. The document concludes that, every site must be designed to insure web usability measure. (Karatzas, 2010) In his paper investigates the web usability in term of technical and social dimensions, as social properties he uses Hofstede’s model & technical properties. The study concludes that culture web usability area needs to be researched deeper and applied by developers. (Kang 2008) in her study on culture based e-commerce investigates usability in global e-commerce websites. It was confirmed that dynamic content attract users, but static information on the web provides much easier comprehension and navigation. In conclusion she suggests a designer to be aware of cultural differences. (Kralisch, 2005) their paper is based on navigational behavior with respect to user culture. They presented three hypothesis based on Hofstede’s and Hall’s model. They concluded that: The results of study broadly confirm the impact of cultural dimensions, on web site navigation behavior. (Krischer, 2006) presented a thorough study on color on web usability as cultural dimensions. She analyzed the impact of different colors on different societies. She concluded her study by “Website color plays an extremely important role to create a successful interactive environment for the user”. (Jacque, 2007) in their research investigated impact of native language as cultural dimensions in web usability, the study was based on two hypotheses. They proved by experiment and concluded that users dislike site if the website is not in their own language and if their foreign language skills are not sufficient. (Aladwani, 2003) explored in his research about effects of national culture on web usability. The qualitative studies showed that there are many symbolic differences between two cultures like structure, function, security and focus (people, places). The Empirical Study results show that the usability variations could be more due to cultural reasons. (Sohaib 2012) in his e-commerce research paper explores the importance of usability as designers prospect, the research was based on i. Culture & Trust in Electronic Commerce ii. Cross-Culture E-Commerce Usability iii. Cross-Cultural User Interface design.

He concluded that: For a business website to be interactive for the international users, the designers must be aware of cultural factors.

MATERIALS AND METHODS
The purpose of this work is to find out the cultural significance in worlds popular global e-commerce sites. For this purpose two of the most populated nations are selected i.e. China & India which are known for their rich culture and background. The sites chosen for this study are some most renowned e-commerce names in the world i.e Amazon, ebay, Alibaba & olx. As in the literature review it was clear that culture has many dimensions ,both the technical as well as social characteristics are involved in culture. In my study I have focused on some limited properties of culture i.e. Color, Language.

Table 1: shows the sites localization (version) with respect to China and India.

<table>
<thead>
<tr>
<th>Website</th>
<th>Origen</th>
<th>Countries</th>
<th>Site for China</th>
<th>Site for India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon.com</td>
<td>USA</td>
<td>09</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ebay.com</td>
<td>USA</td>
<td>37</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Alibaba.com</td>
<td>China</td>
<td>04</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Olx.com</td>
<td>USA</td>
<td>40</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Color
(Krischer, 2006) color plays a key role in user’s experience in website interaction. “A user engages to a website not only because of initial emotional response to the color but also because of the significance of the different colored elements on the site”. Colors put very strong impact on user in its first glance; users like or dislike any website initially due to color. Color has basic three technicalities that is, Contrast, Saturation, Color blindness. These three characteristics must be taken into account according to the color while designing. The color is technical cultural issue, every culture has its own meanings i-e liking, disliking and symbolic representation for instance; in America the black dress is worn on funeral & in India the white color is worn. This shows clear contrast of color acceptance in any other culture. Table 2 shows that all the sites have used
white color as their basic color and background, whether it is their local site for China and India or the international version, the reason might be to create a site on general bases and not to involve cultures. Even the overall themes of all sites have been observed as light colors rather than giving some color flavor where required. Though the light color gives an impression of tranquility but other colors can be used with care to produce pages that grabs attention. The text color of almost all the sites are blue & black only amazon used greens and oranges for Chinese site, it is an obvious thing because the comfortably level is better in blue and black text. All the sites used colors for their menus where amazon used orange for china and silver for international version, eBay used only silver, alibaba used blue & orange respectively for china and India, olx have kept all their site menus in blue, green, orange. Because all the sites have light theme and no green & red are mixed together so there is no issue for color blinds because color blinds have problem only with green and red used together. Overall it is observed that almost all sites have their country versions but none of them tried to play with colors on their cultural bases, which reduces the usability of any website.

Table 2: Websites Color Theme and Scheme

<table>
<thead>
<tr>
<th>Website</th>
<th>Origen of Co.</th>
<th>Chaises lang.</th>
<th>Indian lang.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon.com</td>
<td>USA</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ebay.com</td>
<td>USA</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Alibaba.com</td>
<td>China</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Olx.com</td>
<td>USA</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Another aspect is that the literacy rate of China and India is 95 and 75 respectively, but from the language point of view, Chines are dependent more on their national language however, India has a good English Language reputation. This might be the reason that online business have created Chines site in their native language.

**CONCLUSION**

In this study we showed the effect of colors on e-business. The study clearly indicates that most of e-venders studied ignored cultural usability even after creating “localization” based sites. Another fact that is figured out that the second most populated country in the world which is million dollar business market is being ignored by most top global e-commerce companies.

**REFERENCES**


Exploring the Linkages between Population Growth and Economic Growth for South Asian Countries

Usman Azhar¹, Mohsin Hasnain Ahmad², Abdul Raziq ¹

¹Department of Management Sciences, Balochistan University of Information Technology, Engineering and Management Sciences, Quetta, ²Applied Economics Research Center, University of Karachi, Pakistan.

Abstract

The present study investigates the impact of population on economic growth by using the panel ARDL cointegration technique for long run and error correction model to determine the short run dynamics of system to panel data for selected south Asian countries. The empirical findings indicate that population growth rate causes the low GDP growth rate in long run for selected countries. The results also reveal that there is no short run causality from population growth to GDP growth. Findings from the study support the conventional wisdom, which stipulates that high population growth has an adverse effect on economic growth. In countries like Pakistan, India and Bangladesh, carefully planned population growth strategy could be beneficial for economic growth and eventually poverty alleviation.

Keywords: Population Growth, Economic Growth, South Asian Countries

Corresponding Author’s email: usman@buitms.edu.pk

INTRODUCTION

The effects of demography on economic performance have been the subject of intense debate in relevant literature for nearly two centuries among researchers and policy makers. The relationship between population growth and development has attained massive attention as a controversial topic in the economic development literature; that whether population growth stimulates or retards economic growth and standard of living in developing countries. The proponent group of economists argues that high population growth would increase the size of market and encourage the utilization of economies of scale. Greater population density has particular advantages for provision of education, transportation; sanitation. Division of labor is enhanced by large-scale production and, in turn, encourages technical change. On the other side, the opponent group of economist argument holds that deleterious effects of high rates of population growth on saving and investment, and therefore, future growth. Similarly, high rate of population tend to imply high dependency burdens and result in lowered private saving. They believe that a high rate of population growth is a cause of poverty that impedes economic development. Empirical studies on the long-run relationship between population and economic growth rates have produced mixed results in the existing literature. For instance, Easterlin (1967), Kuznets (1967), Simon (1992), Thirlwall (1972), Coale and Hoover (1958), and Blanchet (1991) found insignificant relationship between population and economic growth rates. On other hand, Kelly and Schmidt (1994), Coale and Hoover (1958), Blanchet (1991) found that economic and population growth rates are negatively related with respect to less developed countries. Dawson and Tiffin (1998) and Thornton, John (2001) by using cointegration analysis found that economic growth rate and population growth rate do not have long run relationship in case of India and Latin America countries, respectively. In 1950, the world population was 2.52 billion which increased to 6.06 billion in 2000 and is likely to reach 8.3 billion by the year 2030. While, the population size will remain almost
stationary in the more developed world during the period 2000 to 2030 around 1.2 billion, it is likely to grow from 4.87 billion to 7.1 billion during the same period in the less developed regions. Therefore, most of the growth in population size is going to be occurred in the less developed countries (UN 2001). These trends provide a good ground for research on South Asian countries and present paper focuses on three South Asian countries namely, India, Pakistan and Bangladesh.

South Asia is included among those regions, which are highly populated. Currently, its population is around 1.45 billion, almost 22.1% of world’s population; it contains more than 40 percent of the world’s poor. In order to explore the robust empirical results for policy analysis the present study investigates the long run and short run dynamic relationship between population and economic growth by using Auto regressive Distributive Lag (ARDL) approach to co integration for South Asian countries. To the best of our knowledge, no attempt has yet been made to study the long run and short run dynamic relationship of population growth and GDP growth by using Auto regressive Distributive Lag (ARDL) approach to co integration for South Asian countries. The plan of the paper is as follows: section 2 provides an overview of demographic and economic variables in selected South Asian countries, data sources and econometrics methodology is discussed in Section 3, the empirical findings are presented and analysed in section 4. The section 5 presents a concluding summary.

Trends of Demographic and Economic Indicators

Table 1: Demographic Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Bangladesh</th>
<th>India</th>
<th>Pakistan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population Growth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990s</td>
<td>2.63</td>
<td>2.09</td>
<td>2.94</td>
</tr>
<tr>
<td>2000s</td>
<td>2.49</td>
<td>2.12</td>
<td>2.07</td>
</tr>
<tr>
<td>2010s</td>
<td>1.91</td>
<td>1.92</td>
<td>2.41</td>
</tr>
<tr>
<td>Mortality Rate (per 1000 Adult)</td>
<td>3.22</td>
<td>3.28</td>
<td>3.11</td>
</tr>
<tr>
<td>1990s</td>
<td>2.13</td>
<td>2.13</td>
<td>2.20</td>
</tr>
<tr>
<td>2000s</td>
<td>2.12</td>
<td>2.17</td>
<td>2.20</td>
</tr>
<tr>
<td>Population Density Growth (per Person)</td>
<td>2.80</td>
<td>2.88</td>
<td>2.83</td>
</tr>
<tr>
<td>1990s</td>
<td>1.76</td>
<td>1.78</td>
<td>2.43</td>
</tr>
<tr>
<td>2000s</td>
<td>1.95</td>
<td>1.49</td>
<td>2.01</td>
</tr>
<tr>
<td>Fertility Rate (per Woman)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990s</td>
<td>5.5</td>
<td>5.5</td>
<td>7.0</td>
</tr>
<tr>
<td>2000s</td>
<td>4.7</td>
<td>3.5</td>
<td>5.5</td>
</tr>
<tr>
<td>2007</td>
<td>3.1</td>
<td>2.4</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Source: World Development Indicators

Table 1 presents demographic trend of three south Asian countries. Population growth rate in Pakistan was declining steadily in 1970s and it averaged 2.7% in 1980s and reached 2.4 percent in 1990s and 2000 onward. Population growth rate is still higher comparatively and according to UN projections, Pakistan will become the fourth most populous country by the year 2050. In terms of population growth rate, India and Bangladesh have more declining trend than Pakistan. In 1970’s it was 2.29 % for India and 2.53% for Bangladesh but, and declined to 1.52% for India, and 1.91% for Bangladesh in 2000-07. Although, it is showing a declining trend over decades, but still very high as compare to other countries of the world. Similarly, there are indications of a downward trend; fertility rates in Pakistan but still remain high. In the 1970s and 1980s the total fertility rate (TFR - total number of children that would be born per woman if current fertility rates persisted) was 7 per woman and 6.5 per woman respectively. TFR dropped to 5.5 children during the 1990s and 4.5 children during 2000-07. In India, fertility rate was 5.5 children per woman in 1970s but now it is 2.4 children on average per woman in 2000-07. For Bangladesh TFR were 6.5 children in 1970s and 3.1 children in 2000-07. Pakistan’s population density grew at an accelerating rate of 3.11% in 1970s, showing steady declining to 2.73% in 1980s and reduced to 2.43% in 1990’s but again show a rising trend; population density grew at 2.51% in 2000-07. Population density in Pakistan is higher than other countries. Although, till 1990s, population density show a declining trend in case of all three countries, but, in case of Pakistan and Bangladesh once again showing an increasing trend and reached 2.51 in case of Pakistan and 1.95 for Bangladesh relative to 2.43 in 1990s for Pakistan and 1.76 in case of Bangladesh in 1990s. In India, population density growth showing a declining trend from 1970s to 2000-07. A table (2) show that the highest mortality rate is in Bangladesh while Pakistan’s rank is third the respect to mortality rate. The mortality rate was 387 per thousand adult in 70s, declining to 231 per thousand adult in 80s, 160 per thousand adult in 90s and 155 per thousand adult in 2000-07.
Pakistan’s growth performance in the decades of 70s and 80s was impressive as compare to 90s. As the Table (2) show that growth rate of real GDP was 4.7 and 6.3 in 70s and 80s respectively, which declined 3.9 in 90s and increase to 4.7% in 2000-07. A large part of high growth in 70s and 80s was spent simply on sustaining a very high pace of population expansion (3%). Pakistan’s higher population growth rate is reflected by lower growth rate of GDP per capita growth high than other countries (Table: 2). Growth performance of India drastically increases from 3.1% in 1970 to 5.8% in 1980 and reached to 6.5% in 2001-07. Growth performance of Bangladesh is showing upward trend from 1.8% in 1970s to 5.5% in 2001-07.

Table 2: Trends in GDP and Per Capita Income Growth

<table>
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<tr>
<th></th>
<th>Pakistan</th>
<th>India</th>
<th>Bangladesh</th>
</tr>
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<tr>
<td>Growth in GDP Per Capita</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1970's</td>
<td>1.5</td>
<td>0.8</td>
<td>-0.7</td>
</tr>
<tr>
<td>1980's</td>
<td>3.5</td>
<td>3.6</td>
<td>2.2</td>
</tr>
<tr>
<td>1990's</td>
<td>1.4</td>
<td>3.6</td>
<td>2.9</td>
</tr>
<tr>
<td>2000-07</td>
<td>4.4</td>
<td>4.9</td>
<td>3.5</td>
</tr>
</tbody>
</table>

| Growth in GDP |
| 1970's       | 4.7      | 3.1   | 1.8        |
| 1980's       | 6.3      | 5.8   | 4.8        |
| 1990's       | 3.9      | 5.5   | 4.8        |
| 2000-07      | 4.7      | 6.5   | 5.5        |

| GDP Per Capita (Constant 1995 $) |
| 1970's       | 281.7    | 217.6  | 213.0    |
| 1980's       | 391.7    | 273.9  | 258.9    |
| 1990's       | 493.1    | 388.8  | 323.6    |
| 2000-07      | 549.6    | 507.8  | 395.9    |

The model consists of variables, Population Growth Rate (PG), GDP growth rate (GR), inflation rate (INF), investment rate (INV) and Market exchange rate(ER). The data for the study consist of annual observations. The data regarding all variables for Pakistan, Bangladesh and India are obtained from World Development Indicators, published by the World Bank. The sample spans from 1972 to 2010.

Table 3 represents descriptive statistics and bivariate correlations. The estimates of table (3) indicate that GDP growth rate and population growth rate are negatively correlated in all three countries.
The error correction term in the model indicates the speed of adjustment back to long run equilibrium after a short run shock. To ensure the goodness of fit of model, the diagnostic and stability tests are also conducted, the diagnostic test examine the serial correlation, functional form, normality and heteroscedasticity associated with selected model.

RESULTS

Testing of the Panel unit root hypothesis

To test the unit root hypothesis to all variables, Pesaran and Shin (W-Stat) and Levin, Lin & Chu (t-Stat) were applied to panel series, while ADF test, PP test were applied to individual cross sections. A summary of these test results is provided in Table 2. First, these tests were applied with the variables in levels, followed by their first difference form. Results show that the variables are having different order of integration which enables us to apply Auto Regressive Distributive Lag Modal (ARDL).

Table 4: Panel Unit Root Test

<table>
<thead>
<tr>
<th>Variables</th>
<th>Im. Pesaran and Shin (W-Stat)</th>
<th>Levin, Lin &amp; Chu (t-Stat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR</td>
<td>Level</td>
<td>1st diff.</td>
</tr>
<tr>
<td>PG</td>
<td>-4.67</td>
<td>-6.78</td>
</tr>
<tr>
<td>INV</td>
<td>-1.06</td>
<td>-3.98</td>
</tr>
<tr>
<td>INF</td>
<td>-1.51</td>
<td>-3.89**</td>
</tr>
<tr>
<td>ER</td>
<td>-3.82**</td>
<td>-9.12</td>
</tr>
</tbody>
</table>

* Represents significant at 1%, ** Represents significant only at 5%

Lag Selection of Panel ARDL

After finding that the underlying regressors in the model, i.e. in our case variables of GDP growth rate and Population growth rate are integrated of mix order for each country, the two-step panel ARDL cointegration is used to find out for long run and short run dynamic relationship between GDP growth rate and Population growth rate. In the first stage, the order of lag length on estimating the conditional error correction version of the panel ARDL modal is usually obtained from unrestricted vector autoregressive (VAR) by means of Schwartz Bayesian Criteria (SBC) and Akaike Information Criteria which is 2, based on the minimum value (AIC) as shown in table below:

Table 5: Lag Length Selection

<table>
<thead>
<tr>
<th>Lag</th>
<th>AIC</th>
<th>FPE</th>
<th>SBC</th>
<th>F-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.73</td>
<td>1.79</td>
<td>4.67</td>
<td>9.62*</td>
</tr>
<tr>
<td>2</td>
<td>4.88*</td>
<td>1.09*</td>
<td>4.26*</td>
<td>11.48*</td>
</tr>
</tbody>
</table>

Overall, our results parts of which are displayed in table 4 provide some evidence in favor of the existence of a long run relationship between the per capita GDP growth rate and population growth rate. The results of bound testing approach show that calculated F statistics is (11.48) which is higher than upper bound critical value at 1% level of significant implying that the null hypothesis of no co integration can not be accepted and there is indeed a co integration relationship among the model. Hence we have a long run relationship between GDP growth and population growth rate in case of three South Asian countries. Having found a long run relation relationship we applied the ARDL method to estimate the long run and short run coefficients (see Pesran et al 2001 details). Long run relationships are shown in Table 7 to test the percentage increase or decrease of change we regressed the GDP growth rate on linear term of population growth rate.

Table 6: Estimated Long Run Coefficients using the Panel ARDL Approach

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>ARDL (2 1 2 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regressors</td>
<td>Coefficient</td>
</tr>
<tr>
<td>PG</td>
<td>-0.82</td>
</tr>
<tr>
<td>INV</td>
<td>0.34</td>
</tr>
<tr>
<td>INF</td>
<td>-0.72</td>
</tr>
<tr>
<td>ER</td>
<td>0.02</td>
</tr>
</tbody>
</table>

R-Squared = 0.89
R-bar-squared = 0.87
F-stat = 10.36(0.00)

As table (6) shows that all estimated long run coefficients of variables is significant and have expected signs. The population growth rate which is core variable in the present study has negative sign and significant at 1 percent level for all three countries. The results support the conventional wisdom and
indicate that high population growth rate leads to lower economic growth in long run. The results strongly support the view that one of the reasons of lower economic growth is a high population growth rate developing country.

Table 7: Error Correction Representation of Panel ARDL Model

<table>
<thead>
<tr>
<th>Regressors</th>
<th>ARDL (2 1 2 2 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔPG</td>
<td>-0.12</td>
</tr>
<tr>
<td>ΔINV</td>
<td>3.34</td>
</tr>
<tr>
<td>ΔINF</td>
<td>21.6</td>
</tr>
<tr>
<td>ΔER</td>
<td>13.35</td>
</tr>
<tr>
<td>EC (-1)</td>
<td>-0.45</td>
</tr>
</tbody>
</table>

The estimated lagged error correction term ECt-1 is negative and highly significant, supporting the co integration among the variables represented by equation 1. The feed back co efficient is -0.45 suggests that about 45% dis equilibrium is corrected in the current year. The result also suggests that in the short run population growth rate and investment rate have no significant impact on GDP growth rate in all three countries, while inflation rate and exchange rate have significant impact on GDP growth rate in all three countries. This implies that in the short run when population growth rate increase the production and income level also increase which leads to higher GDP but the picture on other hand is opposite in the long run.

DISCUSSION AND CONCLUSION

This paper has examined the long run relationship between economic growth and population growth for Pakistan, India and Bangladesh by using panel ARDL co integration approach. The empirical results indicate that there is exhibit a reliable long run causal relationship between population and GDP growth rates for selected south Asian countries. The results reveal that population exert negative impact on economic growth .Therefore, high population growth tends to lower growth rate of GDP in long run in these countries. Similarly, there is short run no causality from population to GDP growth rate for all three countries.

On the basis of empirical findings, it is recommended that the carefully planned population growth strategy coupled with institutional and policy changes could be beneficial to these countries. Human resources development strategies have been used as a weapon against poverty in many developing countries. Since human resources crucial role in the process of economic development and hence poverty reduction but this is only possible to huge investment in human resources in development region .Due to masses population the per capita investment on human resources is extremely low and thus not contributing positively in the development of human resources. High population and low real per capita income couples with poor social indicators during the past four decades eroding the economic and social progress of this region. Enhancement of education levels, improvement of health status and skilled labor, all can contribute greatly to the reduction and alleviation of poverty. Thus, Human capital formation will play vital role to sustain high growth rates in medium to long term. In the first place, the ability to reduce population growth rate will critically depend upon human resource development, especially education of woman.

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Synthesis And Characterization Of Strontium Hexaferrite By Solid State Reaction

Muhammad Talal¹, M.S. Awan² and M. Noor ul Huda Khan¹, Hamdullah Khan¹

Department of Physics, Balochistan University of Information Technology, Engineering & Management Sciences, Quetta, ²Department of Physics, COMSATS Institute of Information Technology, Islamabad,

Abstract

The characterization and magnetic structural properties of strontium hexaferrite (SrFe₁₂O₁₉) has been prepared by solid state reaction method. The Pellets melted at different temperatures 1000°C for 2 hour & 1200°C for 3 hour. For structural study, X-ray diffraction (XRD), scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS or EDX) and magnetic properties were performed. We observed hexagonal crystal structure of strontium hexaferrites refined from X-ray single crystal data and also observed peak value of angle 2θ is 31.9 at 11500 intensity for 1000°C and 31.85 at 12500 intensity for 1200°C. By using SEM technique we observed the topography and morphology of the samples. The B-H curve for the strontium hexaferrites samples was observed at different parameter such as saturation magnetization, remanence and coercivity, under different temperatures.

Keywords: Solid state reaction, X-rays diffraction, Scanning electron microscopy, Energy dispersive X-ray, B-H curve and Comparison.

Corresponding Author’s email: noorulhudakhan@gmail.com

INTRODUCTION

Strontium hexaferrites has been widely used as a permanent magnet because of its large magnetocrystalline anisotropy and high Curie temperature, with its relatively large saturation magnetization, reduce the resistivity, excellent chemical and thermal stability (Shan et al,.2005). Strontium hexaferrites is permanent magnet and its formula is (MFe₁₂O₁₉), where M stands for Sr, Ba, and Pb etc. Its crystal structure is hexagonal magneto sometimes called M-type hexaferrite. The M-type hexaferrite crystallizes in a hexagonal structure with 64 ions per unit cell on 11 different symmetry sites. The unit cell contains 38-oxygen ions, 24-ferric ions and 2 M ions (Joyce, 2007 and Pual and Millan,2000). Ferrites have been found to be the best magnetic materials. It’s widely used in many applications due to good combination of magnetic and electrical properties. Ferrite is a class of ceramic materials with useful electromagnetic properties (Maqsood et al,.2011). Strontium hexaferrite is a dielectric material. The high electrical resistivity of hexaferrites coupled with their low magnetic losses is critical in maintaining low incorporation loss in microwave devices (Pillai, 2003).

MATERIALS AND METHODS

Chemical Compositions of Material

Atomic weight of strontium hexaferrite material is

*Fe = 55.8457 amu.  
*Sr = 87.6200 amu.  
*O = 15.9994 amu.*
The materials have been found in a nano crystal powder form, having a percentage of purity is 99.99%. These materials are SrCO$_3$ and Fe$_2$O$_3$. We have been preparing strontium hexaferrites SrO 6(Fe2O3), and measured by highly accreted sensitive balance.

**Mixing of Compounds**
Mixing of materials is an important step in the preparation of strontium hexaferrite. These materials were mixed by using the instrument called Ball milling.

**Pelleting**
Hydraulic pressing machine used for 10 to 20 Ton. Under such a pressure the required shape and size have been achieved.

**Heat Annealing**
In this process annealed the sample of pellets at different temperature at different timing by using the Crucibles. The pellets have been annealed at 1000°C for 2 hour and 1200°C for 3 hours respectively. Samples which have been prepared and then describe the result of XRD, SEM, EDX and B-H curve.

**RESULTS & DISCUSSION**
The linear thermal coefficient for strontium hexaferrite was found to be $14 \times 10^6$ and $10 \times 10^6$ K$^{-1}$ for the sample placed parallel and perpendicular to the coaxial-axis, respectively. The value of thermal conductivity is 2.69 Wm$^{-1}$K$^{-1}$ and heat capacity per unit volume of strontium hexaferrite at room temperature is 2.73 MJm$^{-3}$K$^{-1}$ (Hberey and Cockel, 2003). The hardness value of strontium hexaferrite is 8.6 k Nmm$^{-2}$ (Veldkamp et al, 1976). And flexible strength is $86.3 \pm 7.8$ Nmm$^{-2}$ (Kools, 1973).
X-ray diffraction (XRD) image at 1200°C

Figure 4: XRD is used to study the crystal structure of Strontium hexaferrite, which is prepared at 1200°C for 3 hours.

Scanning Electron Microscopy (SEM) image at 1200°C

Figure 5: SEM micrograph image of Strontium hexaferrite at 1200°C temperature

Hysteresis curve (B-H curve) image at 1200°C

Figure 6: Magnetic Hysteresis curve of the Strontium hexaferrites at 1200°C temperature.

CONCLUSION

In this research paper we have investigated the characteristic and magnetic structural properties of Strontium hexaferrite SrFe_{12}O_{19} using X-ray diffraction ‘XRD’, scanning electron microscopy ‘SEM’, and B-H curves. Crystalline have been grown by solid state reaction method. The pallets were melted at different temperatures. Hexagonal structures have been observed at room temperature and also provide the information on the structures, phases and other structural parameters such as lattice constant, cell volume, crystallite size and X-ray density. By using scanning electron microscopy I have observed the microscopic structure of strontium hexaferrites compound at different temperature. I have observed fracture, dust particles in the alloy and also observed the presence of oxygen. The variation of saturation magnetization, remanence and connectivity properties of B-H curves have been observed under different temperature. The hysteresis loop shows the relationship between the induced magnetic flux density “B” and the magnetizing force “H”. Hard magnetic materials have rectangular hysteresis loop and has the wide hysteresis loop due to strong magnetization.

REFERENCES

- Che S, Wang J and Chen Q, Structure Research Laboratory, University of Science and Technology of China, Hefei, China.
Wave Propagation into Buildings

Ehsanullah Kakar¹, Farhan Elahi ², Faisal Khan ², Kamran Ali ²,
¹ Faculty of Engineering, ² Faculty of Information & Communication Technology, Balochistan University of Information Technology, Engineering and Management Sciences, Quetta.

Abstract

This paper investigates radio wave propagation into buildings illuminated from an outdoor base station with an antenna above the rooftop. Field strength measurements are taken in four buildings in urban microcells. Results of our experiments as well as those of several other authors are analyzed and the important factors influencing building penetration loss have been discussed namely angle of incidence, external wall configuration, receiver height and significance of non-line-of-sight surface of the building.

Keywords: Building penetration loss, Radio wave propagation, Outdoor-to-indoor propagation, Urban microcells, Non-line-of-sight illumination

INTRODUCTION

By the end of 2007, the global mobile base exceeded 3.25 billion connections, or over half the world’s population [Green et al 2007]. With handsets and services becoming ever more affordable, the prospect of a fully connected mobile world is becoming ever more real. With present third generation telecommunication systems such as Universal Mobile Telecommunication System (UMTS), telco operators are able to provide wireless data services like Internet at data rates up to 2 Mbps in dense urban and indoor environments (Karner et al. 2006).

Since we spend considerable time inside buildings, it becomes indispensable for the network provider to cover indoor areas. Network providers, however, are always interested in a cost effective approach to utilise the existing microcell base stations to cover indoor areas. For the network provider, providing indoor coverage means additional difficulties. In addition to signal strength in urban streets, he has to predict signal losses in a completely different and complex environment. In order to accurately predict the radio wave coverage in any environment, network providers require a thorough knowledge of the channel characteristics such as the surrounding clutter, angle of arrival, frequency of operation etc. This work presented and investigates the radio propagation into buildings.

The proposed received-signal-strength estimation technique uses a topological map of the one-hop neighborhood. Each vehicle along the LOS path between the sender and the receiver is counted as a source of signal attenuation. The accumulated signal attenuation is the sum of attenuation caused by each vehicle along the LOS path. Multiple knife-edge diffraction model is used to account for the loss with each obstructing vehicle counted as a source of diffraction. The simulation results show that the attenuation strictly depends on the angle of the obstacle with the sender and the receiver nodes. A single vehicle as obstacle can cause a received signal strength drop between 2 to 20dB.

MATERIALS AND METHODS

Measurements were taken inside and around the perimeter of four buildings in the metropolis of Karachi. The buildings were
typical urban structures of reinforced concrete, varying from 2 to 9 storeys in height, having coated and uncoated glass windows. The buildings included two of the campus buildings (referred to as A and B in this paper) of the Institute of Management and Computer Sciences, Bahria University and two apartment buildings (referred C and D) in the city downtown. Measurements were taken at 900 MHz with base station (BS) antenna located above rooftop level at a height of 25 m. The BS antenna had a gain of 17.7 dBi, transmit power of 60 dBm and electrical down tilt of 7°. Ericsson Test Mobile System (TEMS) was used to measure the received signal strength on the downlink channel. The TEMS receiver was camped to a particular ARFCN of broadcast control channel (BCCH) and the signal strength was measured within one (51×8) multiframe of 480 ms (sampling rate of approximately 100 samples per frame).

Table 1: Rss on Each Floor of the Buildings.

<table>
<thead>
<tr>
<th>Building &amp; Floor No</th>
<th>Floor Area [m²]</th>
<th>Tx-Rx [m]</th>
<th>Mean RSS Outside [dBm]</th>
<th>Mean RSS Inside [dBm]</th>
<th>Building Loss [dB]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A f1</td>
<td>1386</td>
<td>-40</td>
<td>-69.2</td>
<td>-69.5</td>
<td>19.9</td>
</tr>
<tr>
<td>A f2</td>
<td></td>
<td>-64.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A f3</td>
<td></td>
<td>-61.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B f4</td>
<td>692</td>
<td>-40</td>
<td>-65.11</td>
<td>-65.4</td>
<td>12.6</td>
</tr>
<tr>
<td>B f5</td>
<td></td>
<td>-59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B f6</td>
<td></td>
<td>-64.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C f1</td>
<td>680</td>
<td>-37</td>
<td>-61.8</td>
<td>-61.2</td>
<td>18.4</td>
</tr>
<tr>
<td>C f2</td>
<td></td>
<td>-61</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>C f3</td>
<td></td>
<td>-61.6</td>
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<td></td>
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<td>C f4</td>
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<td>C f5</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>C f6</td>
<td></td>
<td>-63.4</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>C f7</td>
<td></td>
<td>-63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D f1</td>
<td>806</td>
<td>-45</td>
<td>-68</td>
<td>-66.6</td>
<td>18.6</td>
</tr>
<tr>
<td>D f2</td>
<td></td>
<td>-65.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D f3</td>
<td></td>
<td>-63.8</td>
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<tr>
<td>D f4</td>
<td></td>
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</tr>
<tr>
<td>D f5</td>
<td></td>
<td>-61.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D f6</td>
<td></td>
<td>-61</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Building penetration loss in this work is defined as the difference between the average of local power means (in dBm) measured outside a building at street level in the adjacent streets and the average of local power means on a specific floor inside the building. The outside reference measurements were taken about 2 meters from the external wall and around two 2 meters above the ground. The measurements were taken around the complete perimeter of a given building regardless of whether the street is directly illuminated or not. The indoor measurements were taken in all the rooms inside the building. The arithmetic means were calculated over measurement lengths of 6.25λ (2m) inside the buildings. Local means were calculated as arithmetic averages within rooms.

RESULTS AND DISCUSSION

Table 1 shows the average received signal strength on each floor inside the four buildings along with the corresponding outdoor signal strengths and the mean building penetration loss values.

The building penetration loss calculated here is the difference between the average of local power means in the illuminated street along the building and the average of local power means inside the building. The average building penetration loss in four buildings was found to be 18 dB which is consistent with the works of (Karner et al. 2006, Martijn et al. 2003 and Turkmani et al. 1991).

All the four buildings investigated had more or less a similar trend of power level inside. The building penetration loss in building B is small due to the fact that B is being illuminated on two facets as well as on the
roof and also due to a relatively straight out floor plan without too many partitions. The received signal strength (RSS) on ground floor and outside street level of building A and C is depicted in Fig. 1 and Fig. 2, which represents the typical trend found in the experiment.

Signal strength distribution depicted follows a plausible behavior. Indoor power level is high near the illuminated surface and decreases with distance and internal building partitions while moving away from the surface. In Fig. 1 Building A is illuminated perpendicular from the front facet while it is also receiving strong reception in one side facet which is probably due to the surrounding clutter. In the figure, the three front rooms are receiving maximum reception because here the propagation is perpendicular and it is only obstructed by the external wall while there are no internal partitions.

The two adjacent rooms on south have very weak reception because of the lack of wall openings. Further indoors, in the lobby the reception is nearly consistent due to uniformity of penetration channels; the penetration points are the two door openings in the front facet — one in the north and the other in the south. In the rooms deeper inside the building the reception is understandably weaker due to propagation being obstructed by a number of partitions along the way.

Fig. 2 shows the coverage in the apartment building C. The clutter here is perfect dense urban where the street is enclosed with high rise structures on either side and the transmitter is located below the mean roof top level of the buildings. The building is illuminated with one side while the surrounding dense clutter causes a good reflection mechanism, which is why strong reception can be observed at the side facets as well. However, due to the angle of incidence, the front facet can be seen as a stronger source of reception for the immediate rooms inside. Some coverage uniformity in clusters of rooms is also observable inside. It is due to the clustering of rooms in apartments, since rooms in the same apartment have fewer partitions and can therefore support easy propagation than between rooms located adjacent but in different apartments.

Factors Influencing Building Penetration Loss

Propagation into buildings involves a more complex mechanism than that of the outdoor radio channel which is dependent on path length, frequency, height of the mobile and base station and the environment local to the mobile station. In addition to these variables, indoor propagation is effected by several other variables as reported in the works of (Toledo et al. 1998, Davidson et al. 1997, Glazunov et al. 2000) such as existence of line of sight condition, building construction material, internal floor plan, floor area, antenna pattern, down tilt, cell size et al.

Here we discuss only the most influential factors affecting the building penetration loss observed in the experimental study.

**Angle of Incidence**

To cover indoor areas, buildings are illuminated under different incident angles from the outdoor base stations; The effect of the angle of incidence is something that has to be accounted for. Certain models (Toledo et al. 1998, Glazunov et al. 2000) include in their formulation the effect of this angle where an extra loss factor is added to the loss under. A steady variation of signal strength with increasing angle of incidence on the illuminated surface can be noticed in Fig. 3. As the angle of incidence on the surface increases the difference of outdoor-to-indoor power levels decreases. Angle of incidence
Exterior Wall Configuration
The most important factor influencing penetration loss is the external interface i.e. the external wall of the building. Among important parameters of the external interface like the width of the wall and wall material, the defining parameter is the configuration of the external interface. The configuration (arrangement) of windows and wall in the interface effects the overall propagation into building. In our experimental study a high variation of signal strength was observed in some cases even between adjacent rooms facing the same facet of the building. Adjacent rooms, despite being identically oriented towards the transmitter, showed standard deviation of as much as 12 dB. This is because of the difference of window-wall arrangement in the building facet for each room. Rooms having larger proportion of windows on the building facet receive higher power levels than others. Most of the outdoor-to-indoor coverage estimation models consider a fixed value to account for the external interface loss. However, it is observed that not all rooms inside the building have uniform external interface i.e. some rooms may have a larger portion of windows and therefore can receive higher field strength than others and therefore can receive higher field strength than others with less or no windows (Kakar et al., 2008).

Receiver Height Inside the Building
As shown in Fig. 4, among the four buildings a steady increase in power level with receiver height in building D is of interest. An increase of approximately 1.5 dB was observed on each floor while moving upward in building D. However this effect is not found in the remaining three buildings. The ascendancy in building A and B is because of the antenna pattern; both the buildings are situated very close to the 25m high transmitter and the lower floors unlike the upper floors do not receive the direct antenna beam. The effect in building D, however, is because of the phenomenon called the height gain effect, reported in most of the works on outdoor-to-indoor propagation. It is explained by the fact that in buildings with NLOS illumination, waves are received after reflection from the surrounding clutter. On lower floors a larger number of surrounding structures are involved in the reflection mechanism while on higher floors only few surrounding structures have enough height to obstruct the line of sight.

Non-line of Sight Facade
Signal strength distribution depicted in Fig. 1 and Fig. 2 follows a reasonable behaviour. Indoor power level decreases with distance and internal building partitions while moving away from the surface. However, it can be noticed that rooms located away from the illuminated surface are receiving signals from the non-line-of-sight (NLOS) surface. It is because of the strong reflections in the outdoor clutter and diffraction from the edges of the building under observation resulting in a considerable coverage in NLOS streets. It can be deduced that the LOS surface may not always be responsible for signal propagation into every room inside the building.

The hitherto outdoor-to-indoor coverage estimation models consider the LOS surface to be always responsible for indoor coverage from an outdoor transmitter (Kakar et al., 2008). However, improved prediction accuracy can be experienced if at least two propagation paths are considered in calculating the signal level for every location inside the building: one through the LOS surface of the building and the other through the side facet closest to the mobile station. The prediction would be improved particularly in the rooms located away from the LOS surface where the NLOS facet can be a dominant source of propagation.
CONCLUSION
We presented field strength measurements carried in four buildings. Typical coverage patterns on different floors of the buildings are shown. The average building penetration loss in four buildings was found to be 18 dB. The signal propagation behavior in each of the four buildings is discussed and the results of the performed experiment are analyzed. The effect of angle of incidence on building penetration loss is reported. The influence of the external interface of the building on propagation loss is also observed. Height gain effect observed in the measurement is examined. It is also noticed that a reasonable amount of penetration occurs from the non-line-of-sight (NLOS) facet of the building, suggesting that the LOS surface may not be always responsible for outdoor-to-indoor propagation in rooms located deep inside the building.

REFERENCES

Recovering VANET Safety Message in Transmission Holes

Faisal Khan¹, Farhan Elahi¹, Kamran Ali¹, Sadique Ahmed Bugti¹, Ehsanulla Kakar²

¹Faculty of Information & Communication Technology, ²Faculty of Engineering, Balochistan University of Information Technology, Engineering and Management Sciences, Quetta.

Abstract

The core concern in vehicular ad hoc networks (VANETs) is the reliable transfer of safety-related messages to all endangered vehicles on the road. The recent discovery of the presence of transmission holes in the VANET communication range poses a serious challenge in the safety-message propagation. In this work, a technique for recovering the safety message for vehicles located in the transmission holes is proposed. Each vehicle that successfully receives the safety message actively estimates propagation loss for its immediate neighbors. If the receiving vehicle determines one of its neighbors being located in a coverage hole, the safety message is rebroadcast by the receiving vehicle. The propagation-loss estimation makes use of the topology information appended in the periodic beaconing messages. The proposed technique is evaluated in the ns-3 simulator. The simulation results suggest that the proposed technique improves the overall message-dissemination reliability over the existing techniques.

Keywords: Transmission holes, VANETs, Safety message, Routing, Packet reception rate, Received signal strength.

Corresponding Author’s email: faisal.khan@buitms.edu.pk

INTRODUCTION

Vehicular ad hoc network (VANET) is a collection of vehicles equipped with wireless communication capability, spontaneously forming a network while moving on the road. Vehicles cooperate to deliver safety-related information through multi-hop paths without the need for central administration. The dissemination of safety-related information among vehicles on the road helps drivers to anticipate hazardous events and maneuver accordingly to avoid potential dangerous events. With timely and reliable wireless communication between vehicles, VANET is aimed at providing passenger safety by exchanging real-time traffic-hazard messages among vehicles. In addition to safety-related services, VANET can also offer infotainment services by providing high-speed Internet connectivity onboard the vehicle.

The distinctive VANET topology and its dynamic wireless-signal environment pose a serious challenge in VANET communication. Vehicle movements are bound by street maps, traffic signals and regulations, and the movement of surrounding vehicles. Consequently, the distribution of vehicles is highly non-uniform, and the connectivity among them is highly random. Furthermore, the inevitable use of common control channel for safety applications makes communication immensely vulnerable to collisions and interference from both visible and hidden nodes. The unique VANET characteristics cause challenging research concerns in information propagation and routing.

The low height of antennas onboard the vehicles causes the optical line-of-sight (LOS) to be obstructed by obstructions, in particular by the mobile obstructions, causing transmission holes in the transmission range.
Most of the existing studies consider static obstructions as the only source of obstruction in the message-propagation path (Otto et al. 2009, Cheng et al., 2007). However, since the significant portion of vehicle-to-vehicle signal propagation is bound to the road surface, it is imperative to consider surrounding vehicles on the road as obstacles in the LOS path between two communicating nodes. Recent studies on safety-message propagation (Meireles et al. 2010, Boban et al., 2011) suggest that a single vehicle as an obstacle in the LOS path can cause signal attenuation by as much as 20 dB. Consequently, in traffic with a large density of public transportation and commercial vehicles, it is highly probable that there exist a number of coverage holes in the transmission range. The existence of coverage holes causes several vehicles to be completely unaware of the ongoing safety-message transmission. In such a scenario, the use of a feedback-triggered recovery is not possible because the given vehicle located in the transmission hole can not request recovery as it is completely oblivious of the activity in the channel. The lack of feedback from vehicles located in holes makes reliability a serious challenge in the safety-message propagation. To the best of our knowledge, this is the first work that addresses the issue of covering transmission holes in VANET safety-communication scenario. We present a message recovery technique that takes advantage of the topology information contained in periodic beacon messages. Simulation results using ns-3 simulator show that the proposed technique nearly guarantees the delivery of VANET safety messages.

The proposed technique for the coverage of holes

Message origination and forwarding
The safety-message origination and forwarding to the next hop is carried by the base routing protocol. In this explanation of the proposed algorithm, the urban multi-hop broadcast (UMB) [Korkmaz et al. 2004] is considered as an example base protocol. However, as described above, the proposed reliability technique is flexible to be incorporated on top of any base routing method.

After sensing a hazardous event on the road, the original node initiates the safety-message transfer. The node broadcasts the safety alert message within its one-hop transmission range. In case the message is intended for multiple hop distance, then one of the receivers rebroadcasts the message to the next hop after following an elimination mechanism.

The general elimination mechanism used by most of the routing protocols is based on a sectoring method. The transmission range of the sender node is divided into multiple sectors based on the distance from the sender node and the density of vehicles. The back-off assignment is carried in a way that the furthest nodes in the transmission range receive the smallest back-off values. Therefore, a node furthest from the sender rebroadcasts (or forwards) first. After the rebroadcast is carried by the node, the remaining nodes with higher back-off values overhear the rebroadcast and quit their rebroadcast process. During the message propagation when the broadcast transmission takes place in each hop, the critical role of the proposed technique come in to play to ensure that the message is received by every node in the intended distance. The proposed technique tracks the delivery of the message at each node individually and guarantees the reception of the message.

Message recovery
The scenario for recovering the safety message in a transmission hole is illustrated in Figure 1. Three vehicles (X, Y and Z) are assumed as being completely obstructed in the line-of-sight (LOS). Therefore, the nodes X, Y and Z are oblivious of the original broadcast from node A, these vehicles are termed as the nodes in holes. The remaining nodes within the broadcast range are assumed to receive the safety message
successfully. After the reception of the safety message by the remaining nodes, each receiver node checks the reception at its immediate neighbors to determine the need for any recovery rebroadcast.

The immediate neighborhood is defined as the area around a given node \( a \), covered by a circle of radius \( r \), such that there exist two nodes \( b \) and \( c \), where \( r = |a - c| \) and \( |a - b| \leq |a - c| \).

Moreover, \( r \leq |a - z| \) for any node \( x \) where \( x \neq a \neq b \neq c \). Therefore, \( r \) is the smallest radius around a given node that can house two other neighboring nodes. A single neighboring node may be suffice as a rescuer, the reason for keeping two nodes in the immediate neighborhood is to provide additional reliability at the recovery stage.

Each node maintains the topology information of the surrounding broadcast range. The topology information is gathered from beacon messages that are received periodically from all the surrounding nodes. The beacon message is also appended with vehicle-type information, which is used in estimating the attenuation effect of the vehicle. Moreover, as described earlier, each node is equipped with a GPS and a digital map. The assumption is congruous with most of the studies on VANET communication. To determine the need for a recovery rebroadcast, each node generates the road topology with nodes located on the map by using the respective location, the speed, and the direction information of the nodes; all acquired from the periodic beacon messages. The node can then determine its respective immediate neighbors and runs the received-signal strength (RSS) estimation for each the immediate neighbors. The RSS estimation is carried using the angle between the given immediate neighbor and the original sender. A node located in the LOS path between the sender node and the receiver node is counted as an obstruction, with an attenuation effect on the signal depending on the obstructing-vehicle type (Meireles et al., 2010, Boban et al., 2011). The loss caused by the road surroundings can also be considered for additional accuracy in the RSS estimation (e.g., the recommendations in (Otto et al., 2009, Giordano et al., 2011).

In Figure 1, the process for determining the need for recovery rebroadcast is depicted only for node B and node C. The immediate neighborhood of node B and node C is depicted with the help of dashed circles. Both the nodes, upon the reception of the message from node A, perform the RSS estimation for the nodes in their immediate neighborhood. As shown in the figure, both node B and node C detect one neighbor located in a hole (i.e., the RSS value estimated for the neighbor is below the receiver sensitivity threshold). Consequently, node B and node C contend to rebroadcast the safety message to cover each of their neighbors located in a hole. Significantly, in such a case of multiple rescuers, the proposed technique ensures unique rebroadcast to avoid collision, and at the same time, a single recovery rebroadcast is performed for multiple nodes in holes. Thus, node B and node C wait for one rebroadcast cycle (to allow for self-recovery by normal forwarding rebroadcast); and then follow the sectoring-based elimination process as followed in a normal forwarding rebroadcast. In the figure, node B is the furthest node from the original sender node, thus, node B rebroadcasts the safety message in the entire broadcast range. The rebroadcast is also overheard by the other two nodes previously located in transmission holes. Upon receiving the recovery broadcast, only the receiver...
nodes that are ready for recovery rebroadcast previously (node C in Figure 1) repeat the RSS estimation step to confirm the reception at its uncovered immediate neighbor. The details of the proposed hole detection and recovery mechanism are summarized in Algorithm 1.

**Algorithm 1** Pseudo-code for the NSN-H algorithm.

1. **Initialize**
2. \( R_i \leftarrow \text{one-hop transmission range of node } i \);
3. \( r_i \leftarrow \text{radius of immediate neighborhood of node } i \);
4. \( I_i \leftarrow \text{set containing nodes in the immediate neighborhood of node } i \);
5. \( N_i \leftarrow \text{rebroadcast sectors around node } i \);
6. \( rs_i \leftarrow \text{rebroadcast sector of node } i \);
7. \( \omega \leftarrow \text{contention window of each sector} \);
8. \( \text{RSS}_i \leftarrow \text{estimated received signal strength for node } i \);
9. \( rss_{th} \leftarrow \text{receiver sensitivity threshold} \);
10. \( H_i \leftarrow \text{set containing nodes located in holes detected by node } i \);

11. **Event** new safety alert message received from node \( s \)
12. **foreach** \( n \in R_s \) **do**
13. **if** (to_nack = set) **then**
14. cancel to_nack;
15. **else**
16. compute \( |n - s| \);
17. choose \( rs_i \) corresponding to \( |n - s| \);
18. schedule_rebroadcast with random_backoff \( N_s, \omega - rs_i, \omega + \text{random}(\omega) \);
19. **foreach** \( i \) \( rs_i \text{ do} \)
20. compute \( \text{RSS}_i \);
21. **if** (\( \text{RSS}_i < rss_{th} \)) **then**
22. set to_rescue;
23. \( H_n \leftarrow H_n \cup \{i\} \);

24. **Event** new beacon message received
25. compute \( |n - s| \);
26. **if** (\( |n - s| \leq r_i \)) **then**
27. \( I_i \leftarrow I_i \cup \{s\} \);

28. **else if** (\( s \in I_i \)) **then**
29. \( I_i \leftarrow I_i \setminus \{s\} \);
30. **Event** copy of safety alert message received by \( n \) from node \( s \)
31. **if** (to_rescue = set) **then**
32. **foreach** \( i \in H_n \) **do**
33. compute \( \text{RSS}_i \);
34. **if** (\( \text{RSS}_i \geq rss_{th} \)) **then**
35. cancel to_rescue;
36. \( H_n \leftarrow H_n \setminus \{i\} \);
37. **Event** unrecoverable signal received by node \( i \)
38. set to_nack;
39. wait for rebroadcast_cycle;
40. **Event** rebroadcast_cycle expires for node \( i \)
41. **if** (to_nack = set) **then**
42. broadcast nack in \( r_i \);
43. **else**
44. **if** (to_rescue = set) **then**
45. broadcast recent message in \( R_i \);

Figure 2: Packet reception rate and propagation delay of NSN, UMB and SB methods.

**Simulation analysis**

To analyze the performance of the proposed technique, we have fully implemented the
proposed technique on top of the UMB protocol in the ns-3 simulator, version 3.9 (nsnam 2011). For details about the simulation setup, the reader is encouraged to refer to our work in (Khan et al., 2011).

In Figure 2(a), the packet-reception rate (PRR) for one-hop distance is shown against the average message generation rate of each node. The packet reception by a node is the final reception of the message regardless of the number of rebroadcasts resulting from the recovery mechanism. The figure shows that the reliability gain of the proposed technique outperforms the UMB and SB methods, particularly in the high message generation rate region. In Figure 2(b), we show the evaluation of the proposed technique in terms of the average message-propagation delay in each hop. The comparison result shows that the proposed technique, despite its recovery mechanism overhead, incurs a minimal overhead delay of below 5 ms even in the worst case scenario.

CONCLUSION

In this work, we have addressed the problem of covering transmission holes in VANET safety-message communication. We have proposed a new technique that tracks the safety message to individual node level to ensure message delivery. The technique makes use of the existing periodic beacon messages to maintain immediate-neighborhood information. Based on the available topology information each receiving node determines a neighbor located in the transmission hole, and efficiently recovers the safety message for the neighbor. ns-3 simulation results show that the proposed technique promises guaranteed delivery of safety messages, and incurs a minimal overhead delay of below 5 ms even in the worst case scenario.

REFERENCES

Vehicle to Vehicle Cluster-Based Auto-Configuration for Vehicular adhoc Networks

Sadique Ahmed Bugti, Riazulamin, Faisal Kakar and Raja Asif

Faculty of Information and Communication Technology, Balochistan University of Information Technology, Engineering and Management Sciences Quetta,

Abstract

The auto-configuration for Vehicular adhoc networks remains a challenging issue, where the traveling vehicles (nodes) are not bound to travel only in restricted regions like MANET. The application of auto-configuration in infrastructure-based seems to be easier issue as compare to network ad hoc mode. In the ad hoc network, configuration of IP address in advance is not considered a practical method. Nodes need to be configured on fly or at run time. In VANET the Vehicular Address Configuration (VAC) protocols, claimed to be first protocol to consider auto-configuration protocol to reflect on the ad-hoc mode of VANET, but the VAC remained victim to frequent re-configuration request of IP address. This paper introduces Cluster-Based Auto-Configuration (C-BAC) protocol for VANET in ad hoc mode environment. The C-BAC applies lane and speed based grouping algorithm in order to achieve better result. The traveling vehicles on highways adjust to traveling group according to their traveling cluster. This clustering of vehicle according to speed and lane grouping stabilizes the network and reduces request re-configuration requests immensely. In simulation result C-BAC outperforms the VAC protocol, as C-BAC stabilizes the network and reduces the frequent re-configuration of IP requests.

Keywords: Cluster, C-BAC, Member Vehicle, Group, Vehicle to Vehicle (V2V).

INTRODUCTION

The designed application of C-BAC follows the auto-configuration mechanism for the highway network topology. Due to intermittent connectivity of vehicles on highway network and variation in speed, the availability of network services can be irregular and fragmentation of network become inevitable. One way to counter this problem is, to place or install RSUs with required distance or to avail UTMS mobile network services (Benslimane et al., 2011), but lack of bandwidth availability of UTMS, on other hand if RSUs are placed they lack transmission penetration issue. Installation or placement of RSUs everywhere is not ideally possible, keeping in view infinite VANET network topology (Fazio et al., 2009). The selection and grouping of vehicles has been carried out with help of Lane Speed Based Group (LSBG). The accumulation of vehicles in to clustering group is laid out by fuzzy rules. The fuzzy based grouping and selection of cluster group by ordinary vehicle helps vehicle to join their respective speed group and lane group on the highway. This optioned selection in return becomes the reason of prolonged network connectivity and reduces the intermittent connectivity.

The fuzzy based selection of clustering group by joining vehicle demonstrates better results
with respect to auto-configuration as compare to Vehicular Address Configuration (VAC) protocol. The VAC claims to be the first auto-configuration protocol for VANET. The basic problems with VAC protocol remained; it does not follow any particular criteria in order to join the leader vehicle. The uncorroborated joining by ordinary vehicles result in frequent re-configuration requests, because keep in view esurient desires of drivers to obtain better network service from leader vehicles. The ordinary vehicles may frequently change their point of attachment to obtain better connectivity. In the following section LSBG algorithm is discussed.

Lane and Speed Based Grouping (LSBG)

The possibility of frequent changes in the attachment points of vehicles by the ordinary vehicles needs to be dealt with smartly. The C-BAC applies the LSBG in order to create best option for joining vehicle with respect to lane and speed grouping. The detailed information about the LSBG algorithm is presented with help of (Table 1).

<table>
<thead>
<tr>
<th>Speed km/h</th>
<th>Lane</th>
<th>Clustering Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>30-45</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>45-60</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>60-75</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>75-80</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>90-110</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>110-120+</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

The Table-1 introduces the three columns with respect to vehicle movement on the highway, on the respective highway, there are three lanes and every lane has its own speed limitations. The speed and lane combination with respect to cluster grouping is organized very carefully in order to meet every participating vehicle’s need.

The speed criterion from 0-60 has been covered in lane I and there are three clustering groups with respect to speed parameters. Same application is applied for all three lanes with their speed groups as demonstrated in Table I. The scenario of the speed, land and cluster grouping is demonstrated in (Figure 1) for prolonged network connectivity.

Figure 1: LSBG

As the network connectivity enhances, the re-configuration IP requests reduce automatically. This is where C-BAC outperforms VAC with respect to network connectivity and reduces network overhead in form of less amount of re-configuration requests by ordinary vehicle. In the following section we intend to introduce member entities of C-BAC protocol in order to comprehend protocol application easier.

The C-BAC Member Entities

The introduction of member entities paves the way to develop an understanding with C-BAC protocol. The participating vehicles are introduced with respect to their intended terminologies.

Undecided Vehicle (UV)

The UV is a vehicle, this is a state of vehicle where desired vehicle switches on and starts moving along the road and waiting for any signal or response from any existing vehicles along the road. This state of vehicle is termed as UV in C-BAC protocol. The vehicle at the start may or may not find any vehicle advertisement as they start to move along the road. The said vehicle may remain in this stage until it finds any vehicle to join or any vehicle may find this vehicle to join.
Non Participating Vehicles (Non NPV)
The designed protocol tries to follow the real traffic situation and understands that the every vehicle moving along the road may not be interested to join network, or it may not be equipped with desired communication devices in order to develop communication with moving network. The vehicle which is stand alone not connected to any network. These types of vehicles in the designed protocol are termed as Non Participating Vehicles (NPV).

Cluster Member Vehicle (CMV)
Member vehicle is used for those vehicles, which have developed the communication environment with the moving clustering group along the road. After joining the cluster, a vehicle’s status changes from UV into member vehicle CMV. This CMV will become an active member of cluster after receiving an IP address from CH and remains able to communicate with other member vehicle in the vicinity of same cluster group directly.

Cluster Head (CH)
The cluster head is the backbone of small network called cluster. It maintains two tables one for member vehicles and other for neighboring cluster heads. The MV table is used to provide unique IP address to its members and keeps track of the assigned IP addresses. The Neighbor Cluster Head table is used to update the information about the neighboring cluster heads, in order to organize assigned IP address set of neighboring CHs.

Clusters Gateway (CGW)
The gateway plays important part in stability of network, it maintains its position between two CHs in order to keep cluster heads connected with the other. The criterion to become a CGW seems simple as a vehicle receiving signals from two clustering heads. One CH moving ahead of CGW and second cluster group following CGW, this type of vehicle is considered as a potential candidate. The selection criterion for CGW is discussed in more detail for the coming section.

The C-BAC Cluster Formation with help of LSBG
This applies a speed based grouping of vehicle to form the clusters on highways in order to have better inter-communication in the VANET. (Acarman Division, 2007) The Lane and Speed-Based Grouping (LSBG) of vehicles has been designed after understanding the short comings of VAC protocol. The LSBG provides an option to the moving vehicles on the highway to decide, their best matching speed group with respect to lane. The frequent lane changing has not been encouraged in the design of protocol, but changing lane is possible if the lack of SNR is received constantly from same lane. In Figure-2 the LSBG demonstrates a flow diagram, where vehicles with different speed check their relative lane with respect to speeds group and then join the group speed in the lane.

After having decided the LSBG the vehicle starts moving along the highway, in this phase cluster formation the C-BAC protocol introduces different vehicle on the highway appearing with different time pauses, following the Poisson distribution mechanism. The Cluster formation for the C-BAC is depicted in Figure-3 with the help of flow chart.

At the start of the cluster formation a vehicle finds itself in an undecided situation, let that vehicle be termed as X, when X switches on. It may or may not find itself among the vehicles. If the X finds itself alone, it waits for signal or hello message from other vehicle and keeps its timer on. After due time duration, if X does not find any vehicle
nearby it may consider itself as an alone vehicle and considers itself a Cluster Head. Let’s elucidate the cluster formation in all three phases with respect to different phases one by one.

Cluster Formation

In the formation phases, the introduction of every step with respect to process is described.

Phase I Undecided state to CH

The red rectangle in Figure-3 introduces phase 1. When the vehicle switches on it finds itself’s alone and waits for hello message from neighbor vehicles. If vehicle X does not receive any hello message, then X waits for response and keep its timer on. When the time expires and X does not receive any response during this time, it changes its status cluster head, and the vehicle X becomes the CH.

Phase II CH vs. New Hello

In the blue rectangle here X becomes CH after not receiving any response from neighbor vehicles it declares it as CH. In blue rectangle Phase II X receives Hello packet from a vehicle nearby i.e. Y. Now X checks its ID with Y’s ID. If Y’s ID is greater than IP of X, then X tells Y to join X, as X is CH.

Phase III Joining as Member Vehicle (MV)

In the Phase III, when X checks the ID of Y and finds the ID of Y is smaller than the ID of X, then X comes to know that Y is on the road before me. (Note) The term ID is used in to indicate IP address of vehicles. The joining or configuration of new vehicle as MV could fall into three main stages, such as direction configuration from CH, configuration via CGW and configuration via MV.

Direction Configuration from CH

In the direction configuration from CH the said vehicle X, may find direct vehicle Y as CH. The X then sends IP request to Y, after receiving IP request from X, the CH Y replies back to X with a new IP address, after receiving IP address from Y. The X sends joining acknowledgement to Y and Y after receiving acknowledgement form X, registers IP address of X to its MVT, the process of direct configuration from CH is demonstrated in (Figure-4).

Configuration via Cluster Gateway (CGW)

In this scenario the vehicle Y is CGW, the vehicle X sends IP request to Y, and Y forwards the IP request to CH, the CH after receiving IP request through Y, replies back to vehicle X. after receiving IP address from CH, the X sends joining acknowledgement to CH. After receiving acknowledgement form X, the CH registers IP address of X to its MVT, the process is known as indirection configuration via relay vehicle, that is demonstrated in (Figure-5).
Configuration via Member Vehicle (MV)

Y is MV, then X sends IP request to Y, and Y forwards the IP request to CH, the CH after receiving IP request through Y, replies back to vehicle X. After receiving IP address from CH, the X joins CH and replies back with Acknowledgement to CH as demonstrated in (Figure-6).

Figure 6: Joining Through Member Vehicle

BAC CH Practicality

Having understood the basic layout of C-BAC protocol, it’s now time to turn to core issue of C-BAC protocol that is auto-configuration of VANET with respect to V2V application. The auto-configuration on highway with clustering approach for VANET has not been covered before as far as the knowledge of author and available Internet material is concerned. The VAC protocol has applied an auto-configuration protocol with leader vehicles, but it never meant to be cluster-based application. There is a cluster-based auto-configuration protocol for MANET in the literature (Joung and Kim, 2007). The cluster-based application for ad hoc network needs to cover three main aspects.

1. There should be one Cluster Head (CH) that is responsible for all IP address assigned in the vicinity of that cluster.

2. CH should maintain uniqueness IP address intact, before assigning IP to new joining vehicle. Otherwise there is high possibility that joining vehicle may assign already exiting IP address that would be problem known as DAD.

3. The member vehicle should have default link developed to cluster head in order to update its assigned IP address.

The CHs maintain their pool if IP addresses with communication with neighboring CHs in order to avoid assignment of duplicate address. Each CH owns disjoint sorted block of IP addresses. They are designed to be sequential, allocated to every CH with respect to their arrival on the highway. The CH assigns IP address to any joint vehicle (JV) from the allocated pool of IP addresses. The CH remains responsible of uniqueness of IP address in its respective vicinity and keeps itself updated with neighboring CHs in order to avoided duplicated address assignment.

IP address Management

IP address management is one of the basic operations of any host auto-configuration protocol (Perkins. 1999). In order to achieve address uniqueness the CHs are required to perform address synchronization periodically. To achieve this CHs maintain two tables to update information about member vehicle and neighboring CHs. The two tables that are updated by CHs are termed as Member Vehicle Table (MVT) and Neighbor Cluster Head Table (NCHT).

Member Vehicle Table (MVT)

The MVT demonstrated in Table-2 is used to update information about the MV in the vicinity of said CH. This table is updated periodically by CH in order to maintain the status of MV intact. The MVT provides complete information about the MV. The complete description of MVT is elaborated in Table-2.

<table>
<thead>
<tr>
<th>IP Address</th>
<th>Location</th>
<th>Prev Speed</th>
<th>Cur Speed</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AB:0:CD10:1010</td>
<td>F</td>
<td>70</td>
<td>70</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12AB:0:CD20:1011</td>
<td>R</td>
<td>60</td>
<td>70</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12AB:0:CD30:1012</td>
<td>M</td>
<td>70</td>
<td>70</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12AB:0:CD40:1013</td>
<td>X</td>
<td>80</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>12AB:0:CD40:1013</td>
<td>F</td>
<td>95</td>
<td>96</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
The communication between the member vehicle is supposed to be active and every MV remains aware of their cluster fellow with respect to IP address similarity bits. As any new vehicle with different IP pattern is introduced, the CH gets its information from its members i.e. MVs or CGWs. The new vehicle is always recognized with different CH IP address pattern, which indicates different address pool of different CH.

Table 4: NCHT

<table>
<thead>
<tr>
<th>IP Address</th>
<th>AddSet</th>
<th>Status</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AB:0:0:CD:10:0120</td>
<td>1-50</td>
<td>1</td>
<td>F</td>
</tr>
<tr>
<td>12AB:0:0:CD:10:1272</td>
<td>51-100</td>
<td>1</td>
<td>R</td>
</tr>
<tr>
<td>12AB:0:0:CD:10:1230</td>
<td>101-150</td>
<td>2</td>
<td>F</td>
</tr>
<tr>
<td>12AB:0:0:CD:10:1234</td>
<td>161-200</td>
<td>2</td>
<td>R</td>
</tr>
<tr>
<td>12AB:0:0:CD:10:1243</td>
<td>201-255</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

In order to keep updated information about the neighboring CHs, every CH maintains (NCHT-5). The NCHT is updated periodically by CHs, to keep neighbors CHs’ information updated. The benefit of this NCHT is, the duplication in IP address configuration is minimized, and overhead on the network is reduced.

RESULTS AND DISCUSSION

The LSBG adopted approach by C-BAC proves better connectivity of vehicles with the CHs as compared to leader based connectivity of VAC protocol. In main problem with VAC protocol remained it has not considered the prolonged connectivity of individual vehicles, where vehicle may possible frequent change their point of attachment in order to have better signals from leader vehicles. The better connectivity of individual vehicle in return proves better auto-configuration protocol performance in terms of reduces amount of churn rates (frequent leaving and joining of vehicle or nodes). The main idea of C-BAC is to reduce churn rates, because earlier designed protocols have not paid due attention to this part of auto-configuration, which caused heavy amount of overheads on the network. The VAC claims to have lesser configuration time, but due to increase in churn rate, the saved amount of time during auto-configuration can lead to zilch (Rossberg and Schaefer, 2012).

In the auto-configuration protocol design, particularly for ad-hoc networks the cost of individual node is calculated carefully. In the network initialization cost, when a new vehicle joins the network by sending Address Request (AR) and till it receives address confirmation acknowledgement (ACK) (Nazeeruddin et al., 2006), can be expressed as followed.

\[ N_{JV} = 2 \times U_C + S_U \quad (1) \]

Where \( N_{JV} \) is the new joining vehicle \( U_C \) denotes the Unicast Message from joining vehicle and \( S_U \) denotes the single hope Unicast message, if there exists a direct communication link between the \( J_{NV} \) and the CH/ leader vehicle. We have simulated both protocols in matlab environment following the macro simulator (Saleet et al., 2008 ) for mobility pattern.
The simulation results in figure-7 demonstrate the frequent intermittent connectivity among the traveling vehicles. The graph demonstrates connectivity amount the vehicle remains for very little time and vehicle keeps on changing their point of attachment. On other hand in figure -8 demonstrates stable and better result. In first simulation only 50 vehicles were simulated,
but we kept on increasing the number of vehicles in the rest of demonstrated graphs as followed by number of increased vehicles. The results clearly demonstrate better as number of vehicle are increased.

CONCLUSION
The designed auto-configuration protocol C-BAC has been introduced in this paper. The application of C-BAC is meant to be built for highway traffic traveling scenario. In this paper three main things were considered to be achieved successfully. The organization of vehicles in some sort of traveling pattern that was achieved by the introduction of LSBG algorithm. The LSBG organized the traveling vehicles in groups and clusters with respect to lane and speed-based traveling scenario. The auto-configuration of traveling vehicles on the highway was achieved with help of cluster-based application. The CHs in C-BAC maintain distributed IP address pool to assign IP address to the join vehicles. The CH maintained two tables in order to keep IP address pool updated, (i) the NCHT and (ii) the MVT respectively. The connectivity maintenance of traveling vehicles on the highway in order to reduce churning rate effects of the protocol. The churn rates reduction is achieved through selective joining of CHs. The churn rate (frequently reconfiguration) of vehicles with their leader vehicles remained one of major issues of earlier designed standard VANET ACPs. The simulation results demonstrated that the C-BAC provides better results for the VANET auto-configuration on the highway scenario as compare to VAC protocol.

REFERENCES


Attenuation Caused by Obstructing Vehicles in VANETs

Faisal Khan¹, Farhan Elahi¹, Kamran Ali¹, Sadique Ahmed Bugti¹, Ehsanullah Kakar ²

¹Faculty of Information & Communication Technology, ²Faculty of Engineering
Balochistan University of Information Technology, Engineering and Management Sciences, Quetta.

Abstract

The connectivity among vehicles is affected by obstructions either static (e.g., buildings, vegetation, hills) or mobile (other vehicles on the road). The low height of antennas onboard the vehicles implies that the optical line of sight (LOS) can be obstructed by the obstructions, in particular by the mobile obstructions causing disconnection among vehicles even within the single hop transmission range. In this work, the channel modeling for vehicular communication scenario is investigated in detail. Multiple knife-edge diffraction is proposed to account for attenuation caused by vehicle along the propagation path. The vehicular communication scenario is simulated in the ns-3 network simulator with four categories of vehicles and the attenuation loss is calculated. The simulation results confirm that vehicles as obstructions can be a major source of signal attenuation and a single vehicle can cause attenuation up to 20 dB in the road scenario.

Keywords: Signal attenuation, received signal strength, Line-of-sight communication, Multiple-knife edge diffraction, Channel modeling.

CORRESPONDING AUTHOR’S EMAIL: faisal.khan@buitms.edu.pk

INTRODUCTION

While investigating the reliability of message broadcast, the phenomenon of transmission holes in the broadcast range has been recently considered as a potential cause of message loss in VANETs. In (Tonguz et al. 2007, Boban et al. 2011), conduct extensive experiments to prove the presence of reception holes in the transmission range. The authors report mobile obstacles (i.e., vehicles), primarily in the LOS, as a major cause of loss in the signal strength, resulting in some portions of the broadcast region being completely uncovered. The studies show that a single obstacle can cause an RSS drop of over 20 dB when two cars communicate at a distance of 10 m; while in NLOS conditions the chances of a successful communication become 90% (Ros et al. 2012, Santos et al. 2004).

Coverage of nodes located in the transmission holes is a challenging problem in any wireless scenario. The nodes located in the transmission holes are completely oblivious of the activity in the wireless channel. Consequently, the detection of a packet loss becomes challenging considering the limitation of the use of a feedback mechanism in a broadcast scenario. The proposed attenuation and detection model employs constant observation of the immediate neighborhood by each vehicle. RSS is estimated using the angle between the given receiver (immediate neighbor) and the sender (verifier node is aware of the original sender node and its respective location). Any node in the direct LOS path between sender and receiver is counted as obstacle with its impact on the signal loss depending on the its vehicle type (Tonguz et al. 2007, Boban et al. 2011). Loss caused by road surroundings and road geometry can also be included for additional accuracy in RSS estimation (e.g., the propositions of (Laouiti et al. 2009, Otto et al. 2009).

The proposed received-signal-strength estimation technique uses a topological map of the one-hop neighborhood. Each vehicle
along the LOS path between the sender and the receiver is counted as a source of signal attenuation. The accumulated signal attenuation is the sum of attenuation caused by each vehicle along the LOS path. Multiple knife-edge diffraction model is used to account for the loss with each obstructing vehicle counted as a source of diffraction. The simulation results show that the attenuation strictly depends on the angle of the obstacle with the sender and the receiver nodes. A single vehicle as obstacle can cause a received signal strength drop between 2 to 20dB.

ATTENUATION CAUSED BY VEHICLES

Determining the vehicles obstructing the line of sight
Each vehicle maintains the geographical topology of the one-hop neighborhood. The topology is maintained in the form of rectangles representing vehicles on a plane in $\mathbb{R}^2$. The length and width of a vehicle is exchanged in the beacon messages, along with the height of a vehicle. The height of a vehicle will be considered while computing the signal loss using knife-edge diffraction. A vehicle causing obstruction in the line of sight between the sender and the receiver is determined by testing if an intersection exists between the line segment (joining the sender and the receiver) and the rectangle representing the vehicle in the path.

Let $\{(x_1, y_1)\}$ be the line segment representing the line of sight between the sender and the receiver, and $\{(x_2, y_2)\}$ be the rectangle representing the vehicle in the propagation path. If the endpoints of the line segment are $(x_s, y_s)$ and $(x_r, y_r)$, then a point $(x, y)$ is on the same straight line if $u.x + v.y + w = 0$ with $u = y_r - y_s$, $v = x_s - x_r$, and $w = x_s y_r - x_r y_s$. The two half planes defined by the line are $u.x + v.y + w > 0$ and $u.x + v.y + w < 0$.

Additionally, it is also ensured that the vehicle (rectangle) lies within the segment of the line between the sender and the receiver, and not at a point on the line beyond the sender or the receiver. To ensure this condition, the and ABC D intersection verification is performed after the following conditions holds true: $(x_{ob} > x_r$ and $x_{ob} < x_s )$ or $(x_{ob} < x_r$ and $x_{ob} > x_s )$ or $(y_{ob} > y_r$ and $y_{ob} < y_s )$ or $(y_{ob} < y_r$ and $y_{ob} > y_s )$, where $(x_{ob}, y_{ob})$ is the location of the obstacle.

Thus, if $u.v + v.y + w > 0$, ABC D; or if $u.v + v.y + w < 0$, ABC D, there exists no intersection between the line segment and the rectangle ABCD. Therefore, the given vehicle does not obstruct the line-of-sight path between the sender node and the receiver node. The given vehicle is considered as an obstruction otherwise.

Estimating the Attenuation Caused by Vehicles
After determining that a given vehicle lies in the line of sight between the send and the receiver, the impact of the vehicle on the signal loss is estimated. The attenuation in the radio link increases as vehicles obstruct 60% of the first Fresnel zone between the sender and the receiver. The attenuation is due to the diffraction that depends on the obstruction level, the carrier frequency, the shape of the obstruction, and the amount of the obstruction in the path between the sender and the receiver. We use the multiple knife-edge diffraction model to estimate the effect of vehicles as obstructions. The prerequisite for the applicability of the knife-edge diffraction model is that the wavelength should be significantly smaller than the size of the obstacle. Therefore, the application of the model in the VANET scenario is reasonable because the DSRC frequency of 5.9 GHz has a wavelength of approximately 5 cm, which is significantly smaller than the size of a vehicle.
The attenuation is estimated using the knife-edge diffraction model described in the ITU-R recommendation (Piorkowski et al. 2012). The scenario is depicted in Figure 2. The obstacle is viewed perpendicular to the radio link between the sender and the receiver vehicles. The approximation of the attenuation (in dB) caused by a single knife-edge obstacle $L$ can be obtained using the following equation:

$$L = \begin{cases} \frac{0.9 + 20 \log (r - 0.1) + 1 - r + 0.1)}{0.1}, \quad r > 0.28 \\ \text{obstructive}, \end{cases}$$

where

$$r = \frac{1}{\sqrt{1 + \frac{1}{d_2^2}}}.$$

The extension of the single knife-edge diffraction model to multiple edge obstacles is not immediate. We follow the ITU-R method, where correction factors are added to the attenuation to improve the approximation. The method consists of applying single knife-edge diffraction successively to multiple obstacles, with the top of the preceding obstacle acting as a source of diffraction for the following obstacle. The case of multiple obstructions in the line of sight is depicted in Figure 3. The total attenuation caused by multiple vehicles, following the multiple knife-edge diffraction model, is given by

$$L_t = \sum_{i=1}^{N} L_i + 20 \log C_N,$$

where $L_i$ is the diffraction loss over the $i$th vehicle, assuming the source to be at the edge of the $(i - 1)$th vehicle. The function $C_N$ is a correction factor dependent on the parameters shown in Figure 3. The correction factor is given by

$$C_N = \sqrt{\frac{P_a}{P_b}}.$$

Using the correction factor, the total attenuation caused by the vehicles in the line of sight path is calculated from Equation 43. The attenuation $L_t$, along with the free-space propagation loss, gives the total path loss between the sender vehicle to the receiver vehicle. The estimated received signal strength becomes

$$\text{RSS} = P_{T_x} + G_{T_x} - L_{ld} - L_t + G_{Rx},$$

where $P_{T_x}$ is the transmitted output power of the transmitter, $G_{T_x}$ is the transmitter antenna gain, $L_{ld}$ is the log-distance path loss, $L_t$ is the diffraction loss in the propagation path, and $G_{Rx}$ is the receiver antenna gain. The vehicle is considered to be located in a coverage hole when the sensitivity threshold is $\text{RSS} < -98 \text{ dBm}$ (U. technology. 2012).

**Simulation analysis**

**Simulation Setup:** To analyze the performance of the proposed RSS estimation technique, the algorithm is fully implemented along with the UMB scheme and the SB scheme in the ns-3 simulator (The ns-3 2011). The traffic mobility is generated using the VanetMobiSim tool (Haerri et al. 2006). The common simulation parameters are summarized in Table I. The ns-3 simulator lacks the multi-knife diffraction model, and as part of this work, we have implemented a generic multi-knife edge diffraction for ns-3. The code is in the process of review for submission to the upcoming version 3.16.
of the ns-3 simulator. The simulation implements the three dimensional propagation scenario in detail. Each vehicle is considered with its three dimensions information of height, width, and length. Four different vehicle categories are used with vehicle dimensions as described in Table II. The simulation uses a four-kilometers of road-length with unidirectional roads in two lanes. Six different vehicle densities are tested with densities from five to 30 nodes per 300 meters length of the road (i.e., the one-hop distance). Vehicles are assigned Gaussian-random speed with a mean of 50 miles per hour and a standard deviation of three miles per hour. The minimum safe headway between the vehicles is kept as 1.5 seconds. Log-distance path-loss model is used with path loss exponent equal to 3 (Blaszczyszyn et al. 2009). The physical channel is characterized in detail using the multi-knife diffraction loss model. The propagation is followed along the entire path between the sender and the receiver. The effect of each vehicle as obstacle along the path is considered. Each vehicle along the path is first evaluated using the obstruction detection technique described the attenuation caused by the vehicle is estimated using the knife-edge diffraction model.

### RESULTS AND DISCUSSION

In Figure 4, the proportion of vehicles with the LOS and NLOS communication is depicted for one-hop neighborhood. The figure shows the average number of vehicles in the line of sight or non-line of sight to the sender with varying distance from the sender. The result depicted in the figure represents the average based on evaluation over varying vehicle density between five nodes and 30 nodes per 300-meter distance of the road. In the figure, it is noticed that the ratio of vehicles with unobstructed and obstructed line of sight increases with increasing distance between the sender and the receivers. At a distance of 50 meters, most of the vehicles are in line of sight with the transmitter, and the propagation loss is only affected by the attenuation in the free-space. However, at a distance of 100 meters and beyond, the majority of the receivers are in non-line of sight with the transmitter, which can incur excessive diffraction loss due to vehicles along the path. Therefore, characterizing the physical channel of the vehicular scenario by considering the free-space and the road surrounding objects as the only parameters affecting the propagation can result in inaccurate coverage estimation. Moreover, the non-line of sight path for majority of receivers at farther distances has high likelihood of coverage holes, where a given vehicle fails to receive the safety message.

To further quantify the existence of vehicles as obstacles in the propagation path, the average number of obstacles is depicted against the distance from the transmitter in Figure 5. The average number of obstacles along the propagation path are shown for three different node densities. In the figure, the propagation path is mostly a direct LOS at a distance close to the transmitter. However, with increasing distance, in addition to the path being mostly obstructed by the surrounding vehicles, the number of obstrcting vehicles also increases. Similarly, increasing the density of traffic has a direct affect on the number of obstrcting vehicles. Therefore, at a distance of beyond 200 meters from the transmitter and at a density...
of 30 nodes per 300 meters, the average number of vehicles acting as obstacles in the propagation path for a given receiver is over eight vehicles. Considering the potential attenuation caused by an obstructing vehicle (depending on the type of the vehicle), there is a high likelihood that a given receiver does not receive the safety message due to excessive attenuation along the path. It is also noted that the effect may be dominant at a farther distance from the transmitter, however, coverage at a closer distance of 100 meters can potentially be effected by excessive attenuation due to vehicles as obstacles. At a close distance of 100 meters, even though the number of vehicles as obstacles can be four or less, however, larger obstructing vehicles (e.g., a trailer truck) can result in acute attenuation of up to 18 dB per vehicle. Thus, vehicles located at a closer distance to the transmitter are also susceptible to being located in the coverage holes.

In Figure 6, a thorough comparison is presented for the signal reception in the line of sight and non-line of sight path. In the figure, line of sight represents the case where the vehicles are not considered to be causing obstruction and attenuation, while the obstructed case accounts for the average received signal strength (RSS) where the attenuation caused by each vehicle along the propagation path is considered. Since the number of obstacles in the close vicinity of the transmitter are near negligible, the average RSS is almost equal for the two cases in the close vicinity of the transmitter. However, the attenuation due to obstacles is pronounced over farther distances and the difference in the measured signal for the two paths increases with distance. Note that the figure also illustrates the minimum measured RSS for the obstructed path that clearly confirms the notion of holes being present all across the one-hop neighborhood. In other words, even at close distances, there are instances where the attenuation caused by vehicles is strong enough to prevent coverage of a particular location in the path. The reason for such an effect, as stated previously, is the type of vehicles obstructing the path. For example, a combination of a trailer truck and smaller vehicles can cause high attenuation even with a few number of vehicles as obstacles in the propagation path. The existence of holes in the broadcast range results in some vehicles being oblivious of a safety message broadcast, and not performing the necessary safety maneuver. Therefore, it becomes indispensable to cover nodes being located in the coverage holes to ensure the critical VANET requisite of reliability of the delivery of the safety message.
CONCLUSION
In this work, the attenuation caused by vehicles is investigated in vehicular communication scenario. Received signal strength estimation is proposed that uses multiple-knife edge diffraction to calculate the loss caused by each vehicle along the propagation path. The vehicular communication scenario is thoroughly simulated in the ns-3 network simulator with four categories of vehicular traffic. Three dimensional ray-tracing technique has been used to detect vehicles as obstacles along the path. The investigation reveals that a single vehicle can cause an RSS drop of about 2 to 20dB depending upon the dimensions of the vehicle and the angle of the obstacle with respect to the sender and receiver. Further investigation may be conducted to account for the loss caused by surrounding vegetation and structures along the propagation path.

REFERENCES

Efficient Bandwidth Utilization in DOCS

Asad Ali, Abdul Rehman, Aftab Ahmed, Ayesha Iftikhar, Malghalara Kakar

Faculty of Information and Communication Technology, Balochistan University of Information Technology Engineering and Management Sciences, Quetta.

Abstract

Taking into consideration the significance of multi domain dynamic optical circuit switching (DOCS) over other optical switching technologies, we compare the potential viability of DOCS and other optical circuit switching technologies for multi domain traffic exchange thus showing an enhanced algorithm that can used for efficient bandwidth utilization in DOCS. In this paper we make an effort to boost the use of DOCS in e-science technologies by utilizing bandwidth much more efficiently. Immediate request and scheduled request are the two features that our algorithm is covering.

Keywords: Multidomain DOCS, Bandwidth utilization on request priority, Immediate request, Scheduled request

Corresponding Author’s email: abdul.rehman1@buitms.edu.pk

INTRODUCTION

Today, Internet is fairly considered as an imperative reserve of firsthand and most recent information for research organizations, industrial and academic researchers, governmental and non-governmental agencies and for SME’s and large enterprises. In addition to that, Internet is also providing an influential role of communication and has thus become an exciting part of life. Internet is a network of thousands of independently administered networks known as Autonomous Systems (AS). These Autonomous Systems are owned and managed by organization such as telecom operators, Internet service providers etc. Exchange of traffic among autonomous systems is vital to the operational connectivity of the global Internet. It is therefore, interdomain traffic exchange play decisive role in the global Internet and thus plays a significant role in the decentralized global Internet, because the entire Internet, which is made up of AS’s is interconnected.

From a simple means of communication among computers, the Internet, coupled with the uptake of broadband, has emerged as a fundamental part of modern society in most countries. New applications emerge everyday and some have become cultural icons, such as YouTube and Facebook. Its hierarchy has been extended from international, national and campus networks to include networks for businesses, homes, cars, and individuals. The Internet has gone mobile, as devices on cellular networks have been enabled for the Internet Protocol (IP), already used by several millions of individuals and potentially several billions. On top of these networks and devices lies a vast array of applications for e-commerce, e-government, e-education and e-health, together comprising the Internet of Services (IOS). In order to fulfill these demands Optical network efficiency is under research for a long time. Efficient utilization of bandwidth is major area of concern.

Research Challenges in Dynamic Optical Circuit Switching:

As the same protocol has been used by optical layer that were used in IP layer so it has inherited that same problems (Fernandez 2009). Some are listed in table 1. Some more challenges that has been identified by (Mukherjee 2007) What architectural solutions should be developed to efficiently “groom” (i.e., pack, unpack, and switch at intermediate nodes) sub-wavelength granularity connections of diverse bandwidth (including IP flows, multi-protocol label switching (MPLS) tunnels, etc.) on to high-capacity wavelength channels in an optical
Applications like online video streaming, e-science and conferencing require that they must be allocated network resources within a particular duration, so in a way they carry info about their starting and ending time. Such requests that have a certain deadline for their completion are called Deadline Driven Requests (DDRs).

Sometimes applications like server Backup or video conferencing has information about the holding time of these requests, which can increase the efficiency of the network. Such requests differ from DDRs in a way that these requests have certain duration for which they need network resources but they do not have any fixed starting and ending time. These have been described as Holding Time Aware (HTA) Requests. In [4] some work has been done on provisioning of these requests with respect to shared path protection for resiliency purpose. They have proposed an algorithm for dynamic provisioning of shared-path-protected connections in WDM mesh networks. In advance reservation requests we have the knowledge of requests in advance so major issue in this case is request scheduling. According to (Tornatore, 2008) Network requests with advance reservations can be divided into following three types: (i) specified starting time and specified duration (STSD), (ii) specified starting time and unspecified duration (STUD), (iii) and unspecified starting time and specified duration (UTSD). But we can see that there can be requests that do not have specific information about their starting time and duration such requests are called UTUD in [6]. DDR and HTA based architectures can be considered to be a special cases of the AR architecture.

The algorithms proposed so far in the literature utilize type of requests, routing policy and wavelength selection strategy as key components for provisioning requests in optical networks.

**MULTICAST HOLDING TIME ALGORITHM:**

Once it’s decided what has to be done at each phase we can formulate our algorithm as follows:

**Input:** R(s, d, A, B, h); Current network state.

**Output:** Path for R, NULL if no eligible solution is found.

**Initialization:** Construct the auxiliary graph G according to the initial network state.

**1. Routing Phase:**

When a connection request R arrives

1.1. Compute the shortest path p from the source to the destinations of R on graph G using DCSP, if path not found block the traffic demand; otherwise, continue with the following steps.

1.2. If p contains free wavelengths, set up light-paths using the wavelength selected in wave length selection phase.

1.3. Groom R along the pre-existing light-paths on p or setup a new light-path on path p.

**2. Wavelength assignment phase:**

2.1. If Creq free,p then provision Creq, update free capacities. Provisioning successful.

2.2. Wavelength index is selected using following relation:

\[ D_{link} = \text{CapacityFree} \times \text{Link Popularity} \times \text{Holding Timeresidual} \]

\[ W_{select} = \text{link} , m \text{ where } m=0,1,2... \]
Where CapacityFree is the available capacity on the link, link popularity is how many connections are provisioned on that link and residual holding time is the time remaining for which resources on that link will be used.

2.3. If capacity is not available on any single wavelength then proceed to following steps.

2.4. Search for the highest capacity available on the light-path and save index one.

2.5. Find another wavelength with Cfind=Creq-Cfound, if found reserve Cfound on index one and Cfind on index two, else block the request.

3. Update graph G as follows:

3.1. Update the capacity and cost of edges. For the light-paths carrying traffic R, capacities are decreased by the amount of the bandwidth demanded. Modify the cost of the edges of the auxiliary graph according to this rule:

\[
\text{Costupdate} = \frac{(BWreq\times HTreq)}{(BWreq+HTreq)}
\]

3.2. Update the popularity of each link that occurs in the path p from s to d.

4. When a connection terminates:

4.1. Remove the traffic from the network.

4.2. Update G by applying the reverse of steps defined in above section

Existing Bandwidth Allocation Algorithm for DOCS

According to some algorithms for multicast requests provisioning by considering the special case of specified starting time and specified duration STSD requests. We have used existing DCSP algorithm for routing purpose and defined our own wavelength selection and links cost update expressions. After comparison of our algorithm performance in terms of call blocking and bandwidth blocking for on demand and advance reservation scenarios, we observe that advance reservation is better in performance than on demand. However, there is a major drawback in this method that is, the author has just dealt with advance reservation, which is not dealing with scheduled requests.

Proposed Scheme

We had incorporated two features in our algorithm one is immediate request and another one is scheduled request, how to allocate bandwidth to these two cases.

Immediate Request: is that which needed to be fulfilled on the same time.

Scheduled Request: scheduled request is the one which can be fulfilled when it is scheduled, but DDR must be defined for it.

The basic flow of our algorithm is as follows it is dealing with two types of request which are really needed in DOCS, IR and SR. so it is named as Dynamic optical Circuit Switching for Immediate and Scheduled Request (DOCS-ISR).

Figure 2: Existing Bandwidth Allocation Algorithm Flow

Figure 3: Flow of Algorithm for DOCS-ISR
As e-science, webinars and conferences demand for scheduled request but there is no such mechanism to cope with that request this algorithm will be catering with immediate and on demand requests.

**Pseudo Code**
1. Start
2. Construct initial tree graph. (ST)
3. Check if there is new request then go to (4) else (17)
4. Check the request is IR or SR
5. If request is IR go to (6) else (20)
6. Check availability of resources. If available go to (7) else (18)
7. Run shortest path algorithm from source to destination.
8. Check if sufficient capacity is available if yes then go to (9) else (13).
9. Select the best route according to connection holding time.
10. Allocate wavelength.
11. Update network group.
12. Go to new event.
13. Select multiple routes to meet capacity need.
14. Check request capacity if yes (15) else (16). Block request
15. Go to new event
16. Check Scheduled request Dead Line Driven Request (DDR) (if the current DDR can be accommodated before that utilizing that)
17. Follow wavelength according to algorithm
18. [First Fit , Best Fit]
19. Check if the request is schedule check available resources if available (21) else (22).
20. Check the schedule (which will check if the request can be accommodated by comparing DDR)
21. Block request
22. Request Departure
23. Remove traffic from all request
24. Tear down all light paths that do not carry any traffic
25. Update graph
26. Go to new event state
27. End

**RESULTS AND DISCUSSION**
The DOCS-ISR (Proposed algorithm) is ideal in a situation when you need to fulfill immediate and scheduled requests. Previously all algorithms were just dealing with immediate requests.

**CONCLUSION**
In this paper we discussed various algorithms for the utilization of the bandwidth in DOCS. We highlighted the pros and cons of various algorithms. We also showed our proposed algorithm and showed that the proposed scheme has achieved a significant improvement as compared to the approaches existing in the literature.

<table>
<thead>
<tr>
<th>Algorithm name</th>
<th>Support for IR</th>
<th>Support for SR</th>
<th>Support for DDR</th>
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<td>Previous Algorithm[8]</td>
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<td>Yes</td>
</tr>
<tr>
<td>Proposed Algorithm</td>
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<td>Yes</td>
<td>Yes</td>
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</table>

**REFERENCES**
INTRODUCTION

Hexagonal barium hexaferrite (BaFe$_{12}$O$_{19}$) is widely used for various important electronic applications such as permanent magnets, particulate media ferromagnetic recording and microwave devices (Pfeiffer et al., 1993, Smit et al., 1961, Buchner et al., 1989).“we can use the barium oxide and hard magnetic materials to find out the stiochiometry Bao because the mentioned materials are based on iron oxide which cannot easily be replaced by one an other as well as by any other magnet”. (Qiu and Gu, 2005, Bowicz et al., 2007, Dobrzaiski et al., 2006, Drak and Dobrzaiski, 2007) Many methods of synthesis have been developed to obtain a low production cost of powder particles of barium ferrite. There are earth magnets that are used where weight and size are very important from the cost and performance point of view (Makled et al., 2005, Martienssen and Warlimont, 2005). The hard magnetic barium hexaferrite has been widely used as a permanent magnet because of its fairly large magneto crystalline anisotropy and high curie temperature, together with its relatively large saturation magnetization, excellent chemical stability, and corrosion resistively. (Sankaranarayanan et al., 2000) The application of hexagonal ferrites in the magnetic media industry requires materials with strict control of homogeneity, morphology and magnetic properties resulting from preparation technology and heat treatments. Hexagonal ferrites show good chemical and thermal stability which would result in longer storage life of the media. However all these methods require two basic production operations firstly mixing of initial components either mechanically or chemically and secondly a subsequent heat treatment of the obtained mixture, the temperature usually ranges from 700°C to 1400°C. Because of the annealing at high temperatures the grain size of the barium ferrite is usually larger than 50nm, which limits the possibilities of obtaining ultra fine particles for the desired applications, especially basic research. On the other hand it is reported that the saturation magnetization for magnetic materials decreases with decreasing particle size.

MATERIALS AND METHODS

In this section we have used the two materials called BaCo$_3$ & Fe$_2$O$_3$ in a pure powder form to
achieve barium hexa ferrite which has a chemical formula \( \text{BaF}_{12}\text{O}_{19} \). The formula obtained by milling & heating process at 1000\(^\circ\)C and 1200\(^\circ\)C. For weight we have used BUITEMS university chemistry lab (Takatu campus) for the sake of exact ratio we have used four (4) digits sensitive weight balance after ten decimal. The ratio is given below Atomic weight of different element.

- \( \text{Fe} = 55.8457 \text{amu} \)
- \( \text{Ba} = 137.327 \text{amu} \)
- \( \text{O} = 15.9994 \text{amu} \)

So using the above values we have achieved the exact formula weight of \( \text{BaO}_6\text{Fe}_2\text{O}_3 \) which is 1111.3264. The value of \( 6\text{Fe}_2\text{O}_3 \) is 958.1376gm while 197.3359gm of \( \text{BaCo}_3 \) produces \( \text{BaO} \) of 153.3264. The percentage of Oxygen is 82.9930% and Barrium is 17.0069% now adding the values \( \text{Fe}_2\text{O}_3 \) and \( \text{BaCo}_3 \) which are 958.1376 and 197.3359 respectively we get the result 1155.4735 again adding \( \text{Fe}_2\text{O}_3 \), \( \text{BaCo}_3 \) and \( \text{BaO} \) values we achieved the 6.8974gm. The actual value obtained by raw material is 53.2608gm.

**Measurement and analysis.**

The work we have started from the mixing of the barium carbonate (\( \text{BaCo}_3 \)), and Iron oxide (\( \text{FeO}_2 \)) at Islamia University of Bahawalpur where we have tried our best to mix it as its highest approach after mixing them we went to Bahauddin Zakaria University Multan for pressing and preparing pellets using 20 ton hydraulic machine at high pressure to obtain the best results from these machines. After the preparation of these items we took it back to BUITEMS in chemistry department to put these pellets in high temperature accumulated machine for the temperature of 1000\(^\circ\)C and 1200\(^\circ\)C. The samples which we were prepared here sent to KRL institute Islamabad to be examined for SEM XRD EDX and B-H curve results at 1000 \(^\circ\)C and 1200 \(^\circ\)C.

**Mixing the composition of material by ball mill method (\( \text{BaFe}_{12}\text{O}_{19} \)).**

The process we have done by using the
4. B-H Curve at 1000°C

Table 1. EDX at 1000°C

<table>
<thead>
<tr>
<th>Spectrum Label</th>
<th>O</th>
<th>Si</th>
<th>S</th>
<th>Fe</th>
<th>Ba</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max.</td>
<td>30.93</td>
<td>21.6</td>
<td>34.49</td>
<td>30.92</td>
<td>12.03</td>
<td>100.00</td>
</tr>
<tr>
<td>Min.</td>
<td>30.93</td>
<td>21.6</td>
<td>34.49</td>
<td>30.92</td>
<td>12.03</td>
<td>100.00</td>
</tr>
</tbody>
</table>

5. XRD at 1200°C

6 SEM at 1200°C

7. SEM at 1200°C

Figure 3.1: EDX at 1000°F

Figure 5: XRD at 1200°C

8. B-H Curve at 1200°C

Figure 7: EDX at 1200°C
CONCLUSION.

By the study of synthesis and crystallization of barium hexaferrite (BaFe₁₂O₁₉) by solid state reaction using the mythology of XRD, SEM, EDX, and B-H curve, it has been found that the growth of crystalline by solid state reaction, whereas the microscopic structure of material is by SEM method and the change in shape of alloy was also observed which shows the presence of oxygen too. During the EDX process the Ba, Fe, O, Si and S has been found in figure 1000°C while in 1200°C figure there is the absence of sulphar (S) which also has not been shown in table too so the changes in the magnetic field are also observed at a temperature of 1000°C & 1200°C respectively with the intensity of 11000 & 11500 by using the annealing method at the required temperature. We have found the change in the morphology of the material as well in the change of the curve of the peaks as depicted in figures. Finally the weight percentage of material has been observed by EDX method so it is stated that the material is cubical by structure.

REFERENCES


High Performance Management Practices: Definition and Measurement

Abdul Raziq

Faculty of Management Sciences, Balochistan University of Information Technology Engineering & Management Sciences Quetta, Pakistan

Abstract

The purpose of this study is to analyze the definition and measurement of High Performance Management Practices (HPMP). The study analyze the definitions of HPMP that various authors have used in their studies. This study employs four criteria to select the studies for assessing the definitions of HPMP and identifying what practices constitute HPMP. The analyses indicate that recruitment, selection, training, compensation, performance appraisal and employee consultation are the most frequently analyzed practices used in defining and measuring HPMP. Finally based on the analyses, the study concludes with its own working definition of HPMP.

Keywords: High Performance Management Practices; Recruitment; Selection; Training; Compensation; Performance Appraisal; Employee Consultation

Corresponding Author’s email: raziq@buitms.edu.pk

INTRODUCTION

The recent literature has used the term High Performance Management Practices (HPMP) in various ways. For example, high involvement (Bryson et al. 2005; Gollan 2005; Guthrie et al., 2002), high commitment (Whitener 2001), high performance work systems (Beltrán-Martín et al. 2008; Chow 2005; Datta et al. 2005; De Kok & Hartog 2006; Drummond & Stone 2007; Hartog & Verburg 2004; Murphy et al. 2007; Takeuchi 2009; Tsai 2006; Way 2002), high performance work practices (Bae et al. 2011; Connolly & McGing 2007; Huselid 1995; Zhang & Li 2009) and high performance management practices (Wiesner et al. 2007). Although various terms are employed and they are used interchangeably, they all refer to the same philosophy (Evans & Davis 2005; Pfeffer 1998; Wiesner et al. 2007).

The objective of this study is to analyze definition of HPMP used in prior studies. In this regard, studies from 1995 to 2011 are analyzed in the light of certain criteria such as the use of HR practices/approaches; managerial practice; HR outcomes/HR sustainability; firm performance/competitive advantage. Moreover, this study also focuses on how HPMP is measured in various studies. Studies from 2000 to 2011 are analyzed by looking into the frequency of HR practices used.

Defining HPMP

Various studies have been conducted across industries, identifying a number of specific HRM bundles. The 1980s era was represented by the collective use of specific personnel practices such as problem solving groups, job flexibility, team working and minimal status differences. The idea was that these variables would have a positive impact on sustainability outcomes (Wiesner et al. 2007). The idea of HPMP became very common during the 1990s. Osterman (1994) conducted a national study of work organizations in which he assessed the implementation of four important practices including TQM, quality circles, teams and job rotation. Becker and Huselid (1998) suggested several guidelines including, careful recruitment and selection, reward system and development strategies that emphasis training and development. Moreover, Lawler, Mohrman and Ledford (1995) conducted a study of 279 top 1000 companies and identified a number of high performance management practices. Such practices include recruitment, selection, training, compensation, performance appraisal and employee consultation.
Fortune manufacturing and service companies and found that employee involvement and TQM practices tend to improve the firms’ performance.

The definitions that various authors have used in defining HPMP is presented in Table 1. These definitions have been used firstly to determine the particular emphasis that various scholars place in defining HPMP and to derive a working definition of HPMP in this study.

Consistent with the criteria used by Wall and Wood (2005), the researcher of this study employed four criteria to select the studies for assessing the definitions of HPMP and identifying what practices constitute HPMP. Firstly, studies were chosen based on highly reputable journals to ensure quality and frequency (highly cited) of studies (see for example Gollan 2005; Huselid 1995; Wood & Menezes 1998). Secondly, the selection was restricted to studies from 1995 onwards, when research on High Performance Management Practices initially started to emerge. Thirdly, only those studies were included, that covered the concept of ‘High Performance Management System’ or ‘High Involvement Management’ or ‘High Commitment Management’ or ‘High Performance HR practices’, or ‘High Performance Management Practices’ because the focus of this section is on assessing the definitions of HPMP and examining what practices constitute HPMP. Studies focusing merely on strategic human resource management or simple human resource management have been excluded. Finally, a focus of recent studies has been emphasised in order to see the latest views on the concept of HPMP. The selected studies are presented in Table 1.

Table 1: Definitions of HPMP and the main themes in these definitions

<table>
<thead>
<tr>
<th>S.No</th>
<th>Study</th>
<th>Year</th>
<th>Definition of HPMP</th>
<th>HR practices/ approach</th>
<th>Managerial practices (wider interpretation)</th>
<th>HR outcomes/HR sustainability outcomes</th>
<th>Firm performance/ competitive advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Huselid</td>
<td>1995</td>
<td>High performance work practices affect employeesformance (turnover, productivity) and financial performance</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Kling</td>
<td>1995</td>
<td>Specific practices such as training, alternative job system and employee involvement are correlated with higher productivity</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Wood and de Menezes</td>
<td>1998</td>
<td>High commitment management (HCM) is characterized by the use of such personal practice s such as information dissemination, problem-solving groups, minimal status difference, job flexibility, and team working, and commitment on the part of employers to employees based on the conception of them as assets</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Way</td>
<td>2002</td>
<td>HPWS consist of practices such as staffing, compensation, flexible job assignment, team work, training and communication expected to achieve low turnover and high labour productivity</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Burt</td>
<td>2002</td>
<td>High-involvement HR practices allow a firm to build firm-specific human capital, which in turn influences organisational performance in two ways: directly, via its effect on employee performance, and indirectly, via employee attachment to the firm</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
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<tr>
<td>S.No</td>
<td>Study</td>
<td>Year</td>
<td>Definition of HPMP</td>
<td>HR practices/ approach</td>
<td>Managerial practices (wider interpretation)</td>
<td>HR outcomes/HR sustainability outcomes</td>
<td>Firm performance/ competitive advantage</td>
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<tr>
<td>6</td>
<td>Harley</td>
<td>2002</td>
<td>HPWS is a set of practices such as performance related pay, training and team-based work - when used in combination are said to be mutually reinforcing and to generate superior organisational performance.</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>7</td>
<td>Cunha &amp; Cunha</td>
<td>2004</td>
<td>High performance work systems, which include training, incentive systems, high selectivity, flexible job assignments and performance management, in concert, contribute to improve employee and company performance, namely by increasing the level of productivity.</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>8</td>
<td>Hartog &amp; Verburg</td>
<td>2004</td>
<td>High performance work practices are defined as a distinctive approach to employment management which seeks to achieve competitive advantage through the strategic deployment of a highly committed and capable workforce, using an integrated array of cultural, structural and personnel techniques. Such practices are likely to increase organisational performance.</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>9</td>
<td>Gollan</td>
<td>2005</td>
<td>High involvement management is designed to improve employee relations and increase organisational performance and profitability through quality communication and consultation between management and employees.</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>10</td>
<td>Bryson, Forth &amp; Kirby</td>
<td>2005</td>
<td>High involvement management (HIM) represents the combination of task related practices, which aim to maximize employees' sense of involvement in their work, and human resource management practices that aim to maximize employee's commitment to the wider organization.</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>11</td>
<td>Chow</td>
<td>2005</td>
<td>A high-performance work system is defined as a system consisting of a set of complementary HR practices that can give a firm a competitive advantage. Or A system of practices that gives employees the skills, information, and motivation to help the company gain a competitive advantage over its competitors.</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>12</td>
<td>Datta, Guathic &amp; Wright</td>
<td>2005</td>
<td>High-performance or high-involvement human resource systems, which are systems of human resource practices designed to enhance employees' skills, commitment, and productivity.</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>13</td>
<td>Benson, Young &amp; Lawler</td>
<td>2006</td>
<td>High involvement work practices are a specific set of human resource practices that focus on employee decision-making power, access to information, training, and incentives. These practices have the potential to increase productivity and organisational performance.</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>S.No</td>
<td>Study</td>
<td>Year</td>
<td>Definition of HPMP</td>
<td>HR practices/ approach</td>
<td>Managerial practices (wider interpretation)</td>
<td>HR outcomes/HR sustainability outcomes</td>
<td>Firm performance/ competitive advantage</td>
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<td>-----------------------------------------</td>
</tr>
<tr>
<td>14</td>
<td>De Koa &amp; Don Hartog</td>
<td>2006</td>
<td>A high performance work system can be defined as a set of distinct but interrelated HRM practices that together select, develop, retain and motivate a workforce (1) that possesses superior abilities (2) that applies their abilities in their work-related activities (3) whose work-related activities result in these firms achieving superior intermediate indicators of firm performance and sustainable competitive advantage.</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>15</td>
<td>Denton</td>
<td>2006</td>
<td>High performance work systems are those organizational systems that employ a fundamentally different approach to managing than the traditional bureaucratic approach. These work systems sometimes go by other names like high involvement or high commitment organizations. The essential characteristic of such organizations are: employment security, selective hiring of new personnel, use of self-managed teams and decentralization, and of decision making, high compensation that is contingent on organizational performance, extensive training of personnel, reduced status distinctions and bonuses, including dress, office arrangements and wage differences across all levels and extensive sharing of financial and performance information within the organization.</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Shih, Chang &amp; Hsu</td>
<td>2006</td>
<td>HPWS refers to a set of HRM practices that can enhance firm performance that is an economically and statistically significant impact on employee turnover, productivity, or corporate financial performance.</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>17</td>
<td>Tsai</td>
<td>2006</td>
<td>HPWS are associated with a higher organizational performance than that achieved under a control system for example, HPWS enhance workers' skills and competence by providing training and job rotation practices; and skilled and knowledgeable employees are motivated and empowered by the decentralization of managerial decision-making, the setting up of formal participation mechanisms, and the provision of proper rewards.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>18</td>
<td>Zheng, Morrison &amp; O'Neill</td>
<td>2006</td>
<td>High performance HRM practices such as performance-based pay, participatory decision-making, free market selection, and performance evaluation generate better HRM outcomes and, in turn, better HRM outcomes contribute positively to firm performance.</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>S.No</td>
<td>Study</td>
<td>Year</td>
<td>Definition of HPMP</td>
<td>Main themes in definitions</td>
<td></td>
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<tr>
<td>------</td>
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<td></td>
</tr>
<tr>
<td>19</td>
<td>Borrill &amp; Minsky</td>
<td>2007</td>
<td>HPWSs are systems of managerial practices that increase the empowerment of employees and enhance the skills and incentives that enable and motivate them to take advantage of this greater empowerment (wider than just HR practices)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Connolly &amp; McGang</td>
<td>2007</td>
<td>High performance work practices provides organisations with the necessary competitive edge</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Drummond &amp; Stone</td>
<td>2007</td>
<td>High performance work system is defined as set of complementary work practices covering three broad areas or bundle of practices: (1) Self-directed teams, quality circles and sharing of company information (2) Recruitment process, performance appraisals and mentoring. (3) Reward and commitment practices, embracing financial rewards, family flexible policies, job rotation and flexible working.</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Biletan-Martin et al.</td>
<td>2008</td>
<td>HPWS comprise practices aimed at enhancing the firm’s human capital, under the premise that employee potential is not fully utilized and can be enhanced through the appropriate means</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Lomas-Aspenc &amp; Campos</td>
<td>2008</td>
<td>HPMP are set of distinct but interrelated HR practices that, taken together, select, develop, retain and motivate a work force. These practices are also linked to firm performance.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Hui et al.</td>
<td>2009</td>
<td>HPWS is a system of HR practices designed to enhance employees' competencies, motivation, and performance in providing high-quality service to external customers</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Messer and Patel</td>
<td>2011</td>
<td>HPWS may be viewed as strong systems comprising internally coherent practices that send reinforcing messages and cues to employees which in turn affect unit-level performance</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Lawler et al.</td>
<td>2011</td>
<td>HPWS comprise three complementary principles to enhance workforce abilities: to enhance employee motivation, and to create avenues that allow workers to have a significant say in problem-solving or decision-making processes.</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Ait Razouk</td>
<td>2011</td>
<td>HPWS are a source of better performances because it is set of practices which has an effect on employees' commitment and involvement; it is an internal resource able to produce a competitive advantage, and finally, because it contains a set of internal's complementary practices.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
It is clear from Table 1 that four main themes emerged in the analysis of the definitions. These include the use of HR practices/approaches; managerial practice (wider interpretation); HR outcomes/HR sustainability; firm performance/competitive advantage. For the first theme, 21 out of 27 studies have used HR practices in their definitions of HPMP. This shows the importance of HR practices/approaches in defining HPMP. For the second theme, only six studies have used the concept of managerial practices. For the third theme, the majority of studies (22/27) used HR outcomes in defining HPMP. Finally, for the firm performance theme, most of the research articles (21 out of 27) employed this concept.

**Measuring HPMP**

The discussion now turns to what particular HR practices and/or managerial practices have been identified as constituting HPMP.

### Table 2: Frequency of individual HPMP in prior research studies from 2000 to 2011

<table>
<thead>
<tr>
<th>S.No</th>
<th>HPMP</th>
<th>Frequency with which the term is used</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.No.</td>
<td>HPMP</td>
<td>Frequency with which the term is used</td>
<td>Source</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
<td>--------------------------------------</td>
<td>--------</td>
</tr>
</tbody>
</table>
It is evident from Table 2 that recruitment, selection, training, compensation, performance appraisal and employee consultation are the most frequently analyzed practices in research studies.

CONCLUSION
The objective of this study was to analyze the definition and measurement of HPMP used in various prior studies. Within the context of definition of HPMP, studies from 1995 to 2011 were analyzed in the light of certain criteria such as the use of HR practices/approaches; managerial practice; HR outcomes/HR sustainability; firm performance/competitive advantage. Thus, based on this analysis, it can be concluded that researchers view HR practices; HR outcomes and firm performance as the most important components of the concept of HPMP while managerial practices are considered less important in research studies when defining HPMP. Moreover, this study also focused on how HPMP was measured in various studies. Studies from 2000 to 2011 were analyzed by looking into the frequency of HR practices used. The analyses also found that most of authors have used recruitment, selection, training, compensation, and performance appraisal and employee consultation as frequently analyzed practices in defining and measuring HPMPs. Finally, the study concludes with the following working definition of HPMP. HPMP is a set of human resource management practices (Recruitment, Selection, Training, Remuneration, and Performance Appraisal) and managerial practices that enhance employee involvement and participation, which positively impact upon HR outcomes and organizational performance and/or competitive advantage.

REFERENCES


A Dynamic Auto-Address Configuration Protocol for VANET Region based Auto-configuration Protocol with Code Association (RAPACA)

Sadique Ahmed Bugti, Riaz-ul-amin, Faisal Khan, Rahila Umer

Faculty of Information and Communication Technology, Balochistan University of Information Technology, Engineering and Management Sciences, Quetta, Balochistan

Abstract

The Auto-Address Configurations (AAC) for Ad-hoc necessitates appropriate application. The ACC for Vehicular Ad-hoc Networks (VANET) demands even more effort and the assumption of having nodes to be configured a priori do not support the notion for the networks such as VANET. Although Auto-Address Configuration Schemes (AACS) for VANET have been explored prior to this work, however a hybrid (infrastructure and Ad-hoc networks) address configuration still remains in hunt. In this research effort we try to address the problem of auto-configuration for VANET and design a protocol that supports hybrid nature of VANET, that seems be part and parcel of networks such as VANET. We propose a protocol named Regional-based Auto-Configuration Protocol with Code Association (RAPACA) that addresses the configuration issues with the help of clustering approach, an approach that has been proposed in our previous research work Cluster-Based Addressing Scheme for VANET (CAVNET). The RAPACA improves CAVNET approach as the designed protocol considers hybrid nature of VANET.

Keywords- DHCPv6, Control Server, Cluster Head, IPv6.

INTRODUCTION

The increasing growths in wireless networks tempt to involve every device to play its due tasks in order to be the part of connected networks (internet, network of networks). This involvement increasing growth also engages the moving vehicles on the roads and demands them to be the part, to serve and be served as the nodes for sharing information. The impending technology expects these moving nodes (vehicles) to exchange of information with rest of the world. Quite recently these nodes have been blessed with devices known as On-Board-Units (OBUs) to form a network, to establish a Car to Car (C2C) communication for sharing safety information. This C2C communication forms an ad-hoc network. This ad hoc connectivity concept is driven from Mobile Ad Hoc Networks (MANETs) and VANET develop to be known as the subclass of MANETs. The communication among these nodes is developed with a communication protocol called Dedicated Short Range Communication protocol (DSRC). With the help of DSRC Vehicles get themselves in connecting with infrastructure network through the devices known as Road-Side-Units (RSU) installed at road side, to form an infrastructure network and be able to communicate with the rest of the world. But to establish communication with rest of the world, vehicles need to be assigned proper IP addresses. A correctly assigned addressing scheme regarding networks’ topologies remains one of the fundamental issues in the field of communication. Auto-Address configuration develops to be very important issue regarding VANET, which addresses the high mobility vehicles along the roads. A proper scheme in return easies proper communication with the source and destined vehicle in the VANET. AACS remains one of the core issues, irrespective of networks types or topologies.

In the arena of IP addressing Dynamic Host Configuration Protocol (DHCP) claims to be very common method for IP address assignment. The advantage of this protocol
is it can assign addresses to any of the hosts without any manual efforts from network administrator. The DHCP turns out to be very important protocol for assigning IP address to the fast moving vehicles in vehicular ad-hoc network. The authors in (Das and Fazio, 2007, Tuan, 2010, DSRC) have used this protocol to configure vehicles irrespective their speeds. The auto-address configuration among the moving vehicle invites plethora of disputes to be argued. IP AAC in VANET remains an open issue, because VANET has a potentially infinite extension (Das and Fazio) specially keeping in view the mobility pattern of this network. The vehicles accelerating and decelerating without any well known reasons poses challenges. To overcome the issue of addressing in VANET, this paper applies Regional-Based Auto-Address Configuration (RAPACA) protocol a distributed IP addressing scheme.

RAPACA with the help CAVNET (clustering auto-configuration protocol) presented in our previous work covers the part of network where there is no infrastructure network is available. In the (Bugti and Chunhe, 2011). we discussed clustering approach to tackle the auto-configuration process for vehicle moving in the highways or sparse areas. The combination of RAPACA and CAVNET proves to be handful approach to address hybrid nature of network. The designed architecture of RAPACA supports mostly infrastructure of nature, and with help of CAVNET the ad-hoc nature of VANET is also covered. The RAPACA potentially resolve the issue of auto-address configuration among the moving vehicles irrespective network type. The rest of this paper is organized as fellow. The section II enlightens the state of art in VANET address schemes, Section III discusses the architecture of designed protocol, section IV explores the communication process of the designed protocol, Section V discusses the comparisons of designed protocol with exiting approaches and VI highlights conclusions and future direction.

State Of the Art

Mobile IPv6
The solution to connect vehicle to the Internet with assigned unique IP address, a Mobile IPv6 can be applied and this has been acknowledged in (Soliman et al., 2008). There are number of features which are supported by Mobile IPv6 such as mobility based IP addressing, pack forwarding IP addressing. These solutions on other hand invite problems like handoffs, which result in end to end packet delay and degradation of network performance. To overcome the problems of handoff and degradation, other approach such as Mobile IPv6 with Hierarchical Register Management, Mobile IPv6 address Pre-fetching and Local Retransmission Mechanism. However MIPv6 remains an important candidate to counter the IP configuration problems potentially.

Manet Routing Protocol Application
Although MANET and VANET are different networks, but they share some common commodities, such as the vehicles in VANET are equipped with a transceiver, named On Board Units (OBUs) to transmit and receive information. These OBUs exchange information with Access Points (AP) known as Road Side Units (RSUs) installed by road side. These devices use 802.11p standard communication protocol for VANET, the 802.11p protocol is also known as Dedicated Short Range Communication (DSRC) protocol. The DSRC operates at the spectrum of 5.9 GHz and its apparent communication range is up to 1000 m, for more details on DRSC refer (DSRC). On other hand the standard MANET communication protocol used uses 802.11b referred to as Wi-Fi. The application of Mobile Ad hoc Network (MANET) routing protocol for addressing scheme in VANET has been pertained in [8]. But these distributed addressing algorithms do not comply with dynamic nature of VANET. The direct implementation of these protocols does not meet the fast moving vehicles requirement.

Existing VANET Addressing Protocol
The fast mobility of vehicles, and continuous different direction movements, restricts direct implementation of traditional network addressing protocols to integrate with VANET. The work in (Das and Fazio, 2007) claims to be first VANET addressing protocol named Vehicular Address Configuration (VAC) and exploits the VANET topology. The
author enhances DHCP service with dynamically elected leaders to provide a fast and reliable IP address configuration. The VAC organizes some leader’s chain connected to each other with help of ordinary vehicles; residing in the communication range of these leaders (at least one leader). The VAC guarantees uniqueness of IP addresses within a defined SCOPE of the leader. It does not guarantee IP uniqueness once the vehicle is out of SCOPE. The problem VAC is If the distance between two leader vehicles exceeds the max_threshold, then one ordinary vehicle within the SCOPE has to be a leader; on other hand if the distance between two reaches to min_threshold, then one of leaders will have to give up the responsibilities of leader. In either of the cases address reconfiguration is required, which is not clearly focused in VAC.

The Centralized Address Configuration (CAC) (Mohandas and Liscano, 2008) applies centralized approach for DHCP server and guarantees to provide unique IP address to vehicles in the urban area. The network area is supposed to be covered with RSU functioning as Access Point (AP) connected centralized DHCP server. The IP addresses are assigned by the centralized DHCP server and requested by AP, functioning as relays agent. As IP addresses are assigned by the centralized DHCP server so the chances of having duplicated IP address in the network remains out of question , but as all IP addressing depend on single centralized DHCP server in dense urban areas, rises questions, 1) it is hard to guarantee the deployment of APs in every corner of urban area, 2) if this assumption is guaranteed, it will be very unrealistic to imagine that AP placed in hotspots (i.e. Shopping mall, public gatherings, movie center or football ground), would be able to meet IP address requests made by accumulating vehicles. 3) If this assumption is also guaranteed, then how about single centralized DHCP server, which has to meet IP address request from every APs in urban area, seems obscure, because DHCP server follows based First Come First Served (FCFS).

The IP addresses assignment in (Tuan, 2010),proposes an efficient way of distributing IP address, uses a hierarchical DHCP servers mechanism, each RSU is connected to a central DHCP server, name Balance Sever (BS). The BS distributes and synchronizes the assignment of IP address pools, which are actually maintained by RSUs. The RSUs do not completely depend on centralized server. The RSUs meet IP address request by themselves, from assigned pool of addresses to them. The application focuses on IPv4 instead of IPv6 which comprises a number of difficulties of implementation and has not been utilized widely up now (Tuan, 2010). A hierarchical relationship among the RSUs and centralized exits, every RSU periodically sends messages to higher level of RSU and receives these periodic messages from lower level RSUs. The problem with HID is it is dedicated for selected area of city, cannot be implemented in the areas where ideal installation of APs is not covered.

Design Protocol Architecture
Regional-Based routing protocols for Vehicular ad-hoc networks have been focus of interest for the researcher recently (Vandenberghe) but Regional-Based IP address distributions somehow remained out of spotlight for VANET. The designed architecture of RAPACA protocol can be applicable anywhere from macro to micro levels. We consider micro level in this paper and focus on the Beijing city of China. We address this issue with the help of clustering approach and we envision micro level architecture of VANET as shown in Fig 1. Designed architecture functions similar to virtual Mesh Network as described in Fig 2. The respected city is designed with accordance to some ring roads mechanism, where more than 500 bus routes (http://www.bjjgl.gov.cn) available. The designed protocol functions with some hierarchical servers. The root servers termed as Central Control Servers (CCS), covering four different direction of the city i.e. The hierarchy of CCS servers use coding schemes such as 00 CCS covers the area from South West to North West, 01 CCS covers from North West to North East, 11 CCS covers from North East to South East and 10 CCS covers from South East to South West respectively. The CCS cover Access Routers place close to them. Each CCS
server processes 14 Distributed Servers (DS) in each direction.

The DSs are connected with core network and provide services to their closely placed Regional Access Router (RAR). The RARs function similar way to RSUs places by the road side as depicted in Fig 3. In addition to that the RARs provide address space to moving Cluster Heads (will be discuss in section V of this paper). The CHs provide IP address to normal joining vehicles. How these CHs manage and maintain IP addressing among each other has been discussed in our previous work termed as CAVNET (Bugti and Chunhe, 2011).

Regional coding

The Regional Coding (RC) remains fundamental element to understand the division bitwise. The close observation of RC leads us to understand proper coding method applied in Fig 1. Aforementioned there are four CCS servers each covering their respective direction. A vehicle moving in the vicinity of any of the CCSs could easily be detected with respect to its two starting Code bits such as 00, 01, 11 and 10. The rest of the bits followed by these two bits indicate vehicle is still in the coverage area of zone or CCS. The increase in digits indicates increase in distance of the vehicle from the CCSs. The CHs beacon their final destination information through these RCs time to time in order to let normal vehicles select a suitable CH related to their destination. The selection criteria of CH related to normal vehicle destination brings longer during of connectivity with selected CH. We will discuss this method when we discuss CH function in detail in section V.

Hierarchical Server Distribution Mechanism

The designed mechanism of RAPACA is to attain the objectives longer during connectivity of IP addresses with respect to uniqueness. The basic concept is to provide CH an address space directly from RSs through RSU or APs. We would use term APs in place RSUs in this research paper. Aforementioned the CCS are connect with
14 other DSs in their respective covers areas. The DSs are connected with RSs and RSs over all APs in their respective areas. The layer hierarchy of these Servers is demonstrated in Fig 3.

**Figure 3: Servers’ Hierarchy**
The number of APs installed in the regional areas function as address space provide with respect to timing of the day. Provide IP address space to CHs, which in return provides Unique IP address to the vehicles residing in the vicinity of the CH. We don’t require complete coverage of regional area with APs as there are possibilities that number of roads in the city may not be covered. As aforementioned there are nearly 500 bus routes in the respective Beijing city. This is where cluster approached has been brought into act. In Fig 4 we envision the place where two APs install at distance may not cover complete transmission and there remains some space in between that is not covered by transmission. This is why vehicles need to join clusters in order to remain connected with transmission. The proper application of cluster approach is discussed in V section. The details of cluster based auto-configuration have been discussed in our previous work (DSRC). The CAVNET was designed in order to keep highway scenario in mind, but RAPACA with help of CAVNET covers hybrid nature of network.

**Figure 4: Regional-Based Aps**

**Dynamic Host Configuration Protocol (DHCPv6)**
The DHCPv6 is a client-server based architecture. The node develops a contact with server for address allocation. The server assigns the address to requesting client from its address pool, based on the allocation mechanism. If client is not in the same link of server it is possible that may use one or more nodes as relay agent to obtain IP address. Here we highlight the possible steps to obtain IP.
1) A solicit message is sent by a client to locate the server.
2) In reply there is response the server, which sends back a advertisement message, this response indicate the possible IP address available to the server.
3) The Client replies by selecting an IP address from a specific server (if there is more advertisement message)
4) The server which is selected replies back accepting the request of selected IP address of the client. This assigned IP address is leased for specific period of time depends up the settings.

**Distribution of IPv6**
The division IPv6 plays important part in the deployment of the networks. We divide IP address format in main three parts first.
1) The network prefix 64 bits
2) The Ad-hoc prefix 48 bits
3) The Host ID prefix 16 bits.

The 64 bits prefix part is used to cover the part of Internet Gateway the servers connected the globally providing internet services the client’s nodes. The 48 bits prefix part is used to cover the ad-hoc connectivity of the network, such as CHs, and rest of 16 bits is used for vehicles jointing the cluster. In the processing section we discuss the cluster head selection criteria that seem to
be suit with respect the vehicle movement pattern in discussion for the designed protocol.

B. the ad-hoc prefix 48 bits for cluster heads

The cluster head selection for the designed protocol aims to follow some simple criteria.

1) First we intend to spotlight the buses moving along to road for transportation. We try to select these buses as our default servers first. To select these buses as default cluster head raises some questions.

a) Why buses?
b) When buses are not available then what?
c) What about late night timings when system is inactive?

To answer these questions should be appropriate and logical in order to understand selection criteria for buses to be selected as CHs. Answer to first question

1) Buses cover 20% of traffic in Beijing city.
2) It becomes unproblematic to equip these buses with additional required devices (UTRAN interface) to perform as CHs.
3) It's easy to regulate the traffic rules on these buses by the authorities.
4) These buses mostly follow the average speed criterion, which makes them to be suitable for selection.
5) Last but not the least these buses have fix routes to follow, that makes ordinary vehicle to select the suitable bus to join with respect to route and speed.
6) The longer vehicle is connected with the network, the better network performance is achieved.

A simple speed variation with respect to buses and ordinary is taken from the real scenario is observed during travelling. Where we took observed sitting in the buses selected two cars with varying speed Fig 5. Demonstrate such variation in speed.

The answer to second question, in the designed protocol we always keep the candidate CH active, this could be any vehicle that may fellow second selection criterion. In the absence of CH these candidate CH are selected as CHs. The criteria selection for the candidate CH is speed and willingness of the vehicle. The speed criterion for candidate CH is obtained (Kayis and Acarman, 2007).

The answer to last question, we allow AP or RSU to supply IP address to the moving vehicle, when the buses are not available or when these services are not active. One such application have discussed in [CAC], [HID]. In these application AP become responsible to assigned IP address them.

**RAPACA application**

Let's assume once an ordinary vehicle or buses moves along the road. We assume the in normal condition every vehicle; either bus or ordinary vehicle is registered to some home address before it moves along the road. This assumption is taken for the sake of apprehension that mostly vehicles belong to Beijing city and at the off timings they are parked in their respective region or area where they belong to. Such a straightforward registration process is demonstrated in Figure 6.

![Registration Process](image)

**Figure 6: Registration Process**

**Registration process of RAPACA**

Once the vehicle is on the road leaving their respective registered home network they may require to connect with some established network along the road. As aforementioned along the road we have buses function as CHs. Let’s observe process with the flow diagram in Fig 7. How this all process is handled is illustrated in Fig 7. Aforementioned buses or other vehicles are already registered with the home network. The difference between buses and ordinary
vehicle remains as buses before leaving their home network are blessed with address space to function as CHs. The process of address registration in RAPACA demonstrates that CH beacon their destination address with respect to area coding discussed earlier. This beaconing process contributes a very useful process as vehicles smartly select the CH with the same destination, which in return, 1) enhances the connectivity with the CH 2) distributes address configuration requests from single server in rush hours which was main problem in protocol [CAC], 3) vehicles selecting CH with their choice try to remain connected the same CH as long as possible, which should minimize re-configuration problem with very little speed variation, which could be main problem of protocol [VAC].

Figure 7: RAPACA Joining CH

RAPACA addressing Scheme

The main focus of this paper remains at the application of IPv6 for VANET. The geo-casting and regional distribution for VANET remains interest of many cooperative companies. The different approaches have been concerned. Such an approach for VANET has been discussed (Vandenberghe). The RAPACA adapts IPv6 extension header that allocates an integration of geographic data in the IPv6 packets. Similar to the approach been discussed in (Vandenberghe), but the RAPACA addressing scheme is demonstrated in figure (Mohandas and Liscanu, 2008) clearly demonstrates different parameters applied for network connectivity.

The first three fields of the addressing scheme are as same as mentioned in (Vandenberghe). The first field is used for regional multicast packets. The second field is used to understand whether the address used format is permanent or transient. Since the addresses used in for network that is built on fly we apply transient approach. The third field used for scope of the network as we target cluster of the network so we set the field to site-local as the approach suits the requirement. The rest three fields are used to indicate initial area-code, current area-code and destination area code respectively. The seventh field indicates the CH ID; the next field is used for address space allocated to this CH. The ninth field is used for available IP address set for ordinary vehicle to join. The tenth field timestamp is used for understand time period of the day as night timings when the buses are not function as CH then the APs function instead of buses. The last field is used to measure the speed parameters of the CH.

RAPACA Multicasting Method

The method multicasting is been used in RAPACA very carefully, when the CHs pass through different RCs. These RCs through RSUs provide information (road condition, road hazard, weather updates and news updates) to CHs in multicast mode the all the member vehicles of CHs are informed through this mode.

RESULTS

As aforementioned a comparative simulation with respect to CAC, HID and RAPACA configuration protocol is simulated using Matlab simulator with following macroscopic traffic mobility. As defined in table 1.

Table 1 Simulation


<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Simulation Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulation Area</td>
<td>15 km x 15 km</td>
</tr>
<tr>
<td>Number of RSUs Used</td>
<td>10</td>
</tr>
<tr>
<td>Number of Vehicles</td>
<td>100</td>
</tr>
<tr>
<td>Velocity of Vehicles</td>
<td>10 - 70</td>
</tr>
<tr>
<td>IP address</td>
<td>IPv6</td>
</tr>
<tr>
<td>Minimum Coverage Area by RSU</td>
<td>1000m</td>
</tr>
<tr>
<td>Minimum Coverage Area by RSU</td>
<td>1000m</td>
</tr>
<tr>
<td>MAC Protocol</td>
<td>IEEE 802.11p</td>
</tr>
<tr>
<td>Type of Data Transmission</td>
<td>Constant Bit Rate (CBR)</td>
</tr>
<tr>
<td>Mobility Model</td>
<td>Manhattan</td>
</tr>
<tr>
<td>Number of Rounds</td>
<td>10</td>
</tr>
</tbody>
</table>
A Dynamic Auto-Address Configuration Protocol for VANET Region-based Auto-configuration Protocol with Code Association (RAPACA)

The Table-1 defines the simulation environment of RAPACA protocol. The first consideration is put into practice with respect to the RCS grid layout, discussed in section III. Later the comparison between standard VANET auto-configuration protocols CAC, HID and RAPACA is carried out. The carried out scenario introduces the measurement with respect to connectivity between the client and server. The connectivity of joining vehicles with their respective servers (i.e. RSUs in CAC, APs in HID and CHs in RAPACA protocol) has been carried out using Matlab.

Initially a RSU is placed on the straight linear road. The ordinary vehicles with different speed metrics pass through the RSU placed by the road side. The connectivity time of passing vehicle is measured against the stationary RSU of CAC and AP of HID. The passing vehicle speed parameter was linearly increased from 10~60 km/h considering the urban traffic flow. The graph in Figure-10 demonstrates the connectivity time of ordinary vehicle to particular RSU or AP. It should be noticed that only one RSU was placed to meet auto-configuration requests as applied in (CAC and HID) protocols.

The graph in Figure-10 demonstrates the connectivity time of vehicle decreases with stationary RSU as speed of vehicle increases. The fast speed of vehicle provides lessens the time connectivity with the server, to configure the vehicle and also lessens time for vehicle to remain in the network. After measuring the connectivity time taken by vehicle with stationary RSU in Figure-10. The graph in Figure-11 includes the RAPACA CHs into same scenario. The CH travels at constant speed (i.e. 25 km/h), and has transmission range up to 600m. The simple demonstration with respect to CH speed is presented Fig 11. Where kept CH speed from 25 to 35 and number vehicle with different speed from 20 to 100 is presented. We observer vehicles with similar speed remained connected to CH for longer time. The speed of CH have been tested against different speed variation as demonstrated in figure 12 and Figure 13.

The compiled results clearly demonstrate significant difference in connection time with CH and stationary servers.
CONCLUSION
In this paper we proposed a protocol named Regional-Based Auto-Configuration Protocol with code association designed for VANET. The designed protocol functions with some area coding scheme. The cluster approach applied in RAPACA demonstrates improved the result of the network connectivity compared to previously applied protocol. This connectivity in return reduce re-configuration problem. The RAPACA is useful protocol with respect to type of networks. As compare to earlier approaches the RAPACA demonstrates as realistic protocol to be implemented in the networks such as Vehicular Ad-hoc Networks.

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Impact of Competitive Intelligence on Organizational Performance

Tayyaba Akram\textsuperscript{1} and Ajmal Waheed\textsuperscript{2}

\textsuperscript{1} Faculty of Management Sciences, Balochistan University of Information Technology, Engineering and Management Sciences, Quetta, \textsuperscript{2} School of Management Sciences, Quaid-e-Azam University, Islamabad, Pakistan.

Abstract

Competitive intelligence has been an important tool for measuring organizational success, decision making and performance of employees in past decades. Its contribution in literature is worthy some. On the other hand organizational performance is an essential aspect for an organization in current uncertain business environment. With increased competition, limited resources and increased uncertainty, organizations are seeking better and competent ways for improving their own productivity. It is necessary then for organizations to identify those factors which can affect long term productivity and success. The objective of current study is to investigate the relationship between competitive intelligence and organizational performance. Self-administered questionnaire with five point Likert scale is used for identifying the relationship between independent variable, competitive intelligence and dependent variable organizational performance. Sample selected comprises 100 managers from 10 leading banks in Islamabad. Regression and correlation analysis are applied resulting in significant and positive relationship between the variables of the study.

Keywords: competitive intelligence, scanning, organizational performance.

Corresponding Authors email: awkhan2@yahoo.com

INTRODUCTION

Over the last couple of decades, competitive intelligence (CI) has emerged as a distinct, recognizable occupational category and evolved into a fully-fledged corporate discipline with formal education programs (Murphey, 2005). Along with this, the idea of organizational performance also evolved and found a place as an important concern for business and human resource management aspects of an organization. David (2008) defines CI as per the definition given by society of competitive intelligence professionals (SCIP) that it is a systematic and ethical process for gathering and analyzing information about competition’s activities and general business trends to further a business’s own goals. According to West (2001) it is the process by which companies inform themselves about every aspect of their rival’s activities and performance. Mcgonagle and Veela (2003) identified two types of CI i.e., (i) active CI which involves the active development of CI on all aspects of businesses and competitive environment; and, (ii) passive CI which is the process of protecting one’s firm against the competitive intelligence efforts of competitors. On the other hand, David (2008) suggested three basic reasons for running a CI program by firms i.e., (i) to provide a general understanding of an industry and its competitors; (ii) to identify areas in which competitors are vulnerable and to assess the impact strategic actions would have on competitors; and, (iii) to identify potential moves that competitors might make that would endanger a firm’s position in the market. Porter (1980) summarized the essence of these dynamics and said that rivalry occurs because one
or more competitors either feels the pressure or sees the opportunities to improve position. CI can play a vital role in achieving organizational goals. However, the importance of CI has not been studied in the context of organizational performance (OP) in depth, particularly in the Pakistani context. Therefore, the main objective of this study is to find out that how can CI contribute in enhancing the organizational performance. In other words, the objective is to investigate the relationship between CI and OP in the selected banks of Islamabad.

MATERIALS AND METHODS
Respondents and Procedures
Respondents for the study are operational level managers from 10 major banks situated in Islamabad. Sample is chosen through convenience sampling technique due to limited resources in terms of time and money. Total number of distributed questionnaires was 130 out of which 105 received back. Five questionnaires are excluded due to in completion. The total response rate was 76%, showing a sufficient number of data for final analysis. As the study is on organizational level, no demographic information of the participants was required. Filling up of questionnaire followed a proper protocol. Participants were instructed to fill the questionnaire very carefully and confidently. They were ensured that their provided information will be kept confidential and will not be shared with anyone. Questionnaire used for the study is on a five point likert scale, which comprises of two scales. Scale of Qiu’s (2008) is used for measuring competitive intelligence with some modifications according to the requirements for the current study. Competitive intelligence scale includes two facets for measuring CI i.e., scope of scanning for CI and frequency of scanning for CI. Scope of scanning (SS) facet asked participants that how extensively they scan information from six market sectors namely customers, suppliers, competitors, company resources, technology and socio-economic sectors. Frequency of scanning facet of CI asked participants that how frequently they scan these six sectors. Total number of items in scope of scanning were 6 and in frequency of scanning 27 which are reduced to 19 items for meeting the requirements of the current study. Scale for organizational performance was adopted from Baum and Wally (2003). This scale included seven items in total out of which two items are related with profitability and 5 items are related with growth of the organization.

RESULTS
Descriptive statistics, Cronbach’s alpha reliability, regression and correlation analysis are performed by using SPSS 17. Results are presented in tables along with their description. For scope of scanning, SS1, SS2, SS3, SS4, SS5 and SS6 are the items which measures how extensively organizations scan for six market sectors. Sample questions included for measuring scope of scanning (SS) are; our company extensively scans customer sector, and our company extensively scans competitor sector. Descriptive statistics and alpha reliability calculated for the study are presented in Table 1. Descriptive statistics includes mean, standard deviation, and score range. For scope of scanning mean value is 3.90 and standard deviation is 0.714 indicating that most of the respondents agree that they extensively scan six market sectors. Standard deviation is the measure of variation by indicating how far, on average, the observation is from mean. Lowest standard deviations show that the data lie nearer to the sample mean whereas highest standard deviations show that the data set is far from the sample mean of the sample. For current study, the standard deviation lays within mean ± 1 Standard deviation (S.D) from the mean value. It shows that the data set for current study lies within mean ± 1 S.D from the mean value. Alpha reliability for scope of scanning is 0.873 which indicates that variable is significantly reliable.

Table 1: Descriptive Statistics and Alpha Reliability for the Variables of the Study

<table>
<thead>
<tr>
<th>Scale</th>
<th>No. of Items</th>
<th>Score Range</th>
<th>M</th>
<th>S.D</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope of scanning</td>
<td>66</td>
<td>2.17-3.90</td>
<td>3.54</td>
<td>0.71421</td>
<td>0.873</td>
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<tr>
<td>Frequency of scanning</td>
<td>19</td>
<td>2.58-3.85</td>
<td>3.46</td>
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<td>0.593</td>
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<tr>
<td>Profitability</td>
<td>02</td>
<td>3-3.85</td>
<td>3.81</td>
<td>0.661</td>
<td>0.842</td>
</tr>
<tr>
<td>Growth</td>
<td>05</td>
<td>3-3.84</td>
<td>3.84</td>
<td>0.28257</td>
<td>0.844</td>
</tr>
<tr>
<td>M = mean, S.D = standard deviation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Frequency of scanning is measured along items of FS1 to FS19. It explains that how frequently organizations scan six market sectors. Mean value for FS is 3.85 and standard deviation is 0.6478 indicating that most of the respondents agree they frequently scan 6 market sectors and the sample mean lays within mean ± 1 S.D from population mean. Alpha reliability for FS is 0.933 indicating that the items included in the scale are highly reliable for the study.

Profitability is measured along two items in the scale, POP1 and POP2 with mean value of 3.85 and standard deviation of 0.863. It represents that data set lays within mean ± 1 S.D from the population mean. With alpha reliability of 0.612, items of profitability are significantly reliable for current study. Growth for the organization is measured along items of GOP1, GOP2, GOP3, GOP4 and GOP5. Alpha reliability for growth items is 0.814 indicating high reliability of the items. With mean value of 3.81 and standard deviation of 0.7825, it is presented that most of the organizations agree that they have growth in their organizations.

Descriptive statistics for competitive intelligence and organizational performance are presented in Table 2. Competitive intelligence is having mean value of 3.85 and standard deviation of 0.628. Whereas organizational performance is with mean value of 3.82 and standard deviation of 0.737. It shows that for both independent and dependent variables the samples mean lays within 1 standard deviation from the population mean. Alpha reliability for over all scale is 0.952 indicating high reliability of the scale used in the study.

Table 2: Descriptive Statistics and Alpha Reliability for the Competitive Intelligence & Organizational Performance (N=100)

<table>
<thead>
<tr>
<th>Scale</th>
<th>No. of items</th>
<th>Score Range</th>
<th>M</th>
<th>S.D</th>
<th>Alpha coefficient</th>
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</thead>
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<tr>
<td>Competitive Intelligence</td>
<td>25</td>
<td>2.64</td>
<td>3.856</td>
<td>0.62037</td>
<td>0.952</td>
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<tr>
<td>Organizational Performance</td>
<td>7</td>
<td>3.00</td>
<td>3.8229</td>
<td>0.73719</td>
<td></td>
</tr>
</tbody>
</table>

M = mean, S.D = standard deviation.

**Correlation and Regression Analysis**
Correlation quantifies the strength of two variables and also indicates the direction of the relationships. Correlation analysis is performed for identifying the nature of relationship between independent and dependent variables of the study. Table 3 presents Pearson correlation between the variables of the study, whereas, correlation between competitive intelligence and organizational performance, is presented in Table 4. Along with correlation analysis, linear regression analysis is also used to identify the nature of the relationship between the variables and to test the four hypothesis of the study. Regression analysis is reported in Table 5 to Table 9.

Independent variables of the study i.e., scope of scanning for competitive information and frequency of scanning for competitive information are highly and positively correlated with each other. The (p < 0.01) value shows the level of significance for the correlation among the variables of the study. Competitive intelligence and organizational performance are also significantly and positively correlated to each other at p < 0.01.

Table 3: Correlation between the Variables of the Study (N=100)

<table>
<thead>
<tr>
<th>Sr. No</th>
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<th>II</th>
<th>III</th>
<th>IV</th>
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<tbody>
<tr>
<td>1</td>
<td>Scope of Scanning</td>
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<td>0.725</td>
<td>0.507</td>
<td>0.474</td>
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<tr>
<td></td>
<td>Frequency of Scanning</td>
<td>-</td>
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<td>0.100</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td>Profitability</td>
<td>-</td>
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<td>0.000</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Growth</td>
<td>-</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed).**

Table 5 provides the first regression model of the study. This model is developed to identify the strength as well as the direction of the relationship among scope of scanning as independent variable and profitability as independent variables.

Table 4: Correlation for Competitive Intelligence & Organizational Performance (N=100)

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Scale</th>
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<th>II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Competitive Intelligence</td>
<td>-</td>
<td>0.706</td>
</tr>
<tr>
<td></td>
<td>Organizational Performance</td>
<td>-</td>
<td>0.100</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed).**
Note: $b =$ Un-standardized Coefficients, $S.E =$ standard error of variables, $\beta =$ standardized coefficients, $t =$ t-statistic, $p =$ significance level. $R^2 =$ R square, $\Delta R^2 =$ adjusted R square.

Results of model 1 in Table 5 with $R = 0.539$, $R$ square $= 0.291$, $\beta = 0.539$, $t = 6.341$ and $p < 0.001$ indicates that scope of scanning is significantly and positively related to profitability of the organization and 54% variability in profitability of the organization is due to variability in scope of scanning. Therefore, first hypothesis of the study $H1$ is accepted. Table 6 presents the second regression model between scope of scanning and organizational growth. With $R = 0.674$, $R$ square $= 0.455$, $\beta = 0.674$, $t = 9.044$ and $p < 0.000$, the model indicates that there is a significant and highly positive relation between scope of scanning and organizational growth. 67% variability in organizational growth is due to the variability in scope of scanning. Second hypothesis of the study, $H2$ is also positively and significantly supported.

Table 7 presents third model of the study. It depicts the relationship between frequency of scanning for competitive information and organizational profitability. Results indicate that there is 48% variability in organizational profitability which is due to the variability in frequency of scanning. Third hypothesis of the study, $H3$ is also significantly and positively supported.

Table 8 presents model number four of the study. It shows the relationship between frequency of scanning and organizational growth. There is a positive and highly significant relationship between frequency of scanning and organizational growth. Results also indicate that 66% variability in organizational growth is due to the variability in frequency of scanning for CI. Fourth hypothesis of the study, $H4$ is supported positively.

Table 9 presents the fifth model of the study which indicates a very strong, significant and positive relationship between competitive intelligence and organizational performance over all. Results depicts that 71% variability in organizational performance is due to the variability in competitive intelligence. Fifth
hypothesis H5 is significantly and positively supported and accepted.

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
<th>S.E</th>
<th>β</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.624</td>
<td>0.328</td>
<td>1.905</td>
<td>0.050</td>
<td></td>
</tr>
<tr>
<td>Competitive intelligence (°R: organizational performance (D))</td>
<td>0.829</td>
<td>0.184</td>
<td>0.706</td>
<td>0.482</td>
<td>0.000</td>
</tr>
<tr>
<td>R² = 0.499</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΔR² = 0.140</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: b = Un-standardized Coefficients, S.E = standard error of variables, β = standardized coefficients, t = t-statistic, p = significance level. R² = R square, ΔR² = adjusted R square.

DISCUSSION
The central hypothesis for current study i.e., competitive intelligence is significantly and positively related to organizational performance. The data presented in the results section of the study clearly indicates these facts; scope of scanning is significantly and positively related to the organizational profitability. It supports the first hypothesis (H1) of the study. Scope of scanning is significantly and positively related to organizational growth. It supports the second hypothesis (H2) of the study. Frequency of scanning is significantly and positively related to the organizational profitability. It supports the third hypothesis (H3) of the study. Frequency of scanning for CI is significantly and positively related to the organizational growth which supports the forth hypothesis (H4) of the study. Competitive intelligence is highly, significantly and positively related to organizational performance supporting the fifth and last hypothesis (H5) of the study.

Environmental factors have great impact on the organizational performance (Baum & Wally, 2003). This fact shows that competitive intelligence can be used for improving organizational performance. Competitive intelligence is the process by which companies inform themselves about every aspect of their rival's activities and performance (West, 2001). In literature, Nasri (2011) also supported the use of competitive intelligence for organizational performance and said that it is important to obtain information on any aspect of competitive activity that can have a significant impact on the business decision.

Competitive intelligence is an important tool for organizational performance. This fact is highly supported by the results of preset. Results indicate that those organizations who are highly competitive and frequently collects information about different market sectors (in this case six market sectors namely customers, suppliers, competitors, company resources, technology and socio-economic sectors) are expected to perform much better than those organizations who are inactive in collecting competitive information. This study has few limitations. Firstly, due to very short time period of four months the sample size is limited to 100 operational managers from 10 banks of Islamabad. This study could generate better results by increasing the sample size. Second, it only focused on two aspects of organizational performance i.e. profitability and organizational growth. However more indicators of organizational performance can be included in future studies for better and wide spread results.

Current study aimed at identifying the relationship between competitive intelligence and organizational performance in banks of Islamabad. This objective is successfully met as indicated in the results and discussion section of the study. Keeping the relative importance of CI in mind for organizational performance, it can be said that organizations should focus on environmental forces which are continuously affecting their performance. In the current volatile and uncertain business environment, it has become very crucial for a single organization to be aware of and get complete information about all market sectors which have direct and indirect impact of its productivity and ultimately on its performance (David, 2008). This study recommends that organizations should increase the scope as well as the frequency of scanning for CI to be more active and successful for achieving long term organizational success.
REFERENCES


Exploring the Linkages between Energy use and Economic Growth in Pakistan

Ali Kakar¹, Maqsood Ahmed², Aamir Mahmood², and Bilal Sarwar¹

¹Faculty of Management Sciences, ²Faculty of Engineering, Balochistan University of Information Technology, Engineering and Management Sciences

Abstract

The objective of this study was to investigate the linkages between energy use, and economic activities in Pakistan. This study tested the interrelationship among the variables using the Multiple Regression analysis through the estimation of log-linear model. The empirical results of this study suggest that the electricity consumption is one of the most significant variables in the economic performance of Pakistan followed by the population growth, Foreign Direct Investment and trade openness.

Keywords: Energy, Sustainable development, Economic growth, Regression analysis

Corresponding Author’s email: ali.kakar@buitms.edu.pk

INTRODUCTION

The role of energy is critical for any society to achieve the economic prosperity; more energy is needed with growing demands as the world population increases. This is particularly true for the developing countries where it is estimated that the use of energy will increase by 100% in coming few decades, (Hinrichs 2002). Increasing use of non-renewable energy, on the other hand, causes some unpleasant change in our planet earth. This unpleasant or unwanted change is termed as pollution in literature and is extremely dangerous for the stability of the environment as gifted by the nature. The world energy expenditure is mainly from non-renewable sources and accounts for 90% of the total energy consumed globally and is responsible for the increasing emissions of carbon dioxide into the atmosphere and thus increasing the global temperatures, (Hinrichs, 2002, Altinay and Karagol, 2004).

From the beginning of the industrial age in Europe till today, the use of non-renewable energy sources has caused the carbon dioxide absorption in the atmosphere significantly and has ultimately caused the increase in the planet’s temperature, which will not only cause the melting of polar ice caps and increased sea-levels but will also force the human settlements to migrate from low-lying regions near the oceans. According to (Apergis and Payne 2009, Hinrichs 2002), more than 5 billion tons of carbon is being added to the atmosphere each year as a result of fossil fuel burning. This is causing an increase in global temperatures and could affect agriculture negatively. On the other hand, fossil fuel burning has also caused acid rains that harm trees, crops and animals. In Europe, for example, acid rains have harmed about 20% of its forests.(Edal et al., 2008)

The IEA predicts that in near future the developing economies from the third world countries will compete for more energy usage to cater for the growing economies of their countries. China and India are particular in this regard. Developing countries like Pakistan will continue to depend upon nonrenewable energy sources to cater their economic demands as access to more environment friendly and renewable energy sources is still out of their reach. Pakistan mainly depends on nonrenewable energy sources to meet its energy requirements and a great share of it comes from imported oil. According to the State of Environment Report
2005, during the last 20 years, the energy consumption in Pakistan has been tripled from 0.6 quadrillion Btu to 1.9 quads in 2001 and the country accounts for only 0.5% of total world energy consumption. It is a fact that economic development and energy consumption are interlinked and that a growing economy requires more energy to sustain the pace of economic development. But it is also important to consider the role of sources for the energy production. Increasing demand for energy in Pakistan which is mainly from nonrenewable sources has placed additional burden on balance of payment. As per World Bank Report 2006, the estimated environmental degradation in Pakistan accounts for minimum 6% of its GDP and is a top-heavy burden on the poor.

Pakistan is mainly depending on imported oil to meet its energy requirements especially in the industrial sector; the rapid increase in oil prices has hindered the Pakistan’s industry growth as well. As a result, the country’s industrial growth has declined to 3.3% against the projected growth rate of 6.1% during the year 2007-08. The use of fossil fueled energy sources are contributing significant role in enhancing the pace of environmental degradation not only at local but also at global level. The use of other fossil fuels is responsible for the emission of various greenhouse gasses and hazardous fumes which are harming the atmosphere and thus contributing towards the global warming of the earth as a whole.

The empirical work on this important issue related to the field of sustainable development is confined only to the developed countries and is scarce in case of developing countries like Pakistan. So this study is focus on the investigation of associated linkages between energy use and environmental degradation in case of Pakistan. It also seeks to determine the extent of these effects and how it can be minimized through policy interventions in the wider developmental context.

Many research studies have been conducted to find out the relationship between the energy use and economic growth in Pakistan but the causal relationship of both the energy use and economic activities on environmental degradation in Pakistan was relatively scarce. Therefore, there was a need to find out this causal relationship.

**MATERIALS AND METHODS**

To find out the causal relationship of economic activities on energy consumption, the data was collected from the World Development Indicators (WDI) from a period of 1960 to 2008. Energy consumption is also affected by population, foreign direct investment and trade. So all the data collected from WDI was used to find out the impacts on energy consumption using the Multi Linear Regression (MLR).

**Model**

Since, there are different factors behind the demand for electricity consumption (as a proxy of energy consumption) in Pakistan for example, rising incomes, population growth, and increase in international trade etc. A model has been present in these studies to explore the energy demand (energy consumption) due to economic activities, population growth and trade openness.

**Estimation techniques**

In order to explore the above mentioned relations that were intended to establish and estimate such models, not only capable for exploring the existing relationships but which is also helpful for some useful recommendations. Following were the functional form of estimate able models: ED=f (EA, Pop, OT, FDI)

The model specification of above functional form was as:

In this model the Energy Demand (ED) was dependent variable while Economic activities (EA), Population (Pop), Trade openness (OT) and Foreign Direct Investment (FDI) were the independent variables.

Where ED=Energy Consumption (Electricity Demand in mega watts/year).

EA= Level of Economic Activities  
Real Gross Domestic Product of the Country
Pop = Population.  
(Annual population of the country)
OT= Ratio of (Import + Export to GDP) 
[ Economic openness or Trade intensity]
FDI = Foreign Direct Investment in US $.

Limitations of the Model

Though energy consumption and energy demand are two different in many aspects, but for convenience of comparison Energy Demand (ED) has been used as a proxy variable for energy use. Real Gross Domestic Product (GDP) alone does not represent the overall economic growth of the country but GDP is used as a proxy for the economic growth.

Although the trade openness is a vast area itself, but the ratio of import and export to the GDP has been used as an indicator of trade openness in this study. Moreover, trade openness means the absence of taxes and trade barriers to a great extent in this research study.

Instead of taking population growth rate which is a common practice in research. Annual population of the country was taken for the convenience of this study.

Source of Data

All the time series data, on above mentioned variables, was extracted from World Development Series from the period of 1960 to 2008. Moreover, Economic Survey of Pakistan 2008-09 was also consulted.

Model:

Where:
ED=Energy Consumption (Electricity Demand in mega watts/year).
EA= Level of Economic Activities (Real Gross National Product of the Country)
Pop = Population. (Annual population of the country)
FDI = Foreign Direct Investment in US $)
OT= (Import + Export to GDP) [Economics openness or Trade intensity]
Ln = Natural Log
αi = Slope coefficients of the Model

The log-log model was estimated to explore the impact of economic activities, population growth, and trade liberalization on energy demand.

Econometric Technique

The multiple linear regression technique (MLR) was used to estimate above mentioned log-linear model because the OLS could not be used here because of more than one independent variable. The key assumptions of MLR are as:

MLR1: The population model is linear in parameters.
MLR 2: A sample, \{x_{i1}, x_{i2}, \ldots, x_{ik}, y_i\}: i=1,2,\ldots,n}, is random.
MLR 3: \E (u| x_{i1}, x_{i2}, \ldots, x_{ik})= 0\, Zero conditional mean
MLR 4: None of x is content (nonzero sample variation in x). There are no exact linear relationships among x, s.
MLR 5: Homoscedasticity, Variance (u| x_{i1}, x_{i2}, \ldots, x_{ik}) = \sigma^2
MLR 6: the population error, u, is independent of x_{i1}, x_{i2}, \ldots, x, u is normally distributed with zero mean and Variance \sigma^2, u~ Normal (0, \sigma^2).

The estimated model was evaluated on the basis of above mentioned assumptions of MLR.

Prior to estimating the Model, it was important to discuss the expected signs of coefficients of explanatory variables, the expected signs of coefficients were:
The expected sign for the slope coefficient, , capturing the effect of level of economic activities (EA) on energy demand (ED) was positive. So the hypothesis was:
\H_0: <= 0 and \H_1: > 0 (One tailed test).
It was expected a positive sign for the coefficient, this coefficient was gauging the effect of population on energy demand. So hypothesis for this coefficient was:
\H_0: <= 0 and \H_1: > 0 (One tailed test).

In modern global economy, no country could survive without international trade and international trade having a direct linkage with the consumption of energy demand. So was used to explore the impact of international trade on energy demand. The expected sign for this coefficient was positive. Therefore the null and alternative hypothesis was;
\H_0: <= 0 and \H_1: > 0 (One tailed test).

Recently, the role of FDI has become more crucial in economic growth, the slope coefficient was establishing the linkages between FDI and ED. The expected sign for this coefficient was positive. And the hypothesis for this coefficient was:
RESULTS AND DISCUSSION
In this study we analyzed the impact of Carbon dioxide emission (CO2), energy consumption, population, and trade openness on the economic development of Pakistan (GDP). We used two different models to analyze these effects and showed the relations among these variables. The log linear models model and Multi Linear Regression model were used. The results of the models were as below.

Regression Analysis

The estimated equation was:
\[ \ln ED = 3.25 + 0.0419 \ln EA + 0.000065 \ln Pop + 2822.26 \ln OT + 0.00027 \ln FDI + et \]

The ANOVA Table 1 shows the analysis of variations in the model. As the model was in log-log form, the estimated coefficients were showing the corresponding elasticities of the variables (see Table 1 and Table 2). Trade openness was having the highest impact on energy use; it was because of the time series nature of the data indicating that our energy use has significantly increased due to the activities of imports and exports. Exports normally occur after meeting the domestic demand and may also occur due to more production activities and more production need more energy use, therefore, trade openness has significant effect on the energy demand. The coefficient establishing the linkage between energy demand and population was the smallest but significant as per results of the study. Although it is known that population has significant effect on energy use, but in this research study due to the time series data, the effect of population on energy use is ambiguous. Moreover, we know that FDI has significant effect on the energy use, but FDI affected the energy use negligibly in the results of this study. Furthermore, the Economic Activities (GDP as a proxy for EA) has significant effect on the energy use as shown by the results (see Table 2).

All the estimated coefficients were significant at 5% level of significance, reflected by their corresponding t-values (see Table 2). The overall model was also significant, reflected by relatively higher “F-value”. The value of coefficient of determination was very high (0.975 or 97.5%) showing that the model is best fit.

The Table 4 based on Economic Survey of Pakistan 2008-09, shows the annual energy consumption pattern from 1998-99 to 2007-08. This table shows that there was a continuous shift in energy consumption from petroleum products to other sources of energy e.g. coal, gas and electricity. Newly discovered reserves of gas and coal and high prices of petroleum products in the international market were the main reasons. Therefore, the petroleum products experienced a decline in its consumption.

Table 1. Regression Analysis

<table>
<thead>
<tr>
<th>R²</th>
<th>0.975</th>
<th>n</th>
<th>48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adj. R²</td>
<td>0.972</td>
<td>k</td>
<td>4</td>
</tr>
<tr>
<td>Std. Error</td>
<td>0.101</td>
<td>Depend. Var.</td>
<td>ln ED</td>
</tr>
</tbody>
</table>

Table 2. ANOVA Table

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>10.8680</td>
<td>4</td>
<td>2.7242</td>
<td>267.39</td>
<td>0.007</td>
</tr>
<tr>
<td>Residual</td>
<td>0.2751</td>
<td>27</td>
<td>0.0102</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>11.1431</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s calculation

Table 3. Regression Output

<table>
<thead>
<tr>
<th>Variables</th>
<th>coefficients</th>
<th>Std. error</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>3.25</td>
<td>0.3171</td>
<td>10.255</td>
<td>0.25</td>
</tr>
<tr>
<td>In EA</td>
<td>0.042</td>
<td>0.0079</td>
<td>5.369</td>
<td>0.006</td>
</tr>
<tr>
<td>In Pop</td>
<td>0.0026</td>
<td>0.001019</td>
<td>0.364</td>
<td>0.0029</td>
</tr>
<tr>
<td>In OT</td>
<td>2822.26</td>
<td>888.26</td>
<td>4.03</td>
<td>0.0004</td>
</tr>
<tr>
<td>In FDI</td>
<td>0.00027</td>
<td>0.000026</td>
<td>4.165</td>
<td>0.003</td>
</tr>
</tbody>
</table>

Source: Author's Calculation

95% confidence interval
Exploring the Linkages between Energy use and Economic Growth in Pakistan

Table 4: The annual energy consumption pattern in Pakistan from 1998 to July-March 2008-09

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Petroleum Products</th>
<th>Gas</th>
<th>Electricity</th>
<th>coal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tones (000)</td>
<td></td>
<td>(Gwh)</td>
<td>M.T* (000)</td>
</tr>
<tr>
<td>1998-99</td>
<td>16,647</td>
<td>635,891</td>
<td>43,296</td>
<td>3,461.40</td>
</tr>
<tr>
<td>1999-00</td>
<td>17,768</td>
<td>712,101</td>
<td>45,586</td>
<td>3,167.90</td>
</tr>
<tr>
<td>2000-01</td>
<td>17,648</td>
<td>758,068</td>
<td>48,584</td>
<td>4,044.70</td>
</tr>
<tr>
<td>2001-02</td>
<td>16,060</td>
<td>824,604</td>
<td>50,622</td>
<td>4,408.60</td>
</tr>
<tr>
<td>2002-03</td>
<td>16,452</td>
<td>872,264</td>
<td>52,656</td>
<td>4,889.90</td>
</tr>
<tr>
<td>2003-04</td>
<td>13,421</td>
<td>1,051,42</td>
<td>57,491</td>
<td>6,064.50</td>
</tr>
<tr>
<td>2004-05</td>
<td>14,671</td>
<td>1,161,043</td>
<td>61,327</td>
<td>7,893.80</td>
</tr>
<tr>
<td>2005-06</td>
<td>14,627</td>
<td>1,223,385</td>
<td>67,603</td>
<td>7,714.00</td>
</tr>
<tr>
<td>2006-07</td>
<td>16,847</td>
<td>1,221,994</td>
<td>72,712</td>
<td>7,894.10</td>
</tr>
<tr>
<td>2007-08</td>
<td>18,080</td>
<td>1,275,212</td>
<td>73,400</td>
<td>10,110.60</td>
</tr>
<tr>
<td>Avg. 10 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July-March</td>
<td>2007-08</td>
<td>13,342</td>
<td>955,625</td>
<td>55,208</td>
</tr>
<tr>
<td></td>
<td>2008-09 (c)</td>
<td>12,892</td>
<td>931,700</td>
<td>55,614</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual Energy Consumption</th>
<th>Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. 10 years</td>
<td>13.5</td>
</tr>
</tbody>
</table>

* Million Ton

Source: Economic Survey of Pakistan (2008-09)

REFERENCES


Acoustical Properties of Honeycomb Fabric with Advance Material Micro-Plates

Zamir Ahmed¹, ², Sohail Yasin¹, Mohammad Qasim², Mohammad Ali Zeeshan²

¹ College of Materials and Textiles, Zhejiang Sci-Tech University, Hangzhou, China  
² Department of Textile Engineering, Balochistan University of Information Technology Engineering & Management Sciences, Quetta, Pakistan

Abstract

This paper presents the results of experiment carried out with customized fabric design using advanced materials, to determine the significant amount of sound waves absorbed and compare it to the acoustic fabrics available in the market. The designed fabric absorbs the sound waves through a porous layer having honeycomb pattern that converts sound energy into thermal energy. The advanced fabric material diffuses the reflected sound waves within the micro-plate’s structure layer, yet the minimum amount of waves penetrates through the fabric as compare to the other acoustic fabrics. The experimental results showed 20-23 dB insulation value with the advanced material used.

Keywords: Acoustic fabrics, Multilayer fabric, Absorption, Honeycomb weaves.

Corresponding Author's email: zameer.ahmed@buitms.edu.pk

INTRODUCTION

Sound insulation has been a trigger issue for scientists since the sounds with certain frequency levels are different as noise pollution. Sound can be pleasing to human ears in definite range; human ears can perceive sound ranges from 20 to 20000 Hertz. Loud sound is usually controlled by adding number of layers between the source and the receiver; more the number of layers better will be the insulation. The layers can be a series of combinations of layers; it can be materials with different thickness and high damping layers. Owing to the different speeds of sound in the different layers, the wavelength of the incident wave has to acclimatize with each layer, this separation of layers results in the loss of energy at every layer front and a spreading of the coincidence immerses (Christina, 2009).

The sound absorption coefficient for materials is the percentage of incident sound waves energy which is absorbed by that testing material. The coefficient depends upon the sound frequencies and the values which are usually synchronized with the standard frequencies of 250, 500, 1000, 2000 and 4000 Hertz. The noise reduction coefficient (NRC) value measures the amount of sound absorbed into a fabric and passed through it. NRC is an average of values from 250 to 2000 Hertz. Absorption coefficients are sometimes expressed as percentages, for example, a material with NRC value of 0.40 means that the 40% of the sound is absorbed and 60% travels through the fabric (Marian, 2005).

In this effort, the basic concept of absorption has been studied with the acoustic multi-layered fabrics having material like foams, ceramic layers, esthetic layers, woven, and non-woven fabrics. Meanwhile, by introducing advanced material layer with the structure having micro-sized that of absorption values than the average acoustic materials. A lot of multi-layered acoustic panels and boards are used for different purposes, the main disadvantage of multi-layered acoustic structures are generally expensive to manufacture. The absorbing materials used in the acoustic structures (fabrics) are mostly ceramics, steel wool or KEVLAR (Perlikowsk, 1999).
MATERIALS AND METHODS
As for the experimental analysis, test sample (A), have non-woven acoustic fabric, sell under the name of technical fiber (cellulose + glass fiber) with the width of 27mm were taken. Sample (B), a modified design of fabric with sandwiched layer of honeycombed fabric made from fiberglass, and a double layered sheet with numerous micro-plates facing each others, with a thickness of about 25mm. Sample (C) contains fabric made with a layered of mineral fibers with the thickness of 28mm.

Materials with good acoustic properties are found to be with porous in structure, more porous the material more sound waves will diffuse. It is found that, thickness of such acoustic materials is also essential in absorbing sound; thick materials have more capability to absorb than the thin layered fabrics. The aim of this work was to find an acoustic design with less thickness and more sound absorbability.

The reverberation test chamber method was employed in this study on the basis of ISO Standard 354 - Acoustics - Measurement of sound absorption in a reverberation room. This method is based on measuring the reverberation time in a room before and after the introduction of the test samples. The absorption of the materials is then measured by comparing the reverberation times between both of the measurements, taken with and without the sample material in the reverberant room. In ISO Standard 354, the mounting of the test samples frame are taking as read to be solid materials without any cavities. The test samples are sealed to the surface of the wall or ground, open or busted cavities also be sealed to prevent the air leakage to avoid sound absorption enclosed.

Test samples sized approximately 10m² were mounted on the floor (Type-A), in fully reverberant enclosed chamber according to ISO 354. For every test, sample materials were placed in middle of the room and the samples were sealed to the ground with steel duct tape. To avoid errors in the test results temperature and humidity was kept constant. Three non-directional microphones and 2 loudspeakers were positioned in corner, making 6 measuring positions in total including 4 decays averaged for each position. 4 configurations were tested; sample A, B, C and empty room. For each configuration an averaged reverberation time was obtain from third-octave band system. The sound absorption from the materials at different frequencies were measured with random sound level meter (SLM - Measurement Level 26 dB to 130 dB and Measurement Frequency range 31.5 Hz to 8 KHz) with standard sound pressure calibrator.

RESULTS AND DISCUSSION
The analysis was aimed at selecting a fabric design with more capability to absorb sound waves with less thickness. On the basis of the acoustic sound level measurements are listed in Table: 1 for all samples, measured for the middle frequencies of the octave bands, it can be stated that the permissible sound ranged in 1000 Hertz are likely to be absorbed by all the samples. The sample (B) with micro-plates showed more absorbability than the rest of samples. The measurement results are presented in Figure 2.

Table 1: Analytical test values of sound absorption for different acoustic fabrics

<table>
<thead>
<tr>
<th>Test Samples</th>
<th>Frequency Standard Values (Tuning Forks) (Hertz)</th>
<th>Noise reduction coefficient (NRC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.05 0.24 0.56 0.8 0.9 0.9</td>
<td>0.625</td>
</tr>
<tr>
<td>B</td>
<td>0.50 0.94 0.90 1.0 1.0 1.0</td>
<td>0.935</td>
</tr>
<tr>
<td>C</td>
<td>0.18 0.35 0.50 0.99 0.83 0.63</td>
<td>0.757</td>
</tr>
</tbody>
</table>
Note: The experiments were undertaken (with conventional or unconventional methods) only for the result analysis of different materials.

The design of the fabric (Sample B) works same as of the other acoustic materials by changing sound energy into thermal energy. At the first layer, the honeycombed woven fiberglass has a porous structure, in such materials sound energy is mainly converted into thermal energy by viscous friction between the oscillating particles of the sound propagating medium (air) and the structure of that particular porous material.

The rest of the sound waves which were not absorbed by the first layer pass to the second layer, in the double layered fabric, first layer has some loopholes to pass through the sound waves to the micro-plates. Micro-plates faced to each other reflect the waves and reflects again because of the rigid structure of the plates. Thus most of the waves were diffused, while some with different frequency waves passed through the fabric and some reflect back from the loopholes but they are absorbed by the porous structure of fiberglass (Christina, 2009).

As mentioned earlier, the noise reduction coefficient (NRC) is an average of values from 250 to 2000 Hertz; from Fig: 2 it showed that acoustic fabrics made from mineral fibers has sufficient sound absorbability ranging from 500 Hertz to 1000 Hertz.

From the result analysis of three samples, it provides the amount of sound which is absorbed by the fabric and the amount which passes through it. The NRC value (0.935) of sample (B) shows that 93.5 % of sound was being absorbed by the fabric and rest passed through it. As from the other samples with NRC values (A=0.625 and C=0.767), 62.5 % and 76.7 % sound was absorbed and rest traveled through them (Perlikowsk 1999).

CONCLUSION
The analysis of the experiments carried out provides the details of acoustic fabrics with certain honeycomb woven glass fibers and with the layer of micro-plates, are more absorptive than other fabric materials taken for experiments. The sample material, especially the sample (B), the definite limitations for commercial or industrial usage, because different conditions have certain requirements of sound absorbent abilities from materials. So, suitable materials must be used according to the required sound absorbability.

The fabric diffuses the reflected sound waves within the structure yet the minimum amount of waves penetrate through the fabric as compared to the other acoustic fabrics, it was also found that the modified fabric design are 26-29 dB more absorbent than the other fabrics. The acoustic materials have different absorbing levels with different sound
frequencies, so materials for special purposes can be used with required sound isolations.

REFERENCES


