European Journal of Scientific Research

ISSN: 1450-216X / 1450-202X

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Erosion Potential (EROSION) Bottom and Transport Load Bed River Estuary Ranoyapo Amurang Half Month in the Rainy Season (Half Moon)

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Abstract

This research describes and analyzes the bed load transport and changes along the mouth of the river with a map showing the spread of bed load models along the estuary. Distribution pattern of the spread of bed load to the conclusion that the state of the rainy season in half estuaries Ranoyapo an area deposition of material brought on stream transport from upstream. At low tide the river estuary bed load transport Ranoyapo experienced bed load transport, physically increasing the flow volume followed with increasing flow rate, associated on bed load transport. Tidal conditions, the pattern of spread of bed load shows, the first position up to eight bed load transport occurs. In contrast to the position of nine to seventeen is an area where the bed material load can not be transported, meaning that the flow velocity at the position of not being able to transport the bed load sediment toward the beach.

Material deposition process lasted quite high transport taken control of the flow of physical variables, seasons and tides. Results of Formation in the precipitation measurement site was never formed because of the intensive sand mining activities by the local community. Patterns of spread of bed load along the boundary of the model, the conclusion that the state of rainy season in half estuaries Ranoyapo an area deposition of material brought on stream transport from upstream. Transport of material deposited at the mouth of the river, on the model boundary is dominated by sand.

Keywords: Potential erosion, transport, Bed Load.

I. Introduction

Exploitation of bottom sediments of sand mined intensively in estuaries Ranoyapo to supply building materials in the city and surrounding Amurang. Mining, although not recommended to be stopped but sought not to exceed the capacity of watershed sediment supply, as it could potentially happen flow and the potential erosion of the river bottom, the sediments transported by the flow does not settle at the mouth of the river sediment material into the mine site, it flows and settles in areas approached the coastline where there is an open sandbank when the tide, at low tide will be carried away by the speed of the river flow up to the shoreline.

Speed of the flow is also an important determinant sediment transport (bed load) surface of the river (in addition to the type and dimensions of material transport). Quantity of material transport on
the river cross-section of the positions can be expressed in terms of the mass of bed load transport certain types of material unity of the sample volume.

Studies and analysis of potential erosion estuaries base becomes important because a regional basis estuary erosion riverbed at low tide conditions and areas of sediment deposition on tidal conditions, and these conditions will be great in the rainy season. Mapping precipitation and bed load transport base estuary can be done, because the mouth of the river is an area that produces both alluvial formations build basic surface estuaries (gradation) and lower base surface estuaries (degradation).

The problems of research can be described as how the pattern spread of bed load and the potential erosion of the basic estuaries in wet season conditions in half (the lowest tide or seven days after full moon) in the river Ranoyapo Amurang, and research objectives formulated, to describe the potential for erosion (erosion) basis mouth of the river and ask questions along the transport bed load in river mouths Ranoyapo Amurang. The result is important in decision making (decision support systems) use the estuary for the purpose of managing natural resources and environmental conservation estuary

II. Basic Theory

Management and utilization of estuaries can be considered as a major problem in the fulfillment of transport infrastructure and natural resources contained therein. In the mouth of the environmental aspects not only give him a physical container production system as a regional farming, fishing, mining and transport material into a means of transport, but also provide signs of damage that requires serious management and utilization of the environment for a balance. Nugroho and Dahuri (2004) explains, every type of land development to characterize the quality of the use of land, and when the land gave signs of damage, type of use of land ready to replace it. Vice versa, if the land provide social benefits, then its use should be retained.

Activity estuary excessive resource utilization in turn will change the function of the estuary as a result of changes in the landscape by estuarine sediment transport and erosion. Excessive sediment transport will alter the flow path of the river, while the riverbed erosion will accelerate the flow, so it will happen eventually fast flow will transport all the material carried by the flow toward the shoreline, in an area that is not a mining area.

Sediment transport as a natural process is closely related to transport (transport), precipitation (disposition), and compaction (compaction), especially in the highland areas or places where water flows. In principle, sediment transport is relating to the discharge of sediment transported by the river flow and sediment transport stream. Understanding sediment can be described as a result of the erosion process, both surface erosion, erosion ditches, or other land (Asdak, 2007). Sediments interpreted also as accumulation of precipitated material and is soft and does not compact (Sutikno, 1990).

According to Soewarno (1991), sediment transport can move and shift along the river bottom or floating in the river moves depending on the composition (size and density), flow conditions, flow velocity, flow depth, the width of the river, the river mouth and the surface condition of base river. According to his native sediment transport is divided into two, cargo base material (bed material load) and load rinse (wash load).

Movement (transport) bed load (base load) can be in the form of roll or jump as a result of the collision (momentum) of particles (Garg, 1979). Bed load velocity equal to the speed of the flow, but the accretion flow (associated with increasing flow rate) will increase the speed and volume of bed load movement that moves from the surface of the river bed higher to the lower (Zhian and Gangyan, 1992; Garg, 1979). Ongley (1981) and Walling (1982) in Foster et al. (1992) suggested that there is a consistent change of change of particle size sediment transport to the increased discharge (or velocity) flow. That is, the increased discharge flow rates than increasing base load, it also increases the flow of grain size brought.
Lensesley (1972), suggests that the basic material load (base load) is found at the bottom of the channel, while the charge drift (drift load) consists of particles smaller than that found at the base of the channel.

Field observations indicate that the river flow is always varied, during the period associated with the increase of the flow rate or the rate of sediment transport aggradation river, when the peak flow has reached and flow rate decreases rapidly, the rate decreases rapidly sediment which results in degradation river.

In the year 1935, through laboratory research, Mavis develop a formula to determine the particle velocity (base load) are relatively more flexible for variations in particle diameter between 0.35 mm - 5.7 mm and a specific gravity between 1.83 mm.det-2 - 2.64 mm.det-2:

\[ v_t = 0.152 \frac{d^4}{9} (G - 1)^{1/2} \]

where \( v_t \) particle velocity (m sec\(^{-1} \)), \( d \) is the particle diameter (mm), and \( G \) is the specific gravity (mm.det-2) (Schwab et al., 1981).

The formula can be used to evaluate the potential deposition of bed load presented Kennedy (Garg, 1979):

\[ v_0 = 0.55 m^{y0.64} \]

where \( v_0 \) is a critical velocity, \( m \) is the critical price value ratio (CVR), which depends on the type of material deposition, and \( y \) is the water depth.

III. Method

The research was conducted at the mouth of the river is located in the Gulf Ranoyapo Amurang, and for the sake of measurement zoning analysis and preliminary observations of tidal limit, set the measurement position along the 1250 feet (950 meters upstream of the bridge and 300 meters to the shoreline), so that limits research is along the 1250 meters as shown Figure-1, and the research site is shown in Figure-2

**Figure 1:** Border of Research Model

Identify the measurement position along the estuary of the river produces seventeen position measurement, and measurement of the width of the six segments of the river, which is done on the condition of the rainy season, month and a half. The primary data of physical variables such as flow velocity is obtained by using the Current meter were taken at depths approaching the river, this is done so as not to interfere with the movement of bed load, sediment sampling bed material load carried on the depth of the river.
Analysis of the data include: (1) the arrangement of measurement data, (2) techniques Delan Pemo-rating curve data for the determination of velocity and bed load as a function of distance (elongated estuary) to the reference measurement position along the 1250 meters to the shoreline. Methods of mapping data from mathematical modeling bed load reached by the steps of: (a) managing the bed load measurement data by segment and position of the range, (b) model data for each segment and position, (c) result in the model function spasil bed load, (d) the results of interpolation is the final stage results of spatial data (map models) the spread of bed load along the estuary.

IV. Results and Discussion
 Rating curve at speed near the surface layer of the riverbed (x0), when the tide change function shows decreased velocity polynomials up to the interval $0 \leq x \leq \pm$ meters 800 meters. At a distance of more than 800 meters to the beach a speed of zero, because the flow of the river in sea water mass resistance by Figure-3.
\[ v_0 = 66.82 - 0.041x + 0.00052x^2 - 4.069 \times 10^{-6}x^3 + 1.06x \times 10^{-8}x^4 - 1.28x \times 10^{-11}x^5 + 7.38x \times 10^{-15}x^6 - 1.64x \times 10^{-18}x^7 \]

\[ V_0 = 63.00 + 0.13x - 0.0034x^2 + 0.20x \times 10^{-4}x^3 - 5.95x \times 10^{-8}x^4 + 9.66x \times 10^{-11}x^5 - 8.766x \times 10^{-14}x^6 + 4.17x \times 10^{-17}x^7 - 8.12x \times 10^{-21}x^8 \]

Rating curve shown in Figure-3 is speed of stream at the bottom of the smaller rivers because the river bottom there is a bed load concentration that is more concentrated, causing friction that resist the flow of the river, resulting in the reduction of the flow velocity. In theory, the flow velocity in the middle (vertical direction) is larger than the bottom of the river Schwab et al., (1981).

Rising sea level because the tide will increase the rating curve gradient and the zero velocity position shifts towards upstream. This is physically the density of sea water is higher than the density of the river water, in these conditions, a layer of water masses lower to slow the speed at upstream position.

Potential erosion (erosion) based on the results of measurements of the river flow velocity in the layer near the surface of the river bottom (x0) half moon shape rainy season when the tide for all segments of the measurements at up to eight positions have varying rates between 0.6 m. sec-1 up to 0.65 m.det-1. Price speed stream bed or layer near the surface of the river bottom (x0) is the highest (65 cm.det-1 = 0.65 m.det-1) is higher than the smallest critical value (0.099934 m.det-1) that can be explained on all segments occur measurement bed load transport (erosion potential) surface of the river bottom positions one to eight. Physically if there is an increase river flow, the flow velocity in the layer near the surface of the river will rise beyond the critical value, the bed load sediment transport riverbed (base erosion potential estuary) will also increase correspondingly bed load transport area will be shifted towards upstream as described by Figure-4.

**Figure 4:** Spatial maps Bed Load Transport Conditions Half Moon Tides Rainy Season.

In the conditions of the rainy season in half a load bed spread throughout the estuary following the model of polynomial functions with rating curve profile shape as shown in Figure-5.
Rating curve modeling generating function \((c_0)\) condition and the tide low tide, with the graph \((c_0)\) condition is above the ebb flow of the graph \((c_0)\) at high tide. 950-1000 meters in the position of the first measurement point rating curve \((c_0)\) the tide has decreased compared to the steep gradients rating curve at low tide, but at a distance \(x > 950\) to 1000 yards, rating curve became flat and showed that the starting position of the spread bed load to zero. This is due first physically small streams that flow rate is not sufficient to transport bed load, the second occurs because the mixing between the mass of sea water with river water bed load transport, these conditions resulted in bed load is deposited on the position and curve upstream bed load \((c_0)\) became more curved.

Figure-6 describes the map pattern of spread along the estuary where the bed load bed load evenly distributed in small quantities at one and two position measurements, ranged between \(1.2 \times 10^{-3}\) kg / L until \(1.36 \times 10^{-3}\) kg / L, the position measurement the third concentration of bed load of 1.1gr / L to \(1.2\) x \(10^{-3}\)kg / L, while the position of the four measurements up to seven bed load concentration of \(0.5 \times 10^{-3}\)kg / L to \(1.1 \times 10^{-3}\) kg / L.

**Figure 5:** Load Rating Curve B-Segment 3. Half Moon Tidal Rainy Season.

**Figure 6:** Spatial Distribution Model Map Along the Estuary Bed Load Condition Half Moon Tides Rainy Season
Until the seventeenth position measurement or at a distance of 1250 m to the shoreline concentration of bed load is quite small in scale $0.02 \times 10^{-3}$ kg / L to $0.25 \times 10^{-3}$ kg / L. This means that at position seven to thirteen bed load is almost the same concentration and physical condition are caused by the flow velocity at the position showed no significant differences, so that the deposition of bed load at that position is almost the same, while the transport of material in the form of bed load transport almost No, because bed load has been deposited into the headwaters area. Mulyanto (2010), the flow at high tide caused the meeting to be very calm freshwater with seawater. Flow velocity of the upstream and tidal flow through it will lead to the deposition of sediment in the estuary.

Position measuring 1000 m from peg the price of bed load measurement to zero, meaning that all of the sediment transport in the form of bed load has ben precipitated at the mouth of the river upstream. This is physically due to the mass of sea water so that resist the flow of the river sediment transport in the form of bed load sediment at a position between the mass flow of the river meeting the sea water masses that resist the flow of the river.

Conditions of rain in half, physical analysis at low tide describe increased river flow associated with an increase in flow velocity in the layer near the surface of the river will rise beyond the critical potential price erosion of the river bed, which resulted in the transport of bed load will be shifted to the upstream, even in a long time, will damage the estuary basis (basic degradation estuary) and the mouth of the river as a flood barrier.

When the tide is almost the same concentration of bed load at a position close to the shoreline and this condition physically caused by the flow velocity at the position showed no significant difference, while the transport of material in the form of bed load transport is almost non-existent, because bed load has been deposited into upstream, meaning that precipitation occurred on tidal conditions, the deposition process over a long period will cause agradation on water bodies that have an impact on the movement of the river channel. It is therefore recommended to be the location of the area is intensively mining sand, with a volume that does not exceed the capacity of the transport of material transported by the flow of the river downstream.

Physically bed load distribution patterns along the river estuary Ranoyapo highly dependent on velocity and sediment discharge and sediment transport relating to discharge of sediment transported by the river flow and velocity. This is consistent with the theory that the velocity of sediment transport air-tight relationship with flow velocity and sediment particle size (Asdak, 2007).

**V. Conclusion**

Base erosion potential in all segments of the estuary Ranoyapo happen measurement bed load transport (erosion basis) from one position to eighth. Physically if there is an increase river flow, the flow velocity in the layer near the surface of the river will rise beyond the critical value, the bed load sediment transport riverbed (base erosion potential estuary) will also increase. Pattern of spread along the mouth of the river bed load depends on the speed and sediment discharge and sediment transport in principle related to the discharge of sediment transported by the river flow and velocity.

**References**


Erosion Potential (EROSION) Bottom and Transport Load Bed River Estuary
Ranoyapo Amurang Half Month in the Rainy Season (Half Moon)


A Comparison of the Early Maladaptive Schemas in Adolescent Girls Involved in Early Sexual Relations with those Who did not have Sexual Relations

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Abstract

Background and Aim: Adolescence involves changes in body, excitations, and sexual growth and thoughts. Biological changes in body cause an increase in sexual drive and likely sexual intercourse, in some adolescents. Over the last thirty years, the percent of those adolescents who involve in early sexual intercourses has been increased. The aim of this research is to compare the early maladaptive schemas (among three groups of adolescent girls) who had sexual relations, friendship relations, and who did not have relation with opposite sex. Materials and Methods: Research method in the present study is comparative reasoning, and in order to study the aim of research, 287 schoolgirls have been selected. Data has been collected through Young schema questionnaire (SQ-SF) and for the analysis, the analysis of variance and SPSS16 have been used.

Findings: An adolescent who had sexual relation, in comparison to one who did not have, reportedly has more self-sacrifice, entitlement, and social isolation schemas and also less emotional inhabitation and unrelenting standards.

Conclusion: In this research, the relation between early maladaptive schemas and sexual relations in adolescents has been demonstrated. The results of this research help us to better understand teen ages and prevent the outbreak of adolescents’ risky behaviors.

Keywords: Early Maladaptive schema, Sexual Relation, Relationship.

Introduction

Adolescence include coping with identity crisis and social, sexual, cognitive, and emotional changes, which must be conducted during some phases of growth and puberty. Among all aspects of identity, sexual identity is the most complex one. Transition from childhood to adolescence, leads adolescent to accept more risky experiences and whenever the risky behavior and experiences are accepted by the adolescent, it affects his/her life. One of the risky behaviors experienced by adolescents is sexual intercourse in teen ages. Over the past three decades, percent of those adolescents who attempts early
A Comparison of the Early Maladaptive Schemas in Adolescent Girls Involved in Early Sexual Relations with those Who did not have Sexual Relations

Sexual intercourse has been increased. Likewise, the age of sexual intercourse attempt among adolescents has been dramatically decreased. Results of Doswell and associates’ research demonstrate that 31 percent of students in the sample group of 593 people, attempted sexual intercourse before the age of 11. Although sexual behavior is considered as natural in adolescent growth, early sexual intercourse causes unwanted pregnancy, sexually transmitted disease, AIDS, genital infections, and mental health problems. Most of the dangerous problems, mortalities and consequently physical, psychological, and social problems come from puberty ages. Risky behaviors such as early sexual relations will have several consequences for the adolescents and their families. The problems like, dropout, tendency to perverse peers, and physical and psychological illnesses will not be rare among these adolescents. Thus, study and recognition of influential factors in sexual relations formation can be effective in prevention of obliquity in teens.

A lot of factors can be effective in shaping adolescent’s sexual behaviors. These factors include, adolescents living atmosphere, peers, educational failure, poverty, discrimination, mass media, family structure, precocious puberty, familial background, and parent’s norms and values. Parents, especially mothers, have significant role in adolescent’s early engagement in sexual relations and those adolescents who report less parental supervision are probably more engaged in early sexual behaviors. The girls, who have better emotional relations and consequently safe attachment to their mothers, are less likely engaged in early sexual relations. It seems that sexual behavior is an attempt to compensate individual deficiencies and to adjust tensions and individual’s self-confidence. So, these behaviors are the outcome of individual’s return to his/her former unsatisfied needs. Individuals can hide their inner sense of insecurity through sexual intercourse. Researchers conclude that adolescent’s early sexual intercourse is intended to avoid rejection by others. Having relations which are aimed to avoid rejection will cause depression in adolescents.

Cognitive theory of Young, Klosko, Weishaar (2003), Beck (1969), and also Bowlbey attachment theory (1969), underline that during childhood, negative experiences are internalized and it affects the way an individual respond to external events (4). From Beck’s viewpoint, negative experiences and childhood problems will lead to specific set of long term complex and negative beliefs in individuals and these beliefs are usually stable and resistant against change. These coral beliefs or schemas operate as a mediator between childhood problems and individuals problems later in life. In other words, coral maladaptive schemas are known as early maladaptive schemas that are registered in individual’s mind all over childhood. These cognitive schemas are used as individual’s interpretation of him/herself, world, and others. At the time of experiencing an unpleasant relation with home care, the child tries to integrate maladaptive schemas and the result of such cognitive deviations is child’s entanglement in five main domains, “safety, trust and confidence, power, value, and sincerity”. Results of Cooker’s research (2004), demonstrate that inappropriate family atmosphere and pathological interactions with child creates maladaptive schemas such as rejection and abandonment, emotional deprivation, abuse and misbehavior, social isolation, and emotional inhibition (6).

In cognitive approach, schemas are known as a full automatic system of beliefs and information (including individual’s potential tendencies and abilities) in long term memory which is a mediator between the environment and interpersonal behavior. With the schema activation, specific beliefs about self are activated and these rapid evaluations activate automatic behaviors or models. Since thoughts, feelings, and maladaptive schema experienced momentum are stressful for individuals and others, they try to use particular behavioral strategies to confront them.

Safe behavioral strategies and successful problem-solving in adolescents depends on sense of hope, support, and tranquility. Individuals, who are certain that their close relations are constant and their needs are met, can confront their problems and desires. It seems that adolescents who have the schemas of rejection and abandonment, distrust, emotional deprivation, dependence, failure, vulnerability, subjugation, and insufficient self-control are not able to solve problems successfully in their adolescence growth phase.
These schemas lead to individual’s unsafe interaction with family members, friends, and generally in all social relations. Jacobs (1996) has stated that, basic psychological backgrounds, makes individuals to gain particular memes. He presents these backgrounds as sense of inefficiency, humiliation, low self-confidence, and strong sense of rejection by parents during childhood. Sexual behaviors of adolescents are a means to make temporary relations with others in order to meet the unfulfilled needs and to control their severe depression and anxiety (10).

Hatfield (1998), has remarked that sexual behavior of adolescents is a temporary relief for anxiety, insecurity, and depression. Walsh (1995) considers adolescence sexual behaviors as a result of adolescent’s risky attachment experiences (12). The results of Rijkeboer and De Boo (2010) research shows that the most common primary maladaptive schemas in adolescents include, self-sacrifice, unrelenting standards, and insufficient self-discipline and self-control (11).

According to the researches done by Lumeley and Harkness (2007), child sexual abuse leads to formation of incompetency, dependence, and failure schemas in individuals which paves the way for the shaping of sexual behaviors and intercourses in adolescents (5).

The results of researches of Marker, Kemmelmeier, and Peterson (1999), demonstrate that, risk factors in the formation of adolescence sexual relations and incest include alcoholic father or mother, parent’s violent controversies, step fathering, mother’s emotional absence, maladaptive family atmosphere, poor parenting methods, poverty, low income, and social isolation (21).

The results of researches have shown that, adolescents involved in sexual relations, have more severe emotional and relational problems. These adolescents having more emotional problems engage in frequent sexual intercourses which consequently lead to their depression. Although, research results show that the adolescents who are involved in early sexual intercourses have more severe emotional and relational problems, researchers have rarely studied the basic factors of such relations. Since early maladaptive schemas are effective in the formation of a lot of psychological and behavioral problems in individuals and is considered as the most fundamental basic of cognition, emotion, and behavior, it seems that it is also effective in the shaping of unsafe relations among adolescents. Thus, the aim of this research is to compare maladaptive schemas among three groups of teen girls with sexual relation, with friendship relation, and without relation.

**Methods and Materials**

The method of present research is comparative reasoning and compares the early maladaptive schemas in three groups of adolescents. Statistical population consists of teen girls between the ages of 15 to 20, in city of Tehran. Research sample consists of 287 schoolgirls between the ages of 15 to 20. First, 5 high schools for girls in one of Tehran’s zones have been selected through available method, in the second step: students are selected from class with cluster method. The number of students in classes was between 25 and 35. First, the way of answering to questionnaire was explained to the students, then Young schema questionnaire and demographic data collection questionnaire are given to the students and according to demographic data collection questionnaire, students are classified in 3 groups of adolescents who have sexual relations, who have friendship relations, and who do not have any opposite sex relations. The results have been studied through analysis of variance test and SPSS16.

**Research Tools**

The tool used in this research is Young schema questionnaire “short form”, which has 75 items. This questionnaire has been designed by Young (1998) for the evaluation of 15 early maladaptive schemas. These schemas are: emotional deprivation, abandonment/instability, mistrust/abuse, isolation/alienation, defectiveness/shame, failure, and dependence/incompetence, vulnerability to harm or illness, enmeshment/grandiosity, insufficient self T control/self T discipline. This questionnaire is set in a 6 degree Likert scale. For the completely wrong answer 1 mark and for the completely right answer 6 marks are given. In this questionnaire, each 5 answers evaluates one schema and the average
of each subscale is above 5 (6). Standardization of this questionnaire in Iran has been done by Ahi (1384) in universities of Tehran (15). Internal consistency, using Cronbach’s alpha, in female population is 97.0 and in male population is 98.0. Face validity of the questionnaire has been validated by 12 professors of Isfahan University (15). Jalali and Sarvghad (1391), in a study of 400 male and female high school students, have reported this tool’s reliability with Cronbach’s alpha. Likewise, micro-reliability of scales is reported in domains of discrimination and rejection 90%, autonomy 89%, other-directedness 76%, over vigilance and inhabitation 75%, impaired limit 74% (16). Demographic data collection questionnaire consists of 17 questionnaires evaluates cases such as, drug abuse record, drug abuse experience by family members, satisfaction with family relations, and opposite sex relations. Cronbach’s alpha coefficient for demographic data collection questionnaire is 86.0.

**Findings**

Among 287 teen girls participated in the present research, 62 of them had sexual relation experience (6.21%), 153 of them had friendship relation with opposite sex (3.53%), and 72 of them did not have relation (08.25%). The mean age of adolescents participated in the research is 16 years and 7 months.

<table>
<thead>
<tr>
<th>Factors</th>
<th>friendship</th>
<th>sexual</th>
<th>No relation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Father’s Educational Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under diploma</td>
<td>9.25</td>
<td>4.27</td>
<td>3.29</td>
</tr>
<tr>
<td>Diploma</td>
<td>8.40</td>
<td>37</td>
<td>9.37</td>
</tr>
<tr>
<td>Academic Education</td>
<td>3.33</td>
<td>6.35</td>
<td>8.32</td>
</tr>
<tr>
<td><strong>Mother’s Educational Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under diploma</td>
<td>1.23</td>
<td>6.35</td>
<td>31</td>
</tr>
<tr>
<td>Diploma</td>
<td>58</td>
<td>53</td>
<td>46</td>
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<tr>
<td>Academic Education</td>
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<td>11</td>
<td>4.22</td>
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<tr>
<td><strong>Drug Abuse Experience</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>12</td>
<td>1.83</td>
<td>8.4</td>
</tr>
<tr>
<td>No</td>
<td>8.29</td>
<td>3.16</td>
<td>9.53</td>
</tr>
<tr>
<td><strong>Drug Abuse Experience by Family</strong></td>
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<tr>
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<td>1.18</td>
<td>5.62</td>
<td>4.19</td>
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<tr>
<td>no</td>
<td>4.27</td>
<td>6.25</td>
<td>47</td>
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<tr>
<td><strong>Quality of Relation with Parents</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>with conflict</td>
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<td>2.23</td>
<td>8.1</td>
</tr>
<tr>
<td>mediocre</td>
<td>3.40</td>
<td>2.23</td>
<td>1.28</td>
</tr>
<tr>
<td>friendly</td>
<td>3.15</td>
<td>5.14</td>
<td>6.24</td>
</tr>
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</table>

According to demographic data collection questionnaire, adolescents are studied in terms of parent’s educational status and drug abuse experience of family members. Likewise, the conflict between adolescents and parents is studied through demographic data collection questionnaire which evaluates 3 levels of relation. In order to study the hypothesis, analysis of variance test (ANOVA) and Scheffe’s post-hoc analysis are used and the results of 3 groups of girls are summarized in Table 2.

The results of analysis of variance test (ANOVA) has demonstrated that theses schemas are significant in these levels, mistrust P<001.0, social isolation P<0001.0, self-sacrifice P<05.0, emotional deprivation P<0001.0, insufficient self-control P<05.0, entitlement P<0001.0, unrelenting standards P<05.0, vulnerability P<01.0, and obedience P<01.0, while the other schemas did not show a significant difference.

**Table 2:** Scheffe’s Test for the Comparison of Group Differences

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>(I)</th>
<th>(J)</th>
<th>Mean difference</th>
<th>Standard Error</th>
<th>Level of Signification</th>
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<td>Mistrust</td>
<td></td>
<td>Friendship</td>
<td>Sexual</td>
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<td>508.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No relation</td>
<td>76.1*</td>
<td>493.0</td>
</tr>
<tr>
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<td>Sexual</td>
<td>Friendship</td>
<td>No relation</td>
<td>-70.1*</td>
<td>508.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>065.0</td>
<td>446.0</td>
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</tr>
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</table>
Table 2: Scheffe’s Test for the Comparison of Group Differences - continued

<table>
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<tr>
<th>Emotional Deprivation</th>
<th>No relation</th>
<th>Friendship</th>
<th>Sexual</th>
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<th>493.0</th>
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<td>485.0</td>
<td>985.0</td>
<td>429.0</td>
<td>0001.0</td>
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<tr>
<td></td>
<td>Sexual</td>
<td>-083.0</td>
<td>485.0</td>
<td>985.0</td>
<td>429.0</td>
<td>0001.0</td>
</tr>
<tr>
<td></td>
<td>No relation</td>
<td>95.1*</td>
<td>477.0</td>
<td>0001.0</td>
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<td></td>
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<table>
<thead>
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<th>No relation</th>
<th>Friendship</th>
<th>Sexual</th>
<th>-55.2*</th>
<th>591.0</th>
<th>0001.0</th>
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<tbody>
<tr>
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<td>Friendship</td>
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<td>601.0</td>
<td>334.0</td>
<td>591.0</td>
<td>0001.0</td>
</tr>
<tr>
<td></td>
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<td>573.0</td>
<td>001.0</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Sexual</td>
<td>-55.2*</td>
<td>591.0</td>
<td>0001.0</td>
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</table>

<table>
<thead>
<tr>
<th>Emotional Deprivation</th>
<th>No relation</th>
<th>Friendship</th>
<th>Sexual</th>
<th>-55.2*</th>
<th>679.0</th>
<th>717.0</th>
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</thead>
<tbody>
<tr>
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<td>Friendship</td>
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<td>654.0</td>
<td>0001.0</td>
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</tr>
<tr>
<td></td>
<td>No relation</td>
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<td>647.0</td>
<td>475.0</td>
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<td></td>
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<thead>
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<th>Sexual</th>
<th>-55.2*</th>
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<th>717.0</th>
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</thead>
<tbody>
<tr>
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<td>157.0</td>
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</tr>
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<td>883.0</td>
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</tr>
<tr>
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<td>883.0</td>
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<table>
<thead>
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<th>Friendship</th>
<th>Sexual</th>
<th>-55.2*</th>
<th>667.0</th>
<th>016.0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Friendship</td>
<td>-55.0</td>
<td>679.0</td>
<td>016.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No relation</td>
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<td>679.0</td>
<td>016.0</td>
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</tr>
<tr>
<td></td>
<td>Sexual</td>
<td>-51.2</td>
<td>596.0</td>
<td>001.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unrelenting Standards</th>
<th>No relation</th>
<th>Friendship</th>
<th>Sexual</th>
<th>-55.2*</th>
<th>679.0</th>
<th>717.0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Friendship</td>
<td>14.2</td>
<td>762.0</td>
<td>020.0</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>No relation</td>
<td>69.0</td>
<td>762.0</td>
<td>661.0</td>
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</tr>
<tr>
<td></td>
<td>Sexual</td>
<td>-14.2*</td>
<td>762.0</td>
<td>020.0</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
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<th>Friendship</th>
<th>Sexual</th>
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<th>518.0</th>
<th>005.0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Friendship</td>
<td>82.0</td>
<td>527.0</td>
<td>296.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No relation</td>
<td>96.1*</td>
<td>518.0</td>
<td>005.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sexual</td>
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<td>527.0</td>
<td>296.0</td>
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<table>
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<tbody>
<tr>
<td></td>
<td>Friendship</td>
<td>93.0</td>
<td>570.0</td>
<td>263.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No relation</td>
<td>84.1*</td>
<td>570.0</td>
<td>263.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results of table 2 is explained below.

The results of table 2 demonstrate that, mistrust schema among 3 groups of adolescents in comparison to critical values has significant difference. The difference is significant in P<001.0 level. And the adolescents who have friendship, show higher mistrust schema in comparison to two other groups. Social isolation schema of three groups shows significant difference, this difference in comparison to critical values, is significant in P<0001.0 level. Adolescents having friendship and sexual
A Comparison of the Early Maladaptive Schemas in Adolescent Girls Involved in Early Sexual Relations with those Who did not have Sexual Relations

relation have more social isolation in than the ones who did not have opposite sex relation. Three groups’ self-sacrifice schema in comparison to critical value shows significant difference ($P<0.05$). Adolescents having friendship and sexual relations, in comparison to those who did not have, show higher self-sacrifice schema. Emotional inhibition schema among three groups has significant difference. This difference in comparison to critical value is significant in $P<0.001$ level. Adolescents, who have sexual relations, have less emotional inhibition in comparison to other groups. Vulnerability schema among the groups, in comparison to critical values shows significant difference ($P<0.001$). Adolescents having friendship relation have more vulnerability schema than those no having relations. Obedience schema among groups, have significant difference. This difference in comparison to critical values is significant in $P<0.01$ level. Adolescents having friendship relations in comparison to those not having relation, show higher score in obedience schema. Insufficient self-control schema among three groups of adolescents has significant difference. This difference in comparison to critical value is significant in $P<0.05$ level. Adolescents who have friendship relations in comparison to those who did not have any relations report higher score in insufficient self-control schema. Entitlement schema of three groups in comparison to critical values shows significant difference ($P<0.001$). Adolescents having friendship and sexual relations in comparison to those not having relations have reported higher score in entitlement schema. Unrelenting Standards schema of groups, in comparison to critical values shows significant difference ($0.05$). Adolescents who have friendship relations in comparison to those who have sexual relations report higher score in unrelenting schema.

In Order to Study the Hypothesis.2 Chi-Square Test is used. Results have Shown that There is significant relevance between father’s (in $P<0.043$) and mother’s (in $P<0.001$) educational status and adolescent’s sexual relations. Family drug addiction and adolescent’s drug abuse shows significant relevance in $P<0.001$ level. Conflict with parents also shows a significant relevance in $P<0.001$ level.

Discussion

Transition from childhood to adolescence, leads individual to engage in risky experiences and whenever the risky behaviors and experiences and are welcomed by the adolescent, it affects his/her life. One of the risky behaviors which are practiced by adolescents is sexual relation in early age. It seems that sexual relations and opposite sex relations is an effort to compensate individual’s deficiencies, and to adjust tensions and self-confidence. So these behaviors are the result of individual’s return to his/her unfulfilled needs. Individuals try to hide their inner sense of insecurity with recourse to sexual intercourse. In this research, cognitive schemas among three groups of teen girls who had opposite sex sexual relations, who had friendship relations, and who did not have relation are compared.

Results have demonstrated that, adolescents who had friendship relations show more distrust schema than the other two groups of adolescents. It seems that, opposite sex friendship relations in these individuals is an example of extreme compensation and bymaking friendship relations, they try to compensate mistrust schema. Adolescents who had friendship and sexual relations show more social isolation in comparison to those who did not have relation. In social isolation schema the person believes that s/he is isolated and is completely different from others and s/he does not have the sense of belonging and being loved. It seems that, friendship and sexual relations in these adolescents is an example of extreme compensation versus isolation schema. Research results of Waller and colleagues (2006) and Dowsel and colleagues (2002) have shown that, adolescents who had affectionate relation with parents (especially with mother), less probably engage in early sexual relations (3). Adolescents having friendship and sexual relations in comparison to those not having relations show more self-sacrifice schema. In self-sacrifice schema, the person believes that s/he has to sacrifice him/herself in
order to help others, and s/he has to fulfill others’ needs before his/her own needs. The characteristic of such individuals is that, in order to receive love and reception and in order to avoid others’ avenge, they excessively concentrate on others’ needs and feelings and ignore their own needs. In order to receive love and reception of others, they try to neglect some aspects of their own characters and needs. Individuals with such schema believe that their needs and feelings are worthless for the others and this makes them irritated and it can be manifested in form of maladaptive behaviors like sexual relations. Results of Jacob’s research (1986) have shown that, primary psychological bases are involved in the formation of models and behaviors, these psychological bases consist of, sense of inefficiency, humiliation, lack of self-confidence, the sense of rejection by parents (13). Adolescents who have friendship relations in comparison to those who did not have relations show higher vulnerability schema. In vulnerability to harm schema, the person believes that disasters and miseries are waiting and can happen in any moment. It seems that making friendship relations for these adolescents is for avoiding unpleasant events which, in effect, is a kind of excessive compensation of this schema. Research results are in same direction with those of Waller and colleagues (2006), which goes like this, adolescent who experienced early sexual relations or abuse, had higher shame, defectiveness, and isolation schemas and were more vulnerable against danger and harm (vulnerability to harm/illness schema), and these individuals have probably more tendency to behave in accordance with others’ opinions and desires, they extremely obey the others. These individuals are very strict to themselves (18). Adolescents who had friendship relations show higher score in obedience schema than those who did not have relations. For these adolescents, relation with others is a kind of obedience and submission to obedience schema. In obedience schema the individuals believe that in order to avoid the negative outcomes, they have to surrender others’ control (6). These individuals let the others to dominate them; otherwise they will have the sense of being punished, rejected, or enforced by the others. Adolescents having sexual relations, have less emotional deprivation that two other groups. In the other two groups, it seems that emotional deprivation is an agent for self-control and avoiding to express feelings and emotions, whereas these adolescents’ low emotional deprivation leads to the outflow of emotions and consequently sexual relations. Adolescents, who have friendship relation in comparison to those who did not have relations, have reported higher score in insufficient self-control schema. Individuals, who have such schema, usually have problems in postponing and controlling emotions, insufficient self-control schema represents person’s inability to tolerate frustration and deprivation when gaining goals. Thus, involving in opposite sex sexual relations can be due to lack of self-control in these individuals. The results of Dunn and colleagues research in same direction with this research have shown that, character traits such as risk-taking and being impulsive are effective in the formation of risky sexual behaviors (17). Adolescents having friendship and sexual relations have reported higher score in entitlement schema than those not having relations, these individuals believe that they are superior to others and usually the challenging behaviors and inappropriate way of power manifestation is expected from them. It seems that, entitlement schema in these individuals is to compensate their defect and they try to compensate with such behaviors and having relations with others can be considered as their determination to dominate others. Unrelenting standards are more in adolescents with friendship relations than those with sexual relations. It seems that, adolescents having sexual relations rarely feel the pressure of standards such as education, occupation, morality, etc. The results of Rijkeboer and De Boo research have shown that the most common primary maladaptive schemas in adolescents include self-sacrifice, unrelenting standards, and insufficient self-discipline and self-control (11). Results of Reissing and colleagues research (2003), in the same direction with present research, have demonstrated that sexual experiences and childhood sexual abuse have negative effect on positive cognitive representations and person’s sexual schemas and will create sexual growth problems (19). Lumeley and Harkness (2007) have concluded that childhood sexual abuse is along with incompetency, dependence, and failure schemas (7). Seeger’s research results (2003) have shown that, impulsive sexual behaviors are a temporary relief for anxiety, insecurity, and depression in the individual who engage in (20). Because sexual issues are taboo, discussing such matters in our society, is encountered by resistance from the respondents. Assistance of institutes and educational centers is a
A Comparison of the Early Maladaptive Schemas in Adolescent Girls Involved in Early Sexual Relations with those Who did not have Sexual Relations

major limitation for this research. Due to the shortage of inland researches about the basic factors (personal and social) in the formation of risky behaviors in adolescents, extensive researches will be significantly influential. It seems that false interpretation of adolescents, instructors, and families from adolescence and its physical, cognitive, and emotional changes, is effective in the gap and distance between generations and consequently family emotional coldness. Thus, awareness of families and educational centers, together with both generations’ correct and timely information are effective in the decrease of risky behaviors in adolescents. It seems that, our schools need more awareness about the formative factors of early sexual relations in adolescence. And since in the present research, there is relation between drug abuse and risky sexual behaviors, it seems that education and planning can be effective in prevention of risky behaviors in teen ages.

References
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Comparison on GLMM Uniresponse, Biresponse, and Reduction with PCA on Longitudinal Data

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Abstract

In the quantitative research particularly in the field of health research, it often uses longitudinal data using repeated measurements on some individuals within some period of time. One method used for longitudinal data with quantitative response is the General Linear Mixed Model (GLMM). Study using two response variables can be solved by using three methods: first by using both response variables at once with Bi-response GLMM, both by using both variables Unirespon GLMM partial response, and the third uses PCA-reduction GLMM (Jacqmin-Gadda, 2000, and Hermanussen, 2008). This research uses the primary data and the simulation data. Thus, in this study we will compare which of the three best methods for the analysis of longitudinal data with bi-response GLMM using uniresponse, biresponse GLMM, and PCA-GLMM. From the results of the research conducted, it can be concluded as follows: (a) In the low correlation condition (correlations between 0.00 to 0.30), uniresponse GLMM is more feasible to be used. (b) Under conditions moderate correlation (correlation between 0.31 to 0.60), and the GLMM Biresponse and GLMM PCA reduction are feasible to be used, and (c) Under conditions of high correlation (correlation between 0.61 to 0.90), GLMM Biresponse is the best choice in shaping the model GLMM on longitudinal data.

Keywords: GLMM, Uniresponse, Biresponse, and Reduction PCA

1. Introduction

Development of longitudinal data analysis as one of the groups in the statistical sciences has been increasing in the use mainly in the field of health research. Through the incorporation of cross-sectional data and time series data, the use of longitudinal data is more informative, varied and superior
in studying the dynamic changes [1]. According to Verbeke and Molenberghs [2], the analysis of two-stage (two-stage analysis) constitutes an alternative approach to longitudinal data analysis. This analysis is done by summarizing vector of repeated measurements (repeated measurement) for each cross-sectional unit (subject) into the vector form estimators subject-specific regression coefficients in the first stage and connect the probe to the independent variables are known to use the techniques in the second stage regression multipeubah. Merging these two stages into a single statistical model is called the General Linear Mixed Model (GLMM).

In the field of health research, it is often found more than one response variable on the result of interrelated observation and a set of independent variables derived from patients studied in some period of time with quantitative response. Jacqmin-Gadda, et al. (2000), analyzing longitudinal data in the form of two response variables using the General Linear Mixed Model (GLMM) simultaneously (biresponse) and compare them if is done in partial (uniresponse). Hermanussen M [3] uses a reduction from biresponse to uniresponse variables using Principal Component Analysis (PCA) as a response to the General Linear Mixed Model (GLMM).

The purposes of the research to be obtained are as follows: General Linear Model Getting Mixed Model (GLMM) among the best in the response uniresponse, multivariate and variable reduction using PCA.

Benefits of the research are as follows: (1) As an alternative to solving problems in longitudinal data analysis with multiple response, (2) Selection of the best models in the General Linear Mixed Model (GLMM) is expected to be used as an alternative for researchers in the field of longitudinal data analysis.

2. Theory Review

2.1. General Linear Mixed Model (GLMM)

Verbeke and Molenberghs [2], longitudinal data on practice uses the linear regression function on each subject (subject-specific). Analysis of two-stage combination into a single statistical model called the General Linear Mixed Model (GLMM). Diggle, et. al. [4], the General Linear Mixed Model (GLMM) was obtained from two-stage analysis, so the analysis approach uses linear regression function on each subject (subject-specific). Model General Linear Mixed Model (GLMM) is obtained:

\[ Y_i = x_i \beta + z_i b_i + \epsilon_i \]  

where \( x \) = matrix (nixp) independent variables are known. The model assumes that vector of repeated measurement (repeated measurements) follows linear regression model with population-specific parameter, (ie, the same for all subjects) and subject-specific parameter, assumed to be random so called random effects (Molenbergh and Verbeke [2]).

GLMM with Two Variables Response

Thiebaut, et al. [5], defines the General Linear Mixed Model on two response variables with Gaussian mixture models of the components are random, the 1st order of the auto-regressive, AR (1) and residual components.

Suppose \( Y_i = \begin{bmatrix} Y_{i1}^1 \\ Y_{i2}^1 \\ Y_{i1}^2 \\ Y_{i2}^2 \end{bmatrix} \), is the response vector for subject i, with \( Y_{ik}^i \) as the vector measurement, then \( k (k = 1.2) \) with \( n_i^1 = n_i^2 = n_i \). If two longitudinal data are free, it can be used the following two models:

\[ Y_{i1}^1 = x_i^1 \beta^1 + z_i^1 b_i^1 + w_i^1 + \epsilon_i^1 \]  
\[ Y_{i2}^1 = x_i^2 \beta^2 + z_i^2 b_i^2 + w_i^2 + \epsilon_i^2 \]  

where \( \epsilon_i^1 \sim N(0, \sigma_\epsilon^1 I_n) \) and \( \epsilon_i^2 \sim N(0, \sigma_\epsilon^2 I_n) \)
\[ b_1^i \sim N(0, G^1) \text{ and } b_2^i \sim N(0, G^2) \]
\[ w_1^i \sim N(0, R_1^i) \text{ and } w_2^i \sim N(0, R_2^i) \]
\[ x_i^k = \text{matrix (n}_i \times p \times k) \text{ independent variables that are known} \]
\[ \beta^k = p^k \text{-dimensional vector contains fixed effects (fixed effect)} \]
\[ Z_i^k = \text{matrix of known independent variables, modeling the response variable that is arranged based on the time for the i-th subject.} \]
\[ b_1^k = \text{vector of random effect (random effect) q dimension, with} \]
\[ W_i^k = 2n_i - w_i(t), \text{stochastic process that allows the relationship between measurements (order-1 vector realization of the auto-regressive) AR}(1). \]
\[ \ln_i = \text{dimensional identity matrix n}_i. \]

According to Weiss [6], the general model of the General Linear Mixed Model (GLMM) on two response variables, as follows:

\[ Y_1 = x_1^{1} \beta + z_1 b_1 + w_1 + \varepsilon_1 \] (4)

with:
\[ \varepsilon_1 \sim N(0, \Sigma_1), w_1 \sim N(0, R_1), \text{dan } b_1 \sim N(0, G) \]
\[ \Sigma = \text{covariance matrix on the two response variables.} \]

where:
\[ x_1 = \begin{bmatrix} x_1^1 & 0 \\ 0 & x_1^2 \end{bmatrix}; \beta = \begin{bmatrix} \beta_1 \\ \beta_2 \end{bmatrix}; z_1 = \begin{bmatrix} z_1^1 \\ 0 \end{bmatrix}; b_1 = b_1^1 \]
\[ w_1 = \begin{bmatrix} w_1^1 \\ w_1^2 \end{bmatrix} \text{ is } 2n_i \text{ which is the realization of the two-vector response variable.} \]
\[ \varepsilon_1 = \begin{bmatrix} \varepsilon_1^1 \\ \varepsilon_1^2 \end{bmatrix} \text{ is residual vector components are assumed free.} \]
\[ \Sigma_i = \Sigma \otimes I_{n_i} = \begin{bmatrix} \sigma_{\varepsilon_1}^2 & 0 \\ 0 & \sigma_{\varepsilon_1}^2 \end{bmatrix} \text{ is covariance matrix of the residual component.} \]
\[ w_1(t) = \begin{bmatrix} w_1^1(t) \\ w_1^2(t) \end{bmatrix} \text{ is covariance function of two variables-1 response to the order of the auto-regressive derived from} \]
\[ R_1 = \begin{bmatrix} \sigma_{w_1}^2 & \rho \sigma_{w_1 w_2} \\ \rho \sigma_{w_1 w_2} & \sigma_{w_2}^2 \end{bmatrix} \]

value \[ \rho = \frac{\ar(1)}{\ar(\text{residual})} \], so that value \[ \sigma_{\varepsilon_1}^2 = r \times e^\delta, \text{ and } \sigma_{\varepsilon_1}^2 = r \times e^{-\delta} \], \[ \delta \text{ is value exp} \begin{bmatrix} \sigma_{w_1}^2 & \sigma_{w_1 w_2} \\ \sigma_{w_1 w_2} & \sigma_{w_2}^2 \end{bmatrix}. \]
\[ \otimes \text{ refers to notation of Kronecker.} \]

2.2. Selection of the Best Model

If several variable models are found appropriately in the results of diagnostic studies, it can be used then the best models that will be used on the data. Selection of the best model can be done by calculating the value of AIC (Akaike's Information Criterion), with the formula:

\[ \text{AIC} = n \ln(\hat{\sigma}_\hat{o}^2) + 2m \] (5)

where:
Comparison on GLMM Uniresponse, Biresponse, and Reduction with PCA on Longitudinal Data

\( n = \text{number of observation} \)

\( \hat{\sigma}_u^2 = \text{residual range estimator.} \)

\( m = \text{number of suspected parameter in the model} \)

Best model is the model that has the smallest AIC value (Thiebaut, et al. [5]).

3. Methods

The data obtained are the first primary data of patients with Type 2 Diabetes Mellitus listed in hospitalized patients in RSSA Malang. In the health sector, levels of Fasting Plasma Glucose (FPG) and hemoglobin levels (HbA1c) is known to correlate with each other. Diabetes Mellitus Type 2 mainly occurs in adults but sometimes in adolescence and most people with Type 2 Diabetes Mellitus obese. This study conducted two drug therapies, using oral anti-diabetic therapy (OAD) and insulin therapy. Therapy was performed with Diabetes Mellitus Type 2 aims to reduce levels of Fasting Plasma Glucose (FPG) between 90-130mg/dl and hemoglobin levels (HbA1c) of less than 8%. HbA1c levels indicate the amount of sugar that is bound by the protein in red blood cells. Because red blood cells live up to 3 months, the HbA1c test shows blood sugar average over the last 3 months.

The second data are simulated data (generation) with a variety of conditions the correlation between the two response variables, namely (1) a low correlation (absolute value of \( r \) (correlation coefficient between the two response variables) in the range of 0.0-0.30), (2) moderate correlation (absolute value of \( r \) in the range 0.31-0.60), and (3) a high correlation (\( r \) absolute values in the range 0.61-0.90).

1. Exploration data from both response variables simultaneously and partially:
   a. Exploration of individual profiles.
   b. Exploration marginal models: the average structure (fixed effects), the variety and structure of the correlation structure of two response variables.

2. Tentative model of forming with the initial determination of fixed effects number and random effects (\( \Sigma_{ET}^{\text{tentatif}} \) and \( \Sigma_{EA}^{\text{tentatif}} \)) as well as the correlation of two response variables (\( W_k \)).

3. Examination of significance of fixed effects parameter in early model using \textit{Maximum Likelihood} method (ML). If gained value \(-2\log\text{likelihood} (-2\ln L_{\text{ML}}) \) which is convergent \((-2\ln L_{\text{ML}})_k - (-2\ln L_{\text{ML}})_{k-1} \leq 10^{-8}\), then go to next phase, but if this condition is not fulfilled then back to early stages of model building (Phase 2).

4. Examination of the significance of fixed effects parameter in early model using the F test, (other than the time fixed effects) which is not significant then go back to Phase 2 and reshaping early models without including fixed effects into the model in addition to the time is not significant.

5. Formation of marginal models:
   a. Structure of variance (random effect):
   b. Average structure (fixed effects):
   c. correlation structure

6. Estimation of marginal models:
   a. Estimate of the range of appropriate components using REML estimators.
   b. Parameter estimation using the corresponding fixed effects estimator Maximum Likelihood (ML).

7. Formation of the final model.

8. Calculating the value of AIC.

9. Interpretation of the model.

Formation of longitudinal models with two response variables using the General Linear Mixed Model (GLMM) using SAS 9.1.3 software assistance.
4. Results and Discussion

4.1. Data Exploration

In the primary data of patients with Diabetes Mellitus Type 2, there are two responses the research: Fasting plasma glucose levels (FPG) and hemoglobin levels (HbA1c).

Exploration of Individual Profile illustrates how changes in levels of response Fasting Plasma Glucose (FPG) against time on each subject was observed, while the conclusion of the diversity changes in response to the subject and inter-subject is other information that can be obtained from this exploration. Individual profiles are formed is presented in Figure 1.

**Figure 1: Individual Profile Response FPG**

![Individual Profile](image)

From Figure 1, it shows the changes in levels of Fasting Plasma Glucose (FPG) different in patients observed in measurements. Individual profiles are formed also shows the influence of the change of time (months) to changes in levels of Fasting Plasma Glucose (FPG) is different for each patient. Between observations on each patient did not show high variability, it is seen from the graph that is formed for each patient has a pattern of relatively constant over time.

Marginal Distribution exploration is carried through the exploration of the average structure, the structure and the variety of correlation structures. Conclusions on the effects of tentative models will remain on the exploration results obtained from the average structure, while the structure of the range provide initial conclusions about whether or not to include random effects in addition to the fixed effects model of tentative.

**Figure 2: Structure of Average Response FPG**

![Structure of Average Response FPG](image)
Result of average structure of data exploration in Figure 2 shows the graph changes in time (months) to changes in levels of Fasting Plasma Glucose (FPG) showed a linear pattern. Thus the fixed effects linear time structure will be considered in the formation of tentative models at a later stage.

In contrast to the response levels Fasting Plasma Glucose (FPG), in response Hemoglobin levels (HbA1c) seen from the results of exploration of individual profiles in Figure 3 shows the irregularity of the line formed as a result of the use of the unit of time. A change in hemoglobin levels (HbA1c) every time observations lead to the conclusion of the influence of the change of time (months) to changes in hemoglobin levels (HbA1c) in patients.

**Figure 3:** Individual Profile Response HbA1c

![Individual Profile](image)

Exploration results average structure in Figure 3 shows a graph formed decreased linearly, indicating there are significant changes in time (months) on levels of hemoglobin (HbA1c).

**Figure 4:** Structure of average HbA1c Response

![Structure of average HbA1c Response](image)

4.2. Establishment of Model Uniresponse Fasting Plasma Glucose Levels / FPG

Results of uniresponse model building response Fasting Plasma Glucose Levels / FPG are presented in Table 1, the results showed partial fixed effects testing using t-test statistic for fixed effects in the treatment of oral anti-diabetic (OAD) and insulin.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>response</th>
<th>Std.Error</th>
<th>tcalculatin</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersep</td>
<td>138.03</td>
<td>26.7209</td>
<td>5.17</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Time$_{ij}$</td>
<td>-3.6790</td>
<td>0.4056</td>
<td>-9.07</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Age$_{i}$</td>
<td>1.1761</td>
<td>0.5131</td>
<td>2.29</td>
<td>0.0249*</td>
</tr>
</tbody>
</table>

Specification: * sign stating significant at 5% level.
The test results in Table 1 shows that significant time and negative slope. This indicates that changes over time, the patient had a change in FPG response that tends to fall. Tests on concomitant variables that age has a significant effect on the response, it shows that patients with older age had higher FPG response than patients with a younger age. Final model is given as follows: 

\[ Y_{ij} = (138.03 + b_{0i}) + (-3.6790 + b_{ii})Waktu_{ij} + 1.1761Usia_i + \epsilon_{ij} \]

The model describes the overall average rate levels Fasting Plasma Glucose (FPG) in 35 patients before the measurement was 138.03 mg / dl and the reduction or additional levels of Fasting Plasma Glucose (FPG) was influenced by the effects of changes in patient time (months). The addition of 1 year of age with Type 2 Diabetes Mellitus patients, based on 4.2 models can raise levels of fasting plasma glucose as 1.1761 mg / dl.

### 4.3. Establishment of the Unireponse Model (Kadar Hemoglobin/HbA1c)

Results of uniresponse model building response hemoglobin levels (HbA1c) is presented in Appendix 3. Final model are presented in Table 2, the results showed partial testing fixed effects using t-test statistics for fixed effects on insulin and OAD therapy.

**Table 2:** Parameter Estimation of Fixed Effects Model Response HbA1c

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Std.Error</th>
<th>t</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersep</td>
<td>6.9841</td>
<td>0.6552</td>
<td>10.66</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>Time_ij</td>
<td>-0.2002</td>
<td>0.02147</td>
<td>-9.33</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>Sex_i</td>
<td>-0.6867</td>
<td>0.2872</td>
<td>-2.39</td>
<td>0.0195*</td>
</tr>
<tr>
<td>Age_i</td>
<td>0.04211</td>
<td>0.01370</td>
<td>3.07</td>
<td>0.0030*</td>
</tr>
</tbody>
</table>

Specification: * sign stating significant at 5% level.

Final model is given as follows:

\[ Y_{ij} = (6.9841+b_{0i}) + (-0.2002+b_{ii})Time_{ij} - 0.6867Sex_i + 0.04211Usia_i + \epsilon_{ij} \]

The model describes the overall average level of hemoglobin levels (HbA1c) in patients 35 patients before the measurement is 6.9841% and the reduction or the addition of hemoglobin levels (HbA1c) was influenced by the effects of changes in patient time (months). The addition of 1 year of age with Type 2 Diabetes Mellitus patients, based on the above model can improve hemoglobin levels of 0.04211%. Tests on concomitant variables namely gender, the influence of gender on the response of hemoglobin levels (HbA1c) is significant and negative. Sex doll with a peubah 0 is female and 1 is male, indicating that female patients had a better response than the male patients.

### 4.4. Establishment of Model of Biresponse Reduction with PCA Results

Results of uniresponse modeling of the results of response reduction with PCA is presented in Appendix 3. Final models are presented in Table 3, the results showed partial testing fixed effects using t-test statistics for fixed effects on insulin and OAD therapy.

**Table 3:** Parameter Estimation of Fixed Effects Model Reduction with PCA results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Std.Error</th>
<th>t</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersep</td>
<td>1.3939</td>
<td>0.4794</td>
<td>2.91</td>
<td>0.0043*</td>
</tr>
<tr>
<td>Time_ij</td>
<td>-0.0131</td>
<td>0.0245</td>
<td>-0.53</td>
<td>0.5942</td>
</tr>
<tr>
<td>Sex_i</td>
<td>-0.0298</td>
<td>0.0097</td>
<td>-3.06</td>
<td>0.0027*</td>
</tr>
<tr>
<td>Usia_i</td>
<td>0.4726</td>
<td>0.2043</td>
<td>2.31</td>
<td>0.0220*</td>
</tr>
</tbody>
</table>

Specification: * sign stating significant at 5% level.

Final model is given by the following equation:

\[ Y_{ij} = (1.3939+b_{0i}) + (-0.0131+b_{ii})Time_{ij} - 0.0298Sex_i + 0.4726Age_i + \epsilon_{ij} \]
The model describes the overall average rate of reduction in PCA patients results in 35 patients before the measurement is 1.3939% and the reduction or reduction with the addition of the results of PCA patients is influenced effect change in time (months). The addition of 1 year of age with Type 2 Diabetes Mellitus patients, based on the above model can improve the outcome of Response Reduction with PCA at 0.4726%. Tests on concomitant variables namely gender, the influence of gender on the response of the result is a significant reduction with PCA and negative. Sex doll with a peubah 0 is female and 1 is male, indicating that female patients had a better response than the male patients.

4.5. Biresponse Model

Results of the biresponse model building response Fasting Plasma Glucose levels (FPG) and hemoglobin levels (HbA1c) is presented in Appendix 3. Final model are presented in Table 4, the results show the effect of permanent partial testing using t-test statistics for fixed effects on insulin and OAD therapy.

Table 4: Parameter Estimation of Fixed Effects Model Biresponse

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Std.Error</th>
<th>t</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersep 1</td>
<td>1.6191</td>
<td>0.8016</td>
<td>-1.27</td>
<td>0.0212*</td>
</tr>
<tr>
<td>Waktu (i)</td>
<td>-0.1930</td>
<td>0.04199</td>
<td>-4.60</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>Usia (i)</td>
<td>0.03933</td>
<td>0.01580</td>
<td>2.49</td>
<td>0.0152*</td>
</tr>
</tbody>
</table>

Specification: * sign stating significant at 5% level.

Reduction of Fasting Plasma Glucose levels (FPG) and hemoglobin levels (HbA1c) in 35 patients affected effect change in time (months). The addition of 1 year of age with Type 2 Diabetes Mellitus patients, based on the above model can raise levels of fasting plasma glucose (FPG) and hemoglobin levels (HbA1c) of 0.03933.

On two response variables (biresponse) by inserting two random slope effect can be given to the following equation:

\[
Y_1^i (\text{FPG}) = -0.3891 + (-10.6992) I_{i \geq t} + 28.0422 + (0.003165) I_{i \geq t} + \varepsilon_i^1
\]

\[
Y_2^i (\text{HbA1c}) = -0.0124 + (-0.6204) I_{i \geq t} + 14.9355 + (0.01774) I_{i \geq t} + \varepsilon_i^2
\]

4.6. Comparison of Two Models Unireponse and Biresponse Models in Overall

Results of parameter estimation and standard error of two unireponse and biresponse models to the data of patients with Diabetes Mellitus Type 2 is presented in Table 5

Table 5: Comparison Parameter Response and Standard Error

<table>
<thead>
<tr>
<th>Response</th>
<th>FPG (One Respon)</th>
<th>HbA1c (One Respon)</th>
<th>Reduction with PCA</th>
<th>Biresponse (Two Respon)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>S.E.</td>
<td>Estimate</td>
<td>S.E.</td>
</tr>
<tr>
<td>Therapy</td>
<td>-1.040</td>
<td>-1.040</td>
<td>0.029</td>
<td>0.368</td>
</tr>
<tr>
<td>Age, (i)</td>
<td>1.176</td>
<td>0.513</td>
<td>0.042</td>
<td>0.014</td>
</tr>
<tr>
<td>Time, (i)</td>
<td>-3.679</td>
<td>0.406</td>
<td>-0.200</td>
<td>0.021</td>
</tr>
<tr>
<td>AIC</td>
<td>769.3</td>
<td>406.2</td>
<td>316.4</td>
<td></td>
</tr>
</tbody>
</table>

Based on Table 5 it can be said that the model of two response variables (biresponse) has a value of parameter estimators and standard error values are likely to be small. The best model selection can be indicated by the value of AIC (Akaike Information Criterion) in Table 5.

From Table 5 it can be seen that for the overall comparison of the model, GLMM with biresponse model is the most appropriate for use in longitudinal data of 35 patients with Type 2 Diabetes Mellitus with two response variables are correlated.
4.7. Comparison GLMM Model in Simulation Data

The second data is simulated data (generation) with a variety of conditions the correlation between the two response variables (simulation 1) low correlation (absolute value of r (correlation coefficient between the two response variables) in the range of 0.0-0.30), (simulation 2) moderate correlation (values absolute r in the range 0.31-0.60), and (simulation 3) a high correlation (r absolute values in the range 0.61-0.90). Two response variables used are the same as the first data that FPG levels and HbA1c levels. Table 6 of AIC values for all three models are uniresponse, reduction with PCA, and biresponse simulated data at 10 1 to 3. From Table 6 shows that the correlation between the response conditions on simulated data 1 on condition that the low correlations ranged from 0.0 to 0:30, which is the best model that produces the smallest AIC value is uniresponse GLMM models, namely the formation of partial models of both response observations.

Table 6: Value AIC on Three Simulation Data

<table>
<thead>
<tr>
<th>Data</th>
<th>Simulation 1 (r 0.00-0.30)</th>
<th>Simulation 2 (r 0.31-0.60)</th>
<th>Simulation 3 (r 0.61-0.90)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Uniresponse</td>
<td>Reduction PCA</td>
<td>Biresponse</td>
</tr>
<tr>
<td>1</td>
<td>977.9</td>
<td>1137.2</td>
<td>2040.1</td>
</tr>
<tr>
<td>2</td>
<td>953.9</td>
<td>1135.0</td>
<td>2025.3</td>
</tr>
<tr>
<td>3</td>
<td>964.9</td>
<td>1145.6</td>
<td>1981.2</td>
</tr>
<tr>
<td>4</td>
<td>967.3</td>
<td>1140.0</td>
<td>2037.8</td>
</tr>
<tr>
<td>5</td>
<td>952.3</td>
<td>1133.8</td>
<td>1987.1</td>
</tr>
<tr>
<td>6</td>
<td>956.8</td>
<td>1122.2</td>
<td>2019.1</td>
</tr>
<tr>
<td>7</td>
<td>956.8</td>
<td>1131.2</td>
<td>1987.8</td>
</tr>
<tr>
<td>8</td>
<td>962.5</td>
<td>1136.6</td>
<td>2001.2</td>
</tr>
<tr>
<td>9</td>
<td>954.2</td>
<td>1133.4</td>
<td>1995.6</td>
</tr>
<tr>
<td>10</td>
<td>961.5</td>
<td>1136.8</td>
<td>1991.2</td>
</tr>
<tr>
<td>Mean</td>
<td>960.8</td>
<td>1135.2</td>
<td>2006.6</td>
</tr>
</tbody>
</table>

In the second simulation data, namely the condition of moderate correlation ranged between 0.31 to 0.60, it is seen that the GLMM models and GLMM Biresponse PCA reduction overall had a better AIC value compared Uniresponse GLMM models. Can be said on the condition of moderate correlation, GLMM models and GLMM Biresponse PCA reduction as good, because it has a value of AIC which tend to be almost the same.

In the simulated data 3, with high correlations ranged between 0.61 to 0.90, giving almost the same results with simulated data 2, but it was clear that the model GLMM Biresponse have AIC values are much smaller than the GLMM reduction of PCA. It can be concluded, on the condition of low correlation, uniresponse GLMM is more feasible to use. At moderate correlation condition, GLMM Biresponse and GLMM same PCA reduction unfit for use, and the high correlation condition, GLMM Biresponse is the best choice in shaping the model GLMM on longitudinal data.

5. Conclusions and Recommendations

From the results of research conducted, it can be concluded as follows: on simulated data (a) In the low correlation condition (correlations between 12:00 to 12:30), uniresponse GLMM is more feasible to use. (b) Under conditions moderate correlation (correlation between 0:31 to 0.60), and the GLMM Biresponse same GLMM PCA reduction unfit for use, and (c) Under conditions of high correlation (correlation between 0.61 to 0.90), GLMM Biresponse is the best choice in shaping the model GLMM on longitudinal data.

From the results of this study, it is suggested some of the following:

1. GLMM Uniresponse, Biresponse, and reduction of PCA can be used as a settlement of the problem in the analysis of longitudinal data with multiple responses, the correlation between the response to various conditions.
2. On further research it is recommended to use a multivariate responses are responses that use more than two. Because some research in the areas of health, not least the use of more than two responses.

References
Association of C2488T and P2712L Apolipoprotein B Polymorphisms with Coronary Artery Disease Appearance and Plasma Apolipoprotein B Level in Iranian Coronary Patients

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Abstract

Objective: Relationship between coronary artery disease (CAD) appearance and changes in lipid concentrations caused by some Apolipoprotein B (Apo-B) gene polymorphisms have been recently suggested. We examined role of the two Apo-B C2488T and P2712L polymorphisms in the increased risk of CAD.

Methods: Three hundred and sixty patients with suspected CAD were consecutively evaluated. The two Apo-B gene polymorphisms (C2488T and P2712L) were determined and plasma levels of Apo-B and lipid profile were measured.

Results: There were three genotypes of the two polymorphisms in CAD and non-CAD groups with no significant difference in the frequency of these genotypes across the two groups. The types of the genotypes of both C2488T and P2712L polymorphisms could not predict CAD in a multivariable logistic regression analysis. Plasma Apo-B level was not associated with the type of the genotypes of both C2488T and P2712L polymorphisms in both CAD and non-CAD groups.

Conclusion: In the Iranian population, the two Apo-B gene polymorphisms of C2488T and P2712L appear not to be involved in the appearance and extension of CAD. Serum Apo-B level was only related to the LL genotype of the P2712L polymorphism.

Keywords: Coronary artery disease, polymorphism, apolipoprotein, risk
**Introduction**

Coronary artery diseases (CAD) affect millions of people throughout the world and account for over a million hospital stays each year [1]. Numerous epidemiological surveys have shown an increase in the risk of atherosclerosis and CAD appearance with elevating serum lipid profile concentrations [2-4]. In this context, it is also well established that the level of Apolipoprotein B (Apo-B), the almost exclusive apoprotein of LDL particles, is strongly associated with CAD, and is even a more applicable predictor of CAD than is LDL level in the clinical settings [5,6]. Elevated Apo-B levels have been also suggested to predict premature CAD [7, 8]. On the other hand, most large prospective epidemiological studies and clinical trials showed that Apo-B surpassed low density lipoprotein (LDL) cholesterol and other cholesterol parameters, as a predictor of new and recurrent CAD events [9-13]. Furthermore, on the basis of recent observations, Apo-B is significantly related to the blood pressure level in a large sample of individuals untreated with antihypertensive and lipid-lowering drugs and therefore seems to be a stronger predictor of both systolic and diastolic hypertension, as main CAD risk factors [14].

Technological advances, especially in genetics and genomics, have changed our understanding of the risk factors for developing CHD. Several common polymorphisms within the Apo-B gene have been described, with variable effects on lipid concentrations [15], and others with detrimental effect on the binding properties with the LDL receptor [16]. Recently, different polymorphisms of the Apo-B gene have been identified to be associated with plasma total and LDL-cholesterol concentrations [17]. Analysis of patient DNA by single-strand conformation polymorphism and allele-specific oligonucleotide hybridization of the sequence surrounding the putative receptor-binding domain of apoB revealed seven variations. Some unique mutations in Apo-B gene can disrupt the binding of LDL to its receptor and therefore cause hypercholesterolemia [18]. For instance, some frequently investigated in the literature are the T2488T, E4154K, and the signal peptide insertion/deletion polymorphism, which deletes three amino acids [19-21]. Totally, previous findings suggest either a complex relationship between CAD and changes in lipid concentrations caused by the Apo-B polymorphisms or that the known polymorphisms are in linkage with the true causative regions of the Apo-B gene. In the present study, we examined the role of the two Apo-B C2488T and P2712L polymorphisms in the increased risk of CAD in a sample of Iranian CAD patients.

**Material and Methods**

In a case-control study, 360 patients with suspected coronary artery disease and underwent elective coronary angiography at the Mousavi hospital in Zanjan, Iran, were consecutively evaluated. Informed consent was obtained from all participants before examination and the review committee of the Zanjan University approved the study. Demographic characteristics and clinical criteria of these patients were extracted from hospital recorded files as well as face to face interviewing if required and entered into a computerized database form. The patients were given self-administered questionnaires about their medical history included: general characteristics (gender, age), coronary artery disease risk factors included: current smoking history, hyperlipidemia, hypertension, diabetes mellitus, previous cardiac ischemic events, previous coronary artery bypass surgery, positive exercise test, history of pace maker implantation, or abnormal cardiac MRI. Body mass index was calculated from measured weight and height. Blood pressure was measured by standard mercury sphygmomanometer in each arm in seated subjects. Mean readings from both arms were used for systolic and diastolic blood pressure. Venous blood samples of 4.0 cc were collected in EDTA from each patient in the fasting state in the morning from an antecubital vein for DNA extraction and 5.0 cc for biochemical analyses as well as for Immunoturbidimetry test to measure Apo-B. Standard measurements of lipid profile and fasting glucose were performed and standard blood analysis was determined via Hitachi system 717 (Pars Azmoon co., Iran).

All patients underwent coronary angiography using the Judkins technique on digitized coronary angiography equipment. In this study, we defined significant CAD as at least one 50% or greater
diameter narrowing observed in multiple right anterior oblique and left anterior oblique views in at least one coronary vessel. According to the significant CAD, the patients were categorized as the case group (with significant CAD) and the healthy group as the control.

Genomic DNA was extracted from peripheral blood leukocytes in all the patients and controls using the Qiagen Spin Column (Bioron Co. Germany). The purity of DNA was determined by calculating the ratio of absorbance at 260 nm to that of 280 nm using UV-visible spectrophotometer. The purity of the DNA extracted was measured by dividing the absorbance at A260 by A280. A value at a range of 1.7-1.9 indicated pure DNA with purity of 87% to 96%. The determination of the two Apo-B C2488T and P2712L polymorphisms was done by the polymerase chain reaction-restriction fragment length polymorphism. The amplification reaction was carried out using the following primers (Generay Biotech Co.):

1) For C2488T polymorphism:
   Forward: 5´-ATGAAACCAATGACAAAATCC-3´
   Reverse: 5´-AACAGTGACCCTTGCTCTACC-3´
2) For P2712L polymorphism:
   Forward: 5´-CTGAAATCAAGACCATCCTTG-3´
   Reverse: 5´-AATTGTGTGTGAGATGTGGGGAAGCTGGAATCCT-3´

Each amplification reaction was performed with 100 ng of genomic DNA; 10 pmol of each primer; 2.5 µL of 10 x buffer solution; 1 µL of MgCl2; 100 µmol/L each of dATP, dCTP, dGTP, and dTTP; and 1 U (0.2 µL) of Taq polymerase; and 16.1 ML of Ionized H2O, in a total volume of 22 µL. The DNA fragments were generated from initial denaturation at 95°C for 2.5 minutes, followed by 30 cycles of denaturation at 94°C for 30 seconds, annealing at 58°C (for C2488T) and 60°C (for P2712L) for 30 seconds, and extension at 72°C for 30 seconds, with final extension at 72°C for 7 minutes. The amplification products were digested with the restriction enzyme XbaI, and the fragments were separated on a 2% agarose gel.

Results were reported as mean ± standard deviation (SD) for the quantitative variables and percentages for the categorical variables. The groups were compared using the Student's t-test for the continuous variables and the chi-square test (or Fisher's exact test if required) for the categorical variables. Predictors exhibiting a statistically significant relation with the appearance of coronary artery disease were taken for multivariate logistic regression analysis to investigate their independence as predictors. Odds ratio (OR) and 95% confidence intervals (CI) were calculated. This study was done with the power of 80%. P values of 0.05 or less were considered statistically significant. All the statistical analyses were performed using SPSS version 13.0 (SPSS Inc., Chicago, IL, USA) and SAS version 9.1 for Windows (SAS Institute Inc., Cary, NC, USA).

Finding
The baseline characteristics of study subjects are summarized in Table 1. The two groups were well matched for age and sex. The patients in the case group were significantly older than the controls and male to female ration was significantly higher in the former group. The difference in history of hyperlipidemia, current smoking, and history of stable and unstable anginas was significant. Also, positive exercise test and abnormal cardiac MRI was more frequent in those with significant CAD than normal subjects. Left ventricular dysfunction manifested by left ventricular ejection fraction was also more severe in the CAD group than the control. Regarding laboratory parameters, the CAD group had higher mean value of fasting blood sugar, while mean diastolic blood pressure and lipid profile including total cholesterol and low density lipoprotein was higher in the control group.
Association of C2488T and P2712L Apolipoprotein B Polymorphisms with Coronary Artery Disease Appearance and Plasma Apolipoprotein B Level in Iranian Coronary Patients

Table 1: Baseline characteristics in CAD and non-CAD groups

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Case group (n = 181)</th>
<th>Control group (n = 179)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male gender</td>
<td>118 (65.2)</td>
<td>72 (40.2)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Age, yr</td>
<td>60.39/9.58</td>
<td>55.43/9.64</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Body mass index, kg/m²</td>
<td>26.85/4.48</td>
<td>27.42/4.43</td>
<td>0.23</td>
</tr>
<tr>
<td>History of hyperlipidemia</td>
<td>136 (75.1)</td>
<td>50 (27.9)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>History of hypertension</td>
<td>92 (50.8)</td>
<td>83 (46.4)</td>
<td>0.40</td>
</tr>
<tr>
<td>Current smoking</td>
<td>52 (29.8)</td>
<td>18 (10.0)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>History of diabetes</td>
<td>29 (16.0)</td>
<td>16 (8.9)</td>
<td>0.04</td>
</tr>
<tr>
<td>History of unstable angina</td>
<td>121 (66.9)</td>
<td>107 (59.8)</td>
<td>0.16</td>
</tr>
<tr>
<td>History of stable angina</td>
<td>15 (8.3)</td>
<td>36 (20.1)</td>
<td>0.001</td>
</tr>
<tr>
<td>History of STEMI</td>
<td>54 (29.8)</td>
<td>4 (2.2)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>History of NSTEMI</td>
<td>3 (1.7)</td>
<td>2 (1.1)</td>
<td>0.67</td>
</tr>
<tr>
<td>Positive exercise test</td>
<td>13 (7.2)</td>
<td>29 (16.2)</td>
<td>0.008</td>
</tr>
<tr>
<td>Abnormal cardiac MRI</td>
<td>3 (1.7)</td>
<td>17 (9.5)</td>
<td>0.001</td>
</tr>
<tr>
<td>Left dominancy</td>
<td>10 (5.5)</td>
<td>9 (5.0)</td>
<td>0.83</td>
</tr>
<tr>
<td>History of CABG</td>
<td>9 (5.0)</td>
<td>5 (2.8)</td>
<td>0.29</td>
</tr>
<tr>
<td>LV ejection fraction &lt; 30%</td>
<td>9 (5.0)</td>
<td>2 (1.1)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Systolic blood pressure</td>
<td>153.39/28.89</td>
<td>154.08/27.14</td>
<td>0.82</td>
</tr>
<tr>
<td>Diastolic blood pressure</td>
<td>85.14/8.54</td>
<td>87.14/9.69</td>
<td>0.04</td>
</tr>
<tr>
<td>Fasting blood sugar</td>
<td>113.14/49.50</td>
<td>101.67/35.90</td>
<td>0.01</td>
</tr>
<tr>
<td>Total cholesterol</td>
<td>164.98/50.89</td>
<td>185.48/54.20</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>High density lipoprotein</td>
<td>45.30/9.64</td>
<td>47.87/10.50</td>
<td>0.02</td>
</tr>
<tr>
<td>Low density lipoprotein</td>
<td>85.23/42.39</td>
<td>105.72/47.38</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Very low density lipoprotein</td>
<td>34.76/20.03</td>
<td>33.23/17.91</td>
<td>0.44</td>
</tr>
<tr>
<td>Apolipoprotein-B</td>
<td>107.39/28.42</td>
<td>110.77/28.18</td>
<td>0.26</td>
</tr>
</tbody>
</table>

Results of the C2488T and P2712L polymorphisms as well as the genotype distribution and the allele frequency for Apo-B two polymorphisms are shown in Table 2. There were three genotypes of the two polymorphisms in CAD and non-CAD groups with no significant difference in the frequency of these genotypes across the two groups. The frequency of CC and CT genotypes of the C2488T polymorphism was significantly higher in men than women in CAD group. Also, the frequency of PP, PL, and LL genotypes of the P2712L polymorphism was higher in men than women with CAD (Table 3). In the CAD group, the CC genotype of the C2488T polymorphism was more frequent in the age range 60 to 70 years, whereas similar genotype was more prevalent in the control group with the age range 40 to 50 years. The frequency of the genotypes of CT and TT were similar in other age subgroups in the CAD and non-CAD groups (Figure 1). Regarding frequency of the genotypes of the P2712L polymorphism in different age subgroups (Figure 2), heterozygote genotype of PL was more appeared in higher age subgroups of CAD patients compared with non-CAD ones. Besides, homozygote genotypes of PP and LL were more appeared in younger cases in non-CAD group than the CAD group.

Table 2: The genotype distribution and the allele frequency for Apo-B two polymorphisms in CAD and non-CAD groups

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Case group (n = 181)</th>
<th>Control group (n = 179)</th>
<th>OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2488T polymorphism</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC</td>
<td>81 (45.0)</td>
<td>87 (48.3)</td>
<td>1.00</td>
<td>-</td>
</tr>
<tr>
<td>CT</td>
<td>80 (44.4)</td>
<td>67 (37.2)</td>
<td>1.16 (0.60 – 2.26)</td>
<td>0.65</td>
</tr>
<tr>
<td>TT</td>
<td>20 (10.6)</td>
<td>25 (14.5)</td>
<td>1.49 (0.76 – 2.92)</td>
<td>0.24</td>
</tr>
<tr>
<td>P2712L polymorphism</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td>65 (36.1)</td>
<td>68 (37.7)</td>
<td>1.00</td>
<td>-</td>
</tr>
<tr>
<td>PL</td>
<td>85 (47.2)</td>
<td>90 (50.0)</td>
<td>0.71 (0.38 – 1.32)</td>
<td>0.28</td>
</tr>
<tr>
<td>LL</td>
<td>30 (16.7)</td>
<td>22 (12.2)</td>
<td>0.70 (0.37 – 1.34)</td>
<td>0.28</td>
</tr>
</tbody>
</table>
Table 3: The frequency of genotypes of the C2488T and P2712L polymorphisms in men and women in CAD and non-CAD groups

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Case group (n = 181)</th>
<th>Control group (n = 179)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C2488T polymorphism</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Men</td>
<td>60 (74.1)</td>
<td>36 (41.4)</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>21 (25.9)</td>
<td>51 (58.6)</td>
<td></td>
</tr>
<tr>
<td>CT</td>
<td></td>
<td></td>
<td>0.019</td>
</tr>
<tr>
<td>Men</td>
<td>47 (58.8)</td>
<td>27 (40.3)</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>33 (41.3)</td>
<td>40 (59.7)</td>
<td></td>
</tr>
<tr>
<td>TT</td>
<td></td>
<td></td>
<td>0.165</td>
</tr>
<tr>
<td>Men</td>
<td>11 (55.0)</td>
<td>9 (36.0)</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>9 (45.0)</td>
<td>16 (64.0)</td>
<td></td>
</tr>
<tr>
<td><strong>P2712L polymorphism</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td></td>
<td></td>
<td>0.002</td>
</tr>
<tr>
<td>Men</td>
<td>26 (86.7)</td>
<td>10 (45.5)</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>4 (13.3)</td>
<td>12 (54.5)</td>
<td></td>
</tr>
<tr>
<td>PL</td>
<td></td>
<td></td>
<td>0.006</td>
</tr>
<tr>
<td>Men</td>
<td>55 (64.0)</td>
<td>39 (43.8)</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>31 (36.0)</td>
<td>50 (56.2)</td>
<td></td>
</tr>
<tr>
<td>LL</td>
<td></td>
<td></td>
<td>0.006</td>
</tr>
<tr>
<td>Men</td>
<td>37 (56.9)</td>
<td>23 (33.8)</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>28 (43.1)</td>
<td>45 (66.2)</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: The frequency of genotypes of the C2488T polymorphism in different age groups in CAD and non-CAD groups
Figure 2: The frequency of genotypes of the P2712L polymorphism in different age groups in CAD and non-CAD groups

As shown in Table 4, serum Apo-B level was not associated with the type of the genotypes of C2488T polymorphism in both CAD and non-CAD groups. However, serum Apo-B level was significantly related to the LL genotype of the P2712L polymorphism so that the patients with this genotype had frequently normal range of this genotype.

Table 4: The frequency of genotypes of the C2488T and P2712L polymorphisms according to serum Apo-B level in CAD and non-CAD groups

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Case group (n = 181)</th>
<th>Control group (n = 179)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2488T polymorphism</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apo-B ≤ 75</td>
<td>11 (13.6)</td>
<td>8 (9.2)</td>
<td>0.654</td>
</tr>
<tr>
<td>Apo-B: 76 – 150</td>
<td>64 (79.0)</td>
<td>74 (85.1)</td>
<td></td>
</tr>
<tr>
<td>Apo-B &gt; 150</td>
<td>6 (7.4)</td>
<td>5 (5.7)</td>
<td></td>
</tr>
<tr>
<td>CT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apo-B ≤ 75</td>
<td>7 (8.8)</td>
<td>9 (13.4)</td>
<td>0.689</td>
</tr>
<tr>
<td>Apo-B: 76 – 150</td>
<td>65 (81.3)</td>
<td>52 (77.6)</td>
<td></td>
</tr>
<tr>
<td>Apo-B &gt; 150</td>
<td>8 (10.0)</td>
<td>6 (9.0)</td>
<td></td>
</tr>
<tr>
<td>TT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apo-B ≤ 75</td>
<td>3 (15.0)</td>
<td>1 (4.0)</td>
<td>0.299</td>
</tr>
<tr>
<td>Apo-B: 76 – 150</td>
<td>16 (80.0)</td>
<td>20 (80.0)</td>
<td></td>
</tr>
<tr>
<td>Apo-B &gt; 150</td>
<td>1 (5.0)</td>
<td>4 (16.0)</td>
<td></td>
</tr>
<tr>
<td>P2712L polymorphism</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apo-B ≤ 75</td>
<td>7 (23.3)</td>
<td>1 (4.5)</td>
<td>0.047</td>
</tr>
<tr>
<td>Apo-B: 76 – 150</td>
<td>22 (73.3)</td>
<td>17 (77.0)</td>
<td></td>
</tr>
<tr>
<td>Apo-B &gt; 150</td>
<td>1 (3.3)</td>
<td>4 (18.2)</td>
<td></td>
</tr>
<tr>
<td>PL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apo-B ≤ 75</td>
<td>10 (11.6)</td>
<td>6 (6.7)</td>
<td>0.227</td>
</tr>
<tr>
<td>Apo-B: 76 – 150</td>
<td>68 (79.1)</td>
<td>79 (88.8)</td>
<td></td>
</tr>
<tr>
<td>Apo-B &gt; 150</td>
<td>8 (9.3)</td>
<td>4 (4.5)</td>
<td>0.197</td>
</tr>
<tr>
<td>LL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4: The frequency of genotypes of the C2488T and P2712L polymorphisms according to serum Apo-B level in CAD and non-CAD groups - continued

<table>
<thead>
<tr>
<th>Apo-B</th>
<th>CAD (n, %)</th>
<th>Non-CAD (n, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 75</td>
<td>4 (6.2)</td>
<td>11 (16.2)</td>
</tr>
<tr>
<td>76 – 150</td>
<td>55 (84.6)</td>
<td>50 (73.5)</td>
</tr>
<tr>
<td>&gt; 150</td>
<td>6 (9.2)</td>
<td>7 (10.3)</td>
</tr>
</tbody>
</table>

Multivariable logistic regression analysis (Table 5) showed that among all baseline variables, male gender, advanced age, higher level of Apo-B, and lower diastolic blood pressure could predict appearance of coronary atherosclerosis. However, the types of the genotypes of both C2488T and P2712L polymorphisms could not predict coronary artery disease. Also, stepwise logistic regression model showed significant relationships of male gender, advanced age, higher level of Apo-B, and lower diastolic blood pressure with both studied polymorphisms.

Table 5: Main determinants of CAD in a multivariable regression model

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2488T polymorphism (CT vs. CC)</td>
<td>1.65 (0.97 – 2.81)</td>
<td>0.60</td>
</tr>
<tr>
<td>C2488T polymorphism (TT vs. CC)</td>
<td>1.26 (0.56 – 2.82)</td>
<td>0.57</td>
</tr>
<tr>
<td>P2712L polymorphism (PL vs. PP)</td>
<td>0.72 (0.35 – 1.48)</td>
<td>0.37</td>
</tr>
<tr>
<td>P2712L polymorphism (LL vs. PP)</td>
<td>0.78 (0.36 – 1.70)</td>
<td>0.53</td>
</tr>
<tr>
<td>Age</td>
<td>1.06 (1.03 – 1.09)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Female vs. male</td>
<td>0.39 (0.24 – 0.65)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Apolipoprotein-B</td>
<td>1.02 (1.01 – 1.04)</td>
<td>0.007</td>
</tr>
<tr>
<td>Body mass index</td>
<td>1.00 (0.95 – 1.06)</td>
<td>0.95</td>
</tr>
<tr>
<td>Triglyceride</td>
<td>0.97 (0.86 – 1.09)</td>
<td>0.60</td>
</tr>
<tr>
<td>Total cholesterol</td>
<td>0.99 (0.96 – 1.02)</td>
<td>0.47</td>
</tr>
<tr>
<td>High density lipoprotein</td>
<td>1.00 (0.96 – 1.04)</td>
<td>0.92</td>
</tr>
<tr>
<td>Low density lipoprotein</td>
<td>0.99 (0.96 – 1.04)</td>
<td>0.60</td>
</tr>
<tr>
<td>Very low density lipoprotein</td>
<td>1.12 (0.66 – 2.13)</td>
<td>0.57</td>
</tr>
<tr>
<td>Systolic blood pressure</td>
<td>1.01 (0.99 – 1.02)</td>
<td>0.26</td>
</tr>
<tr>
<td>Diastolic blood pressure</td>
<td>0.96 (0.93 – 0.99)</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Discussion

The studies considered polymorphisms of the Apo-B as risk factors for CAD have reported discordant results. The aim of the present study was to search for the role of two Apo-B C2488T and P2712L polymorphisms in CAD patients diagnosed by angiography. In our observation, although frequency of the alleles to these polymorphisms were influenced by sex and age variables, no significant associations were revealed between the appearance of CAD and gene polymorphisms adjusted for baseline parameters. Also, except for LL genotype of the P2712L polymorphism that was associated with the serum level of Apo-B, serum Apo-B level was not associated with other types of the Apo-B gene-related genotypes. On the other hand, it seems that in the Iranian population, the studied the Apo-B polymorphisms appear not to be involved in the appearance and extension of CAD.

A number of Apo-B polymorphisms have been found to be associated with serum lipoprotein levels in many children and adult populations [22-25]. In fact, genetic polymorphisms at the Apo-B have been associated with elevated plasma concentrations of LDL cholesterol, and thus it has been hypothesized to be also associated with atherosclerosis and increased risk for CAD [26]. Hu and his colleagues showed that Apo-B XbaI and EcoRI restriction sites might serve as potential genetic markers affecting body mass index, serum protein and lipid profiles, and therefore, modification of living habits and diet was recommended [27]. Liu et al. observed that an allele in G12669A polymorphism might be one of the genetic factors influencing the susceptibility to atherosclerotic events in the individuals with a positive family history, and it might play its role through its influence...
on the blood lipid levels [28]. Meanwhile, although we could not confirm the role of two Apo-B C2488T and P2712L polymorphisms in CAD severity in our population, variations at the Apo-B gene locus had been associated with the development of atherosclerosis among other populations, but the data also suggested that this might act through mechanisms not directly related to effects on measured lipid traits [29].

Apo-B is a component of all atherogenic or potentially atherogenic particles, including very-low-density lipoprotein (VLDL), intermediate-density lipoprotein (IDL), LDL, and lipoprotein(a) [Lp(a)], and each particle contains 1 molecule of Apo-B. Therefore, Apo-B provides a direct measure of the number of atherogenic lipoprotein particles in the circulation [30]. Apo-B collectively has three major functions that are involved in modulating the activity of enzymes that act on lipoproteins, maintaining the structural integrity of the lipoprotein complex, and facilitating the uptake of lipoprotein by acting as ligands for specific cell-surface receptors [31,32]. These functions can be potentially influenced by other conditions such as Apo-B polymorphic sites, the incidence and rarity of the allelic variants of Apo-B polymorphism, and the occurrence of CAD in target population [20].

Acknowledgement
This study was supported by the Zanjan University of Medical Sciences. We thank the University authorities who offered critical administrative support and managerial services.

References


Prioritizing the Client trust Factors in Electronic Banking with Analytic Hierarchy Process

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Abstract

This study is aimed to prioritize the trust factors among electronic banking clients of Bank.(parsian bank) Accordingly after analyzing and reviewing the literature and interviews with experts of electronic banking and academicians, the factors of client trust and each of the sub-parameters has being determined which includes; individual factors, banking factors and infrastructural factors. The sample populations consist of 25 experts (academicians, managers and bank officers, clients of electronic banking). The data was simultaneously collected through conducting interviews and questionnaire and the data was analyzed using analytic hierarchy process (AHP) and Expert Choice software and Microsoft excel. The research findings indicate that the attitudinal factors, telecommunication infrastructure and cultural factors were the most influential factors accordingly and the customer orientation and ease of access were the least influential factors in spite of their influence on client trust.

Keywords: Electronic Banking, Trust, Features of Trust, Analytic Hierarchy Process.

Introduction

Nowadays there is no doubt regarding the importance of easy communication, without geographical and physical limitations. In electronic banking the need for analyzing the information technology aspects and parameters affecting trust of electronic banking clients are emphasized by all experts in, because in the absence of client trust providing these services will face failure. Therefore banks have to identify all the parameters of this field in order to win their customers’ trust particularly the customers who use the electronic banking services. In this regard there are multiple factors which play role, since
in cyberspace the communications are of indirect type people have less trust in electronic banking because there are some ambiguities [2]. Consequently security and trust are always argued as the most important factors for success of electronic banking.

Electronic banking is a new method of banking which provide services in cyberspace. According to the previous studies the key factors in accepting the electronic banking are trust and customer satisfaction toward the bank which indirectly affects the electronic banking. Electronic Banking has different aspects, which affect differently the success or failure of electronic Banking. Reviewing the background of the study reveals that the previous related researches conducted have focused more on the aspects related to development of electronic system in Iran from operational concepts perspective and theoretical discussions have been neglected. Therefore in the present study we attempt to focus more deeply on theoretical areas of electronic banking. Barriers in gaining the client trust (e.g. Parsian Bank) which is the fundamental component of developing electronic banking system.

Research Objectives are as follows:

1. Defining the effect of individual variables on client trust in electronic banking in Parsian Bank.
2. Defining the effect of banking variables on client trust in electronic Banking in Parsian Bank.
4. In order to prioritize client trust variables for electronic Banking Customers of Parsian Bank.

Literature Review

The Concept of trust dates bank to the history of human life and beginning of interpersonal Social interactions. Almost every aspects of an individual’s life are based on trust. In Oxford dictionary trust is defined as a belief in the character, or truth of individual or thing [3]. Some definitions of trust are:

Mayer defines trust as the willingness of a party (the trustor) to be vulnerable to the actions of another party (the trustee) based on the expectation that the trustee intends and is able to perform in ways that will not harm the trustor in a particular situation, irrespective of the trustor’s ability to control the trustee’s behavior[7]. Rousseau defines trust as a psychological State Comprising the intention to accept Vulnerability based upon positive expectations of the intention or behavior of another [9].

Urban defines trust as belief in online Sellers and accepting the probable losses along with feeling of Security [12].

Shanker define trust as belief in somebody who acts in order to satisfy our demands [11]. In previous researches conducted the competence, benevolence, predictability and honesty are four principal features of trust, in other word, trust in somebody requires the four following characteristics [2].

- Competency is a cluster of related abilities, commitments, knowledge and skills that enable a person (or an organization) to act effectively in a job or situation. In other word we call a person is competent when we believe he/ she is capable of performing the assigned tasks and providing the expected service.
- Benevolence is a belief which express the seller desires to do good to customers and he does not act only for the profit and his self-interest.
- Predictability is belief in behavioral stability of the other party.
- Honesty expresses the fact that the person believes that the trustee act sincerely and adhere a set of principles and standards in their behavior [14].

Urban (2002) has investigated the trust based on a multidimensional attitude in e-Commerce. In his research he believes that, competency, benevolence and honesty as a prerequisite for creating trust in e-Commerce.

Ang et al. (2001) has presented three influential principles for increasing the perception of trust in Internet [1].
1. The ability of the seller to deliver the good or service as it is promised.
2. The tendency of e-seller to rectify his action when the transaction is not Satisfactory for the customer.
3. Existence of customer privacy strategies and stating the same in the web site.

Lee and Turban (2002) states the four elements which have influence on the trust of the customers in e-purchases [6]. Trustworthiness of e-seller.
1. Reliability of Internet as a medium in e-purchases.
2. Infrastructural elements such as approval of other companies.
3. Other factors like the size of the company.

Hemphill emphasized the necessity of legalizing and adoption of civil solutions for creating trust in electronic customers. He proposes the following items as a principal of creating trust among e-customers: [5].
1. Setting guidelines and policies by seller regarding non-disclosure of customers’ personal information.
2. Providing the customers the right to choose how their personal information will be used by the seller.
3. Allowing customers to access and view their personal data.

Egger (2003) has proposed the model of trust in e-commerce, in order to gain an understanding of effective factors in assessing the level of seller trustworthiness in e-purchase [4]. He categorized these factors in seven sub-components which are:
1. Transference can be defined as creating trust for customers regarding specific website via a third party.
2. Reputation refers to the strength of a trade mark.
3. Familiarity refers to ease of access and using a website.
4. View refers to the layout and design of a website.
5. Risk refers to the risks pertaining in e-payment and the after sales service offered to the customer.
6. Cooperation refers to the level of communication and interaction between consumer and the company.
7. Transparency refers how the company treats and uses the customers’ information.

**Materials and Conceptual model**
We used the following conceptual model in the present study

*Figure 1: Conceptual Model of the study*
This Model includes the following aspect:

- **Individual Variable** - These variables study the factors of gaining client trust from the customers' point of view and address whatever characteristics which lead to clients trust toward the electronic banking.
- **Banking variables** - These variables analyze the factors of gaining client trust from the bank perspective and emphasize those banking features which lead to customers trust toward the electronic banking.
- **Infrastructural variables**: These variables investigates the factors of gaining client trust from e-banking macro and infrastructural perspective, in other word, it addresses the almost all essential factors which lead to development and growth of e-banking system.

| Individual Variables [14] | Personality: It refers to all factors related to individuals’ personality such as risk taking level, familiarity with cyber space and lack of time for the mental, and career preoccupations [3]. |
| Bank Website | Attitudinal: It refers to the attitude of customers toward using e-services such as no preference of using traditional tools instead of e-tools and his past experiences [14]. |
| | Skill: It refers to the level of customer’s familiarity with e-commerce and his satisfaction derived from past experiences in this regard [15]. |
| Banking Variables [15] | Security system: It refers to the various technologies provided in order to create, establish and protect customers trust in e-banking, such as cryptography, seal & signature verification [14]. |
| | Error free system: Customers expect error free website such as incorrect information, wrong processing, disconnections of services, therefore if the website errors are few the level of customer satisfaction would increase. |
| | Professionalism: This aspect of the model of Wang & Emuriam refers to the design factors and graphic interface which customers initially encounter. |
| | User friendliness: It refers to the existence of appropriate helps and guidance in the website [4]. |
| | Customer oriented: It refers to existence of appropriate guidelines for customers when using the website [10]. |
| | Assurance: It refers to providing & presenting the approvals obtained from credit agencies in their agencies and the possibility of transactions monitoring by customers [14]. |
| | Ease of access: It refers to convenience of using the Website [4]. |
| Bank Performance | Competency & Reputation: It refers to belief in abilities, skills, and banking expertise in e-banking [4]. |
| | Creativity & Innovation: It refers to innovative aspects, updated services and employing modern technologies by bank to facilitate the customers banking services [6]. |
| | Predictability: It refers to the level of banks stability in providing and offering e-services [11]. |
| Infrastructural Variables [6] | Telecommunication: It refers to banks telecommunication structure which provides terminal equipment connections. Regarding the technical and telecommunication infrastructures, most of the bank branches possess ports and bank connects to central bank via different methods (Dialup, satellite etc.) |
| | Legal: Hemphill’s study emphasizes on the existence of appropriate legal infrastructures and framework in e-banking cyber space[5]. |
| | Financial: It refers to supply of financial resources for financing investments in telecommunication, expenditure related to development of satellite–computer networks and costs related to access to web and updating the networks [10]. |
| | Cultural: It refers whether the e-banking possess an appropriate place between people, bank and government, such as familiarity of managers and government officials to e-banking issues, and the high digital literacy level of society and the appropriate supports of private banks as the main agents of development of e-banking in Iran. |

Based on the Research Conceptual model, the following questions are proposed:

1. To what extent the individual variables influence the level of e-client trust of Parsian Bank?
2. To what extent the Banking variables influence the level of e-client trust of Parsian Bank?
3. To what extent the infrastructural variables influence the level of e-client trust of Parsian Bank?
4. How is the prioritizing of the trust variables of e-customers of Parsian Bank?
5. The current study is of qualitative type and the data collection is done through conducting survey. The sample size is 25 which consist of university teachers, managers and e-banking experts in different branches of Parsian Bank. And also the customers who use the bank’s e-services in Tehran. The data collected and analyzed using Analytic Hierarchy Process (AHP), Expert Choice and Microsoft Excel Software. The questionnaire items adopted from three articles and customized according to social environment and in this regard we used the reverse translation method. In the present paper some indices used in the questionnaire for assessing trust variables which include: Attitude, Cooperation and Transparency.

Materials and Methodology

In order to analysis the data, the first step is to calculate the compatibility rate of all paired comparison matrices in AHP, because if in a decision making case the number of decision makers (Experts) are more than one, in order to consider the opinion of all participants, we should use group AHP [10]. In this case we can use the geometric mean for the elements of comparison matrices, \[ a_{ij}^{\left( \prod_{k=1}^{i} a_{jj}^{1/k} \right)} \] and the opinion of decision makers will be imported in group calculation when the compatibility rate of each opinion is not below 0.1. CR ≤ 0.10 in this study all of the figures are below 0.1. (In the following tables the calculations are presented) otherwise in order to obtain and acceptable compatibility we should revise the table of comparisons. Saaty illustrated that the compatibility index for group comparisons is defined according to the following formula:

\[
\text{Figure 2:}
\]

<table>
<thead>
<tr>
<th>Factors Matrices</th>
<th>N</th>
<th>(\lambda_{\text{max}})</th>
<th>CI</th>
<th>RI</th>
<th>CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Variables</td>
<td>3</td>
<td>3.0000008</td>
<td>0.000000</td>
<td>0.58</td>
<td>0.00000</td>
</tr>
<tr>
<td>Individual Variables</td>
<td>3</td>
<td>3.007838</td>
<td>0.002613</td>
<td>0.58</td>
<td>0.004505</td>
</tr>
<tr>
<td>Banking Variables</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Website related Variables</td>
<td>7</td>
<td>7.2755</td>
<td>0.0394</td>
<td>1.3200</td>
<td>0.0298</td>
</tr>
<tr>
<td>Bank performance related Variables</td>
<td>3</td>
<td>3.0003</td>
<td>0.0001</td>
<td>0.5800</td>
<td>0.0001</td>
</tr>
<tr>
<td>Bank performance related Variables</td>
<td>4</td>
<td>4.0070</td>
<td>0.0017</td>
<td>0.9000</td>
<td>0.0019</td>
</tr>
</tbody>
</table>

Findings & Result

Regarding the fact that in AHP, first paired comparisons should be calculated, therefore in this study the findings of paired comparison of trust variable indices are presented in the following table:

1. Individual Variable

As it is shown in the figure3 table, in Individual variable the attitudinal factor is 1st priority, personality factor is the second priority and the skills factor places as the last priority.

\[
\text{Figure 3:}
\]

<table>
<thead>
<tr>
<th>Priorities</th>
<th>(1^{\text{st}}) Priority</th>
<th>(2^{\text{nd}}) priority</th>
<th>(3^{\text{rd}}) priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Attitudinal</td>
<td>Personality</td>
<td>Skills</td>
</tr>
<tr>
<td>Weight</td>
<td>0.362</td>
<td>0.343</td>
<td>0.296</td>
</tr>
</tbody>
</table>
2. Banking Variable

Is containing 2 parts: performance and website.

2.1. (Performance)

Figure 4:

<table>
<thead>
<tr>
<th>Priorities</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; priority</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; priority</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; priority</th>
<th>4&lt;sup&gt;th&lt;/sup&gt; priority</th>
<th>5&lt;sup&gt;th&lt;/sup&gt; priority</th>
<th>6&lt;sup&gt;th&lt;/sup&gt; priority</th>
<th>7&lt;sup&gt;th&lt;/sup&gt; priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>Security system</td>
<td>Error free</td>
<td>Professionalism</td>
<td>Ease of access</td>
<td>User friendly</td>
<td>Assurance</td>
<td>Customer oriented</td>
</tr>
<tr>
<td>Weight</td>
<td>0.271</td>
<td>0.247</td>
<td>0.101</td>
<td>0.0969</td>
<td>0.0963</td>
<td>0.0967</td>
<td>0.08973</td>
</tr>
</tbody>
</table>

2.2. (Website)

Figure 5:

<table>
<thead>
<tr>
<th>Priorities</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; priority</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; priority</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>Competency &amp; reputation</td>
<td>Creativity &amp; Innovation</td>
<td>predictability</td>
</tr>
<tr>
<td>Weight</td>
<td>0.433</td>
<td>0.365</td>
<td>0.202</td>
</tr>
</tbody>
</table>

Aggregate results of paired comparison of banking factors:

Figure 6:

<table>
<thead>
<tr>
<th>Priorities</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; priority</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>Bank Performance</td>
<td>Website</td>
</tr>
<tr>
<td>Weight</td>
<td>0.6197</td>
<td>0.3803</td>
</tr>
</tbody>
</table>

The results derived from paired comparisons of banking factors show that e-customers signify the bank’s website more important than bank performance.

3. Infrastructural variable

Figure 7:

<table>
<thead>
<tr>
<th>Priorities</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; priority</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; priority</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; priority</th>
<th>4&lt;sup&gt;th&lt;/sup&gt; priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>Telecommunication</td>
<td>Cultural</td>
<td>Financial</td>
<td>Legal</td>
</tr>
<tr>
<td>Weight</td>
<td>0.2993</td>
<td>0.2901</td>
<td>0.2381</td>
<td>0.1726</td>
</tr>
</tbody>
</table>

The findings of the study indicate that the factor of telecommunication infrastructure is the first priority, the factor of culture is the second priority and the factor of finance is the third priority and the legal factor is the last priority.

Figure 8:

<table>
<thead>
<tr>
<th>Priorities</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; priority</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; priority</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>Banking</td>
<td>Infrastructural</td>
<td>Individual</td>
</tr>
<tr>
<td>Weight</td>
<td>0.380</td>
<td>0.355</td>
<td>0.265</td>
</tr>
</tbody>
</table>

The final results (above table) indicate that in the intended aspects the Banking, infrastructure and individual factors placed in the first to third priority respectively.
After completing the stages of analytic hierarchy method and calculating the geometric mean, first we normalize the group AHP matrix and determine the total weight vector matrix, and then we calculate the priority and compatibility rate of each one of paired comparison matrices listed in the questionnaire and finally we calculated the overall significance of the factors.

**Managerial Discussion**

As you can see on above figure (9) finding indicate that the Individual factor influenced the e-customers trust for 26%, the Banking factor for 38% and infrastructure factor influenced the e-customers trust in Persian Bank for 35%. As it is presented the Banking factor gained 0.38, possess the highest position (priority) among the main factors. Totally, indices of the aspects which we analyzed the attitude factor (0.36), telecommunication infrastructure and cultural factor (0.29) possess the highest influence and the factors of customer-orientation (0.08) and case of access, assurance and user friendly (0.09) place in the lowest positions.

**References**


Prioritizing the Client trust Factors in Electronic Banking with Analytic Hierarchy Process


Introduction of Two Newfound KS1732-KS1735 Paleolithic Sites in East of Dez River, Dezful, Iran

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Abstract

Iran is among the countries which has a diverse climate. Khuzestan is one of Southern provinces of Iran chosen for accommodation throughout history for various reasons. Zagros Mountains in North, Karun Delta in South, Shoushan plain in West as well as having three river of Dez, Karkheh and Karunhave made this province unique. Our knowledge about Paleolithic period in this province is very limited. The studies conducted in the eastern coast of Dez river, reveals new areas of settlement of Paleolithic societies. Identifying and introducing this area has considered of great importance. There are plenty of food and stone sources near Dez River which have made it a suitable place for people of Paleolithic period.

Keywords: Paleolithic, identification and study, Khuzestan, Dez, Zagros and Dezful

Introduction

If we look at a relief map of Iran, we will realize that Iran has mountainous and plateaus nature. There are differences between the northern and western mountains. Northern mountains, like strands ring have almost no incision, But the most striking feature of the Zagros Mountains is that they are Folded and thready. This mountain range is elongated from the North West to the southeast. Zagros Mountains with about 1800 km length and 250 km width, begin from North West of Iran and continue to near Bandar Abbas and Kerman. Iran is lack of plains and coastal lowlands. The only exception is Karun Delta (Malek Shahmirzadi, 2003).Khuzestan province is one of the most fertilelands in southwest of Iran. Many surveys and excavations carried out in the last century in Khuzestan But it was a very small contribution to identify and introduce Paleolithic sites. In 1976, Professor Wright examined several places of Paleolithic period in the north of Khuzestan (Izeh town)(smith,1986).Generally, the first attempt to explore the Paleolithic cultures in Zagros took more than half a century ago. Since then, other activities of the various archaeological survey or excavation were carried out but it can't be said that they were enough. The most important and most widely accepted conclusion that was obtained from the first excavations of the Zagros(e.g. excavation of Bisotoun by kone) was this that in the Zagros Mountains there are tools called "Mousterian", probably belongs to the Middle Paleolithic period. In the first decades of excavation in the Zagros Mountains of Iran and the Sulky excavations in
Introduction of Two Newfound KS1732-KS1735 Paleolithic Sites in East of Dez River, Dezful, Iran

Iraq, it became clear that These tools date back to probably 50 to 80 thousand years ago (Sharifi, 2006). From the study of Human and animal communities at the present era we conclude that Mousterian areas of Zagros were used by human groups in summer and in other seasons they may move to more inferior places (Lindly, 1997). Investigation and identification of the found artifacts in Coast of Karkheh River in 2008 and Investigation of the eastern bank of the Dez River in 2009 showed new evidence from Paleolithic human presence in the Khuzestan. In this paper we introduce two sites (KS1732-35) of several sites found in east Coast of Dez River.

Study Area
Dezful is one of the cities of Khuzestan province which is limited from the north to Lorestan province, from North and North West to the city of Andimeshk, from North East to the cities of Masjed Soleiman and Shoushtar and from the south and southwest to the city of Shush. Dezful is 147 meters above sea level and its highest point is 3605 meters on the mountain of Key Nava (Mohammadpour, 2004). Dez catchment area is 17140 sq. km and is drained by two rivers join together in folded central part. These two rivers are Bakhtiari water sometimes called Zalaki and Dezkeh water on mountainous area known as Caesar. DezRiver comes from a metamorphic thrust which located in North West of Broujerd plain and Imbricate highlands are located in the South East of it. Dez or Caesar River is created by the confluence of the two rivers of Tireh and Marbreh and after passing the south of Lorestan, it enters Dezful holes (Dostali, 2005). Two KS1732 and 35 sites are located in 10 km north of the city of Dezful in Dez Dam Lake Road (Shehyoun region). Height of These area from sea surface is between 175 to 235 meters and the area of each site is less than half a hectare.

Objective
Evidence of Pleistocene climate changes have been identified in the late nineteenth but so far sequences have not been designed coherently for ancient climates. Hence, the past climate of the Zagros region, especially in pre-Holocene times, is unclear and complex. Among the studies in this regard, sedimentology researches are conducted on bottom sediments of Zarivar and Mirabad Lakes in Zagros area. The subject of these researches was about restoration of vegetation in recent 42000 years. Also reviews of Pleistocene climate reconstruction based on deposits of Shenidar cave, states that Human settlement in this area began before the start of local glaciers around the cave and has ended
before peak glacial period. Wright has determined peak glacier for Zagros about 20,000 years ago (Vahidi Alvar, 2009). Before our study, no investigation had conducted for identification of Paleolithic sites in eastern shore of Dez river. On the other hand based on morphology of land as well as river stone resources, all evidences showed human group settlement in this region. Plane Failure and earth crust slippage in west of Iran, Undoubtedly had a profound influence on human habitats. This phenomenon is known as effective factors in the ground and underground water resources. (Hole, 2002) But all these theories will come true when we deal with identification of area. We started surveying the desired area. After a few days we encountered physical evidences that would confirm our theory. This led us to expand the scope of our investigation. Then we discovered several Paleolithic sites (open site) in our area.

The Found Artefacts in the Area (KS1732 -1735)
In the eastern shore of Dez river, we were identified four sites of Paleolithic period And we named them KS1732, 33, 34, and 35. KS1732 and 33 sites are located in two miles to the south, lower than KS1734-35 sites. After examining and networking desired area, we removed found artifacts. In KS1732; Approximately 104 pieces of stone artifacts and in KS1735, another 8 ones were removed. In initial studies based on comparisons with neighboring areas in the Zagros, Most of the artifacts are placed in cores, flakes, and Scrapers groups. The found artifacts are possibly related to the Middle Paleolithic period which Most of them in terms of made stone, are placed in chert rocks Group. In this area, the most widely used method is direct Percussion with a stone hammer, because using methods such as Indirect Percussion and Pressure techniques is Related to the more recent periods that is not seen here. Also in this area, in addition to Mousterian industry, Levallois technique is used but the majority of found stone removals is resulted from a simple Flaking.
Introduction of Two Newfound KS1732-KS1735 Paleolithic Sites in East of Dez River, Dezful, Iran
Conclusion
Today, Identification of Paleolithic sites is one of the main priorities for the archaeologists in Iran because our information about this period in Iran is very low compared to other periods. In the past, most attention of archaeologists in Iran was to the historical and Prehistorical sites (until Neolithic period). Now we need extensive review to identify Paleolithic sites in Iran to identify Settlement patterns and human lifestyles of these communities completely. These newfound sites are extremely important. In investigations of northern parts of Zagros (Lorestan, Kermanshah, and Kurdistan) and south of it (Shiraz), several sites have been identified; however, our knowledge about Central Zagros (Dezful Embayment) remains unknown. Hence newfound sites in eastern coast of Dez river, will introduce a new deployment patterns which probably are related to Human groups chosen this area in the middle Paleolithic period for their temporary Settlement. Next days we hope to gain more information. Currently we engaged in the study and analysis of newfound artifacts.

Acknowledgment
thanks to Dr. Fereydoun Biglari and Dr. Mojhgan Jayez for their useful helps and also special thanks to Mr. Hadi Mehranpour and Ms. Masoumeh Zeinizadeh.

Reference

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Abstract

In this investigation, accordance to importance of relation between risk and return, affection of liquidity risk and risk affective factors that involved market risk or systematic risk, size, and relation between book to equity and also free float on cross-sectional returns, have been considered due to FARM model (Float-Adjusted Return Model). To this direction, 108 companies among statistical society that necessary information for 4 years periods to research (2009-2012) about them were accessible, had chosen. By means of hypothesis test, simple and multiple regression (step by step) techniques were used. Exams of significance models has accomplished by use of T and F statistic. Results show that market risk, size and free float have meaningful relation by return, but relation between book-to-market equity with return doesn’t have any meaning. Liquidity risk, despite having correlation with return couldn’t accomplish with the model because of its low significance. Also, researches show that relation between systematic risk and liquidity risk is significant.

Keywords: Float-Adjusted Return Model, Liquidity Risk, Size, Free Float, Systematic Risk.

1. Introduction

One of the essential subjects in investment is the asset assessment. The inherent value of each asset is the current value of next liquid asset and both the appearance time and discount rate are considered. The discount rate or the return expected from each asset indicates the return lost under the equal risk conditions due to the gained asset. One of the effective factors on the assets liquidity is their liquidity
potential. The role of liquidity factor is important in the assets valuation because the investors consider if there is any appropriate market to sell their assets.

The evidence shows that the liquidity factor plays an important role in taking decisions, but notwithstanding many studies done in this field by the researchers there is no harmonization in selecting an acceptable criterion for the market liquidity (Zhang et al., 2007). When the market develops newer devices are defined to fulfill the investors; needs. The investors accept the asset with higher risk when they lead to higher returns so one of the factors effective on the asset risk is the liquidity potential. When the liquidity is lower it is less attractive. Recent studies have focused on the investors’ attitude to the liquidity and tried to find if such liquidity indicates the systematic risk factor and tried to find the best definition for liquidity.

In this regard Amihud has defined the illiquidity as the ratio of absolute value of daily shares return to the transaction amount of the share on the same day. Another case under consideration recently company float shares. The free float shares is the percent of the company shares to be available for the investors in the shares market and is transactional without any limitation (Amihud, 2002). Weil (2006) defines the free float share as a share of the capital available for sale in the market and uses it as a liquidity criterion (Zhang et al., 2007). The return model modified by FARM (Float-Adjusted Return Model) states that the liquidity risk is appropriate to reverse float shares in the equation (Zhang et al., 2007).

The current study is to test if the liquidity risk is the only factor in the FARM proposed by Weil (2006) to valuate the shares of Tehran stock exchange companies for 2007-2011 and considers the risk factors (Systematic factors, company size, BV to shares market value) and the float shares vastly used in valuating assets to justify cross returns, too.

Nest section reviews the study literature and history. Third section proposes the hypothesis. The fourth one describes the model and sampling method. The fifth one indicates the study findings. The sixth one is the conclusion and finally the seventh one shows the limits of the study.

2. Literature Review
The studies under title of ‘Illiquidity Risk’ or sometimes ‘Liquidity Risk’ began in the middle of 1980. Notwithstanding deep roots the subject is considered as a new study field in fiscal management. However, many people have studied this aspect of fiscal asset risk especially in shares market in this short time. Primary results from the studies have been very different in the field. In some cases a very strong and positive relation was seen between the return rate and illiquidity while in some other cases no special relation was proved. Some others believe there is the relation in January (Marcello and Quiros, 2006).

Fangjian Fu (2009) show that idiosyncratic volatilities are time-varying and thus, their findings should not be used to imply the relation between idiosyncratic risk and expected return. Using the exponential GARCH models to estimate expected idiosyncratic volatilities, he find a significantly positive relation between the estimated conditional idiosyncratic volatilities and expected returns.

Geert et al (2007) find that it significantly predicts future returns, whereas alternative measures such as turnover do not. Consistent with liquidity being a priced factor, unexpected liquidity shocks are positively correlated with contemporaneous return shocks and negatively correlated with shocks to the dividend yield. They consider a simple asset-pricing model with liquidity and the market portfolio as risk factors and transaction costs that are proportional to liquidity. They results suggest that local market liquidity is an important driver of expected returns in emerging markets, and that the liberalization process has not fully eliminated its Impact.

Sadka (2009) results show that funds that significantly load on liquidity risk sub-sequentially outperform low-loading funds by about 6% annually, on average, over the period 1994.2008, while negative performance is observed during liquidity crises. The returns are independent of the liquidity a fund provides to its investors as measured by lockup and redemption notice periods, and are also robust
to commonly used hedge-fund factors, none of which carries a significant premium during the sample period. These findings highlight the importance of understanding systematic liquidity variations in the evaluation of hedge-fund performance.

Amihud (2002) stated that the expected illiquidity of market has positive relation with expected return surplus of shares. In his study he proved that some of the expected surplus may be justified by only illiquidity. He used the ratio of the absolute value of shares return to the transactions amount in dollar as the criterion for illiquidity in his study. He proved that the illiquidity has more effect on only the shares of small companies. Fama and French (1993) believe that the company size as the liquidity index has negative and significant effect on the companies return. They stated that the companies with High (Low) book to market value generally are very weak (Strong).

Longstaff (2005) showed that many assets have the few liquidity features and it is not always possible to study them immediately. In his study he examined the role of liquidity factor in valuating assets. In the shares market some assets have high liquidity, but some others are transacted in relative long periods. Illiquidity has very considerable effect on optimum portfolio decision. He stated that the value of an asset with high liquidity is 25 percent more than an illiquid asset. Marshal and Young (2003) have examined the relation between liquidity and shares return. The liquidity criteria used in their study is the gap between the price proposed for purchase and sale and flow fee. They used the factors: market return and company size in their model. They concluded that the company size factor has negative effect on the shares return.

Acharya and Pedersen (2005) stated a model to valuate the capital assets and examined the relation between the return expected from market and liquidity expected from a share. They believe a share with low liquidity has low effect on the share return and at the same time, high effect on the return foreseeable from the share later. Also if the shares with current low return but high foreseeable return have stable liquidity.

Datar and Radkliffe (1998) used the circular ratio proposed by Amihud in 1986 as the index for liquidity. They found the liquidity has significant role in justifying the cross changes of the shares return. They used the control factors such as company size, the ratio of book value to market value and market return as the liquidity factors.

Omri et al. (2004) examined the liquidity effect on the shares return in Tunisia shares market through cross regression and by monthly data in 1998–2003. They stated there is a negative relation between liquidity and shares return. Baker and Stein (2003) presented a model to justify the liquidity increase during the gap decrease between proposed purchase and sale price or price effect decrease on the exchanges or circular fee increase. Their results indicate their general criterion has high correlation with the shares return.

Chan and Faff (2003) examined assets liquidity effect in Australia market be using the shares circular fee criterion in valuating assets as cross section. In their study they used monthly data and control factors such as the ratio of book value to market and company size and market return surplus.

Bortolloti (2006) showed that the shares distribution is considered as the main liquidity source of shares market to privatizing companies in 19 developed countries and when the companies are privatized the shares liquidity increases.

Piqueira (2005) believes the transactional activities may justify the expected return changes as cross section. The evidences of the study indicate there is relation between the illiquidity cost and company size. Also the effect of the shares of bog companies with high liquidity on the transactions size is high. In his study he introduced the transactional activities as the only liquidity index. Marshal and Young (2006) examined the relation between normal shares return in Australia market and factors such as beta risk and company size and the price proposed for purchase and sale, circular fee and the illiquidity rate of payment and results showed that among different criteria of illiquidity the rate proposed by Amihud justifies the shares return surplus better.

Marcello and Quiros (2006) examined the illiquidity risk factor in Spain shares market in 1994–2002. In their study they used the size control factors and the ratio of book value to the market value as
the illiquidity criterion proposed by Amihud (2002). Their conclusion show the illiquidity factor should be considered as a key element to evaluate the assets.

Deuskar (2006) introduced a model for liquidity function and fluctuations of the shares price. By virtue of the model the investors foresee recent price changes for an asset with risk. The risk spending is high and current return of the asset decreases while the asset changes are high. The fee of the assets without risk is low, too and the market encounters with illiquidity.

3. The Hypotheses of the Study
The hypotheses to be tested in the study are as follows:

- **H$_1$:** There is a significant relation between the liquidity risk and cross sectional returns.
- **H$_2$:** There is a significant relation between the float shares and cross sectional returns.
- **H$_3$:** There is a significant relation between the systematic risk and cross sectional returns.
- **H$_4$:** There is a significant relation between the company size and cross sectional returns.
- **H$_5$:** There is a significant relation between the ratio of book value to shares market and cross sectional returns.
- **H$_6$:** There is a significant relation between the systematic risk and liquidity risk.

4. The Study Data
The data used in the study are the companies accepted in Tehran stock exchange and are selected by virtue of following criteria:

1. The companies should be accepted in the stock exchange until Feb. 2006.
2. The fiscal year of the companies should end on 20, March of each year.
3. The companies are not permitted to change their fiscal year during the periods.
4. The book value of the equity should be positive in the companies.
5. Their necessary data should be available in the section defining the variables.
6. They should not be a fiscal or investing company.

The companies with above qualities were 108 selected by elimination method according to above criteria for 2006–2012.

In the study we conduct the tests by virtue of the model FARM:

$$[R_i - R_L = \frac{\phi}{\phi_i} (R_{FM}^{FW} - R_L)]$$

Where:

- $R_i$ and $R_L$ are asset or share return i and complete flowing asset L (To be bought and sold immediately), respectively.
- $(R_{FM}^{FW} - R_L)$
- $(R_{FM}^{FW}$ is the return of balanced floating shares in market.
- $\frac{\phi}{\phi_i}$ is the float shares of company i and the mean float shares.

And the $\frac{\phi}{\phi_i}$ ratio in above equation is the liquidity beta (Zhang et al., 2007).

The model indicates if the liquidity risk increases, the return increases, too and considering the model was introduced for the first time by Zhang et al. in 2007 in current study we try to find if the criterion proposed as the liquidity is right in Iran market or not.
In current study the hypotheses were examined by Pearson’s correlation coefficient and then by step by step regression a multivariable regression model was issued for the significant variables and the findings were presented by the significance of the coefficients and remainder examination.

5. Data Analysis

The step by step regression method was used in order to estimate the regression paradigms. The significance test of the paradigms was conducted by the ‘F’ and ‘t’ statistics and the independence of the remainders were confirmed by Durbin–Watson statistic. It should be noted that the significance level of the test was less than 0.05 and Durbin–Watson was 1.5–2.5. The examinations were done collectively in 2007–2011.

The results from tested hypotheses are shown in following tables:

Table 1: Pearson correlation coefficient and significance level between the study variables

<table>
<thead>
<tr>
<th></th>
<th>Return</th>
<th>BE/ME</th>
<th>Size</th>
<th>Market Beta</th>
<th>Free Float</th>
<th>Liquidity Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>correlation coefficient</td>
<td>-0/050</td>
<td>0/006</td>
<td>0/132</td>
<td>0/318</td>
<td>-0/133</td>
</tr>
<tr>
<td></td>
<td>sig</td>
<td>0/031</td>
<td>0/006</td>
<td>0/132</td>
<td>0/318</td>
<td>-0/133</td>
</tr>
<tr>
<td></td>
<td>numbers</td>
<td>432</td>
<td>432</td>
<td>432</td>
<td>432</td>
<td>432</td>
</tr>
<tr>
<td></td>
<td>correlation coefficient</td>
<td>-0/069</td>
<td>0/076</td>
<td>0/113</td>
<td>0/005</td>
<td>-0/0041</td>
</tr>
<tr>
<td></td>
<td>sig</td>
<td>0/015</td>
<td>0/432</td>
<td>0/432</td>
<td>0/432</td>
<td>432</td>
</tr>
<tr>
<td></td>
<td>numbers</td>
<td>432</td>
<td>432</td>
<td>432</td>
<td>432</td>
<td>432</td>
</tr>
<tr>
<td></td>
<td>correlation coefficient</td>
<td>0/076</td>
<td>0/113</td>
<td>0</td>
<td>0/005</td>
<td>0/0041</td>
</tr>
<tr>
<td></td>
<td>sig</td>
<td>0/076</td>
<td>0/432</td>
<td>0/432</td>
<td>0/432</td>
<td>432</td>
</tr>
<tr>
<td></td>
<td>numbers</td>
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<td>432</td>
<td>432</td>
<td>432</td>
<td>432</td>
</tr>
<tr>
<td></td>
<td>correlation coefficient</td>
<td>0/093</td>
<td>0/030</td>
<td>0</td>
<td>0/005</td>
<td>0/0041</td>
</tr>
<tr>
<td></td>
<td>sig</td>
<td>0/046</td>
<td>0/432</td>
<td>0/432</td>
<td>0/432</td>
<td>432</td>
</tr>
<tr>
<td></td>
<td>numbers</td>
<td>432</td>
<td>432</td>
<td>432</td>
<td>432</td>
<td>432</td>
</tr>
</tbody>
</table>

By virtue of above table we see all variables have correlation with return, but the correlation of the ratio of book value to the market value is refused because the its sig is not less than 0.05 and in relation to the liquidity risk the factor is not entered into the model because the sig is very weak.

Table 2: Step by step regression, in/out variables.

<table>
<thead>
<tr>
<th>Model</th>
<th>The model for the entered variables</th>
<th>got out variables</th>
<th>the used method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Market Beta</td>
<td>-</td>
<td>step by step regression</td>
</tr>
<tr>
<td>2</td>
<td>float shares</td>
<td>-</td>
<td>step by step regression</td>
</tr>
<tr>
<td>3</td>
<td>Size</td>
<td>-</td>
<td>step by step regression</td>
</tr>
</tbody>
</table>

Summary and findings of the model

<table>
<thead>
<tr>
<th>Model</th>
<th>Correlation coefficient</th>
<th>R</th>
<th>R²</th>
<th>foreseeing criterion error</th>
<th>Durbin–Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0/318</td>
<td>0/101</td>
<td>0/099</td>
<td>60/27555</td>
<td>1/948</td>
</tr>
<tr>
<td>2</td>
<td>0/359</td>
<td>0/129</td>
<td>0/125</td>
<td>59/39909</td>
<td>1/948</td>
</tr>
<tr>
<td>3</td>
<td>0/415</td>
<td>0/172</td>
<td>0/172</td>
<td>57/97199</td>
<td>1/948</td>
</tr>
</tbody>
</table>

We see in the step by step regression the third model including all the variables is the best model because it has higher definition coefficient so we have:

\[ R_{t83-86} = \alpha_0 + \beta_1 \text{Market Beta} + \beta_2 \text{Free Float} + \beta_3 \text{Size} \]

Table 3: Variance analysis

<table>
<thead>
<tr>
<th>Model</th>
<th>Total squares</th>
<th>freedom degree</th>
<th>mean squares</th>
<th>statistical ‘F’</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>regression</td>
<td>175339/62</td>
<td>1</td>
<td>175339/625</td>
<td>48/261</td>
</tr>
<tr>
<td></td>
<td>remainder</td>
<td>1562251/2</td>
<td>430</td>
<td>3633/142</td>
<td>0/000</td>
</tr>
<tr>
<td>Total</td>
<td>1737590/8</td>
<td>431</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>regression</td>
<td>223971/00</td>
<td>2</td>
<td>111985/499</td>
<td>31/740</td>
</tr>
<tr>
<td></td>
<td>remainder</td>
<td>1513619/8</td>
<td>429</td>
<td>3528/251</td>
<td>0/000</td>
</tr>
<tr>
<td>Total</td>
<td>1737590/8</td>
<td>431</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>regression</td>
<td>299189/35</td>
<td>3</td>
<td>99729/784</td>
<td>29/675</td>
</tr>
<tr>
<td></td>
<td>remainder</td>
<td>1438401/5</td>
<td>428</td>
<td>3360/751</td>
<td>0/000</td>
</tr>
<tr>
<td>Total</td>
<td>1737590/8</td>
<td>431</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The regression model is significant by virtue of the variance analysis table.

Table 4: Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>non-standardized coefficients</th>
<th>standard coefficients</th>
<th>‘t’ statistic</th>
<th>Sig</th>
<th>collinear statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta error Beta</td>
<td>Beta</td>
<td></td>
<td></td>
<td>tolerance</td>
</tr>
<tr>
<td>1</td>
<td>fixed rate Market Beta</td>
<td>15/712 3/069</td>
<td>0/318</td>
<td>5/120</td>
<td>0/000</td>
</tr>
<tr>
<td></td>
<td>fixed rate Market Beta</td>
<td>18/047 2/598</td>
<td></td>
<td>6/947</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>fixed rate Market Beta</td>
<td>19/893 3/227</td>
<td>0/318</td>
<td>6/165</td>
<td>0/000</td>
</tr>
<tr>
<td></td>
<td>fixed rate Market Beta</td>
<td>19/045 2/574</td>
<td></td>
<td>7/399</td>
<td></td>
</tr>
<tr>
<td></td>
<td>float shares e^-8 Market Beta</td>
<td>-7/384 /000</td>
<td>-/.168</td>
<td>3/713</td>
<td>0/000</td>
</tr>
<tr>
<td></td>
<td>float shares e^-8 Market Beta</td>
<td>-1/207 /000</td>
<td>-/.276</td>
<td>5/551</td>
<td>0/000</td>
</tr>
<tr>
<td></td>
<td>size e^-12</td>
<td>4/745 0/000</td>
<td>0/235</td>
<td>4/731</td>
<td>0/000</td>
</tr>
</tbody>
</table>

In this step we examine the coefficients and their significance for the model and we have:

\[ R_{t83-86} = 16.332 + 18.668 \text{Market Beta} \cdot 0.20e^{-7} \text{Free Float} + 4.745e^{-12} \text{Size} \]

Table 5: Got out variables

<table>
<thead>
<tr>
<th>Model</th>
<th>Beta In</th>
<th>‘t’ statistic</th>
<th>Sig</th>
<th>partial correlation</th>
<th>collinear statistic</th>
</tr>
</thead>
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</tr>
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<td>1</td>
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<td>-1/707</td>
<td>0/089</td>
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<td>0/114</td>
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<td></td>
<td>float shares</td>
<td>-3/317</td>
<td>0/000</td>
<td>-0/176</td>
<td>0/989</td>
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<td></td>
<td>liquidity risk</td>
<td>-1/430</td>
<td>0/153</td>
<td>-0/069</td>
<td>0/991</td>
</tr>
<tr>
<td>2</td>
<td>BE/ME</td>
<td>-0/068</td>
<td>-1/504</td>
<td>0/133</td>
<td>-0/073</td>
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<tr>
<td></td>
<td>Size</td>
<td>0/000</td>
<td>4/731</td>
<td>0/223</td>
<td>0/785</td>
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<tr>
<td></td>
<td>liquidity risk</td>
<td>-0/065</td>
<td>0/153</td>
<td>-0/069</td>
<td>0/991</td>
</tr>
<tr>
<td>3</td>
<td>BE/ME</td>
<td>-0/044</td>
<td>-0/991</td>
<td>0/322</td>
<td>-0/048</td>
</tr>
<tr>
<td></td>
<td>liquidity risk</td>
<td>-0/056</td>
<td>0/203</td>
<td>-0/062</td>
<td>0/990</td>
</tr>
</tbody>
</table>

We see in the got out coefficients table the two variables: the ratio of book value to shares market value and liquidity risk have been got out the model properly because sig is not less than 0.05. we use following model to test the sixth hypothesis:
Table 6: Pearson correlation coefficient and the significance level between the study variables:

<table>
<thead>
<tr>
<th></th>
<th>Market Beta</th>
<th>Liquidity Risk</th>
</tr>
</thead>
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<tr>
<td>Market Beta</td>
<td>correlation coefficient</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Numbers</td>
<td>432</td>
</tr>
<tr>
<td>Liquidity Risk</td>
<td>correlation coefficient</td>
<td>-0/105</td>
</tr>
<tr>
<td></td>
<td>Sig</td>
<td>0029</td>
</tr>
<tr>
<td></td>
<td>Numbers</td>
<td>432</td>
</tr>
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</table>

By virtue of the table we see there is a correlation and significant relation between the systematic risk variables and liquidity risk.

6. Conclusion

By virtue of the examination relating to the study hypotheses and variables we see in the FARM model

\[ R_i - R_L = \frac{\phi}{\phi_i} (R_{MW} - R_L) \]

the liquidity risk is considered as the criterion for shares return sensibility. and it is stated that considering the liquidity risk may not justify all the cross sectional changes in the return the risk factors (Market risk or market value risk) and float shares should be considered, too; in current study the correlation of liquidity risk criterion is certified, but it is not considered as a logic, experimental criterion because the significance is very weak and market risk or systematic risk, company size and float shares have defined potential to justify the cross sectional changes in the return. Also it become clear in the examinations that the market, systematic risk or liquidity risk have significant relation.

Current study findings are not in harmonization with the Zhang et al. (2007) ones when they state the \( \frac{\phi}{\phi_i} \) is the liquidity risk criterion, but they are in harmonization with them when they sate that the liquidity risk lonely justifies all the changes in the return and other variables interfere in it and it shows that the float shares, market or systematic risk and the size have defined potentials to describe the changes, but the book value potential to the market value to describe the cross sectional changes snt in harmonization with our study findings.

Our study findings show the company size has direct and significant relation with the company size, but the findings about the relation of book value ratio to the market value with the shares return are not certified.

References


Study the Effect of Cold Working on Thermal Properties and Solution Treatment on Wear Behavior of 355/Al Alloy

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Abstract

In this study an experimental work has been done to show the effect of cold working process on the thermal properties of Al-355 alloys, as the specific heat at constant volume (Cv), thermal conductivity (k), and thermal diffusivity (α), and cold working by reduction (5%, 10%, 15%, 20%, 30%). The results shows as the cold working percentage is increased cause, decreasing the alloy density and increasing of the specific heat, the thermal conductivity and the thermal diffusivity by . Through this study it was found the wear rate was decreased with increasing of aging temperature and aging time.

Keywords: Mechanical properties, Aluminum, Al-355, cold working.

<table>
<thead>
<tr>
<th>Used Symbols</th>
<th>Definitions</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Vertical sectional area of the specimen on the direction of heat transfer</td>
<td>m²</td>
</tr>
<tr>
<td>C_va</td>
<td>Specific heat capacity of the sample with constant volume</td>
<td>J/g.oC</td>
</tr>
<tr>
<td>C_v</td>
<td>Specific heat capacity of the device components</td>
<td>J/g.oC</td>
</tr>
<tr>
<td>C_w</td>
<td>Specific heat capacity of water</td>
<td>J/g.oC</td>
</tr>
<tr>
<td>D</td>
<td>Diameter of the sample</td>
<td>cm</td>
</tr>
<tr>
<td>H</td>
<td>Height of water in the metal container</td>
<td>kJ/kg</td>
</tr>
<tr>
<td>I</td>
<td>Current</td>
<td>A</td>
</tr>
<tr>
<td>K</td>
<td>thermal conductivity</td>
<td>W/m.oC</td>
</tr>
<tr>
<td>L</td>
<td>Length metal container</td>
<td>cm</td>
</tr>
<tr>
<td>m_s</td>
<td>Mass of the sample</td>
<td>g</td>
</tr>
<tr>
<td>m_c</td>
<td>Mass components of a device conductivity</td>
<td>g</td>
</tr>
<tr>
<td>m_w</td>
<td>Mass of water</td>
<td>g</td>
</tr>
<tr>
<td>Q</td>
<td>supplied Power to the device conductivity</td>
<td>Watt</td>
</tr>
<tr>
<td>Q_i</td>
<td>supplied Power to the device specific heat</td>
<td>Joule</td>
</tr>
<tr>
<td>Q_v</td>
<td>Heat gained by the container and device components</td>
<td>Joule</td>
</tr>
<tr>
<td>Q_w</td>
<td>Gained heat by water</td>
<td>Joule</td>
</tr>
<tr>
<td>Q_a</td>
<td>gained heat by the sample</td>
<td>Joule</td>
</tr>
<tr>
<td>R</td>
<td>working percentage</td>
<td>%</td>
</tr>
<tr>
<td>T</td>
<td>Temperature</td>
<td>oC</td>
</tr>
<tr>
<td>t_a</td>
<td>Sample thickness before working</td>
<td>Mm</td>
</tr>
<tr>
<td>t_b</td>
<td>Sample thickness after working</td>
<td>Mm</td>
</tr>
<tr>
<td>V</td>
<td>Voltage difference (volt)</td>
<td>Volt</td>
</tr>
<tr>
<td>X</td>
<td>length of the distance traveled by the heat (length of the sample)</td>
<td>cm</td>
</tr>
<tr>
<td>W</td>
<td>Width metal container</td>
<td>m</td>
</tr>
<tr>
<td>ρ</td>
<td>Density</td>
<td>g/cm³</td>
</tr>
<tr>
<td>ΔT</td>
<td>temperature difference</td>
<td>oC</td>
</tr>
<tr>
<td>α</td>
<td>Thermal diffusivity</td>
<td>m²/sec</td>
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Introduction
The Aluminum Association (AA) 3XX series of alloys covers a range of aluminum-silicon-magnesium(-copper) alloys that are the backbone of the aluminum investment, sand, semi-permanent mold and permanent mold casting industry. This alloy system has excellent castability, good machinability and weldability, good pressure tightness and resistance to corrosion, freedom from ‘hot cracking’ susceptibility, is heat treatable and capable of moderate to high mechanical properties. Alcan Inc. produces primary foundry ingot that are well within the Aluminum Association Chemical Composition Limits for these alloys. Moreover, Alcan Ingot can tailor alloys specifically to the customer’s requirements. This combined with full technical assistance from a team of experienced researchers, foundry technologists and a knowledgeable sales staff, provides a full service package to foundries. Where higher temperature strengths are required, Cu is added to produce the AA 355 families. This elevated temperature strength capability comes at a sacrifice in corrosion resistance and ductility. The thermal conductivity of the alloy is also reduced by the presence of Cu. Alloys like this are used for things like automotive air condition scrolls, impellers for superchargers, and some high strength automotive suspension and brake components. Aluminium-silicon (Al-Si) cast alloys are fast becoming the most universal and popular commercial materials, comprising 85 % to 90 % of the aluminum cast parts produced for the automotive industry, due to their high strength-to-weight ratio, excellent castability, high corrosion resistant and chemical stability, good mechanical properties, machinability and wear resistance. Mg or Cu addition makes Al-Si alloy heat treatable [1].

Tribology—the science of lubrication, friction, and wear—deals with a diverse array of man-made and natural systems of interacting bodies in relative motion. As the principal cause of wear and energy dissipation, friction is responsible for consuming about one-third of the world’s energy resources as humans attempt to overcome its barrier in one form or another [2].

Another study on 6xxx carried out by Matsuda et al. (2002)[3] showed that the addition of copper to Al-Mg-Si alloys not only changes the precipitation sequence but also enhances hardness and refines microstructure by segregating to the Q’α – Al interface..

Wang et al.,2007 [4] report that the hardening precipitates were Q β (Al5Mg8Si6Cu2), and β (Al2Cu) for high Cu, in the peak aged condition and the peak yield strength was shifted to longer times compared to the Al–Si–Mg alloy.

Kozyrev and Sedakova,2008 [5] performed a theoretical and experimental analysis within a non-equilibrium thermodynamic framework to derive a dependence of wear rate on the load in stationary state. They demonstrate that the linear increase in wear rate with an increased load may be interrupted as a result of reduction in wear rate. They observe a nonlinear behavior of wear W as a function of pressure p. That is, in a particular range of load, wear can decrease by increasing the pressure. This phenomenon is explained by tribological reactions that results in formation of wear resistant oxide layers. Kozyrev and Sedakova take into account the effect of another independent process which is the diffusion of material into tribo-film, beside the friction process. The diffusion process can be considered as an external element that lead to self-organization and wear reduction.

(Krupiński m. & etals,2009)[6] had investigation results of derivative thermo analysis performed using the UMSA device (Universal Metallurgical Simulator and Analyzer). The material used for investigation was an Al-Si-Cu alloy known as AC-AlSi7Cu3Mg grade aluminium cast alloy. As a result of this research the cooling rate influence on structure and mechanical properties changes, especially HB Hardness was investigated. The cooling rate was set in a variable range of ~0.2 °C/s to ~1.25 °C/s. In this work structure changes were determined concerning the structure, especially the dendrites and grains and particle distribution in the aluminium matrix. The reason of this work had to determine the optimal cooling rate values, to achieve good mechanical properties for protection of this aluminium cast alloy from losing their work stability and to make it more resistant to action in hard working conditions. For investigations of the aluminium samples hardness measurements of the different sample areas were performed. The material was examined metallographically and analyzed qualitatively using light and scanning electron microscope as well as the area mapping and point-wise
EDS microanalysis. The performed investigation are discussed for the reason of an possible improvement of thermal and structural properties of the alloy. The investigation revealed the formation of aluminium reach (α-Al) dendrites and also the occurrence of the α+β eutectic, the ternary eutectic α+Al₂Cu+β, as well the occurrence of the Fe and Mn containing phase was confirmed.

Precursors of the θ (Al2Cu) phase form both in Al–Si–Cu casting alloys and in Al–Cu wrought alloys at ageing had studied by (Wang G. & et al.s,2011) , but the age hardening response per added wt% of Cu is lower in casting alloys. The high dislocation density formed during quenching in Al–Si–Cu alloys may be a reason for the low age hardening response [15]. The θ phase forms on dislocations, while the θ phase forms far from the Si particles, where the dislocation density is low. The for- good examples showing the possibility for formation of different types of precipitates in Al–Si–Cu–Mg alloys. They both added different amounts of Cu (0–4 wt%) to Al–Si–0.5Mg alloys and studied the age hardening response[7].

**Experimental Work**

**Introduction**

Aluminum alloys are classified depending on the chemical composition of the metal (alloy) as follows:-

Aluminum divided by its purity to aluminum high-purity where the proportion of aluminum(99.999%) and commercial aluminum purity (99%), and aluminum merits high resistant against corrosion by increase its purity, high conductivity of heat, high conductivity of an electricity, good portability working, low resistance and does not heat treatment in the case of purity. commercial aluminum uses for the construction industry and non loaded parts [8].

3XX alloy family – The 3XX alloys are the true workhorses of the aluminum casting industry because of their superior casting characteristics and good strength. Al-Si-Cu alloys are the most prevalent and the higher-copper versions are fully heat treatable. When full heat treatment is desired, the Al-Si-Cu-Mg alloys provide the highest strength and hardness, at both ambient and elevated temperatures. A355 an aluminum alloy with 0.02% copper added for greatly improved strength over the more common A356 material. This alloy yields highly consistent castings that are crack resistant, easy to repair, and have excellent tensile elongation properties. This has been used very effectively in aftermarket aluminum engine block castings. When heat treated to T6 condition the alloy remains very strong to 300° F which is 100° F higher than A356.[9]

**Samples**

Samples were prepared as follows: -

1. Alloy rods and pure aluminum rods diameter (30 mm) and length (25 cm) Were obtaining, and machining these bars on a turning machine presence of coolant and cut them into several samples with diameter (25 mm) and length (60 mm).
2. Samples for both wear resistance and cold working were prepared from pure aluminum and aluminum alloys - 355 of a cylindrical diameter (10mm) and length (20mm) for wear and diameter(25mm) and (5mm) thickness for cold working, then samples were cleaned and refined for the purpose of getting the surface free from defects (scratching), which may increase the rate of wear and tear between the touching surfaces before you start the process of testing samples.
3. samples were Heating in an electric oven to the temperature (300 °C) and cooled in the furnace for purpose of removing the resulting stresses from the casting process.
4. Forming process was conducted on the cold working to the used alloys with reduction percentages (5%,10%,15%,20%,30%).
5. The samples were treated at 505°C for three hours and then water quenched .After that the samples were reheated to temperature of (175,200,225 °C) for aging time of(60,120,180) minutes, The solution treatment was done by using a resistance electrical furnace.
Used Devices

**Device to Measure the Specific Heat**
the used device to measure the specific heat Consists of a metal container and substance of the galvanized aluminum alloy Sticky inside heated electric and mixer to ensure the distribution of a homogeneous temperature and insulated group thermally isolate fully using thermal wool and placed inside a box of wood and to measure the temperature of the water put Thermocouple type (T) into the water located in the container, Figure (2) shows us a photograph of the user's device.

**Figure 2:** Photo of a device for measuring specific heat describes the used devices in the research: 1- measure the current. 2- measure the voltage. 3- basin water. 4- double heat. 5- the test sample. 6- the remote control with heater and fan. 7- A device for measuring temperature.

**Thermal Conductivity Measuring Device**
The used device to measure the thermal conductivity Consists two of pieces of copper placed inside two pieces of Teflon as a insulated material. As well as heated electric, were controlled by thermostat, and the amount of transmitted heat from heated electric to alloy placed between two pieces of copper can be controlled by organized voltages were used water to cool the end of the sample to ensure the transfer of heat in one direction is the axis of the cylinder, and temperatures measured by eight thermocouples type (T) as shown in Figure (3), which shows us a photograph of the user's device.
Figure 3: A photograph of the device for measuring thermal conductivity describes the used devices in the research: 1- Power key. 2- a digital scale with temperature. 3 - control of the thermocouples. 4 - power regulator. 5 - measure of power. 6 - test sample with Teflon. 7 - Teflon isolated copper electrodes. 8 - Place the test sample. 9 – Thermocouples.

**Wear Measuring Devise**

This research includes the study of the impact speed slid and pregnancy vertical and time slipping on the properties and behavior of wear and tear sliding dry samples of aluminum-355 alloy using a measuring wear and tear sliding Dry (Pin-on-disc) for the purpose of obtaining the status of contact between sample and turntable made of steel (45HRC).

The device consists of an electric motor with a speed of rotation of the electric power (1.5) hp and arm with a rectangular section showing the sample by holder with a diameter 10mm, has been proven on the scale arm emotion Strain gauge to measure the force of friction. I have been using five different loads (5,10,15,20,25) N under the influence of linear sliding speed (0.94) m / s where it is control the speed of the turntable by transmission belts of the electric motor as shown in Figure (1) All tests were testing samples in normal atmospheric air and at room temperature.

**Method Testing for Measuring of Thermal Conductivity**

1. Placing the sample between the poles of copper and insulated with Teflon material.
2. Operating An electric heater and placed under one of the poles of copper and control electrical power input were used (10,20,30,40,50) volt, to calculate the rate of thermal conductivity alloy accurately.
3. Measuring power entering into heater, voltage and current by gauges placed in the device.
4. After arrival temperatures to the required degree and stability temperatures after reaching steady state for time (50 minutes), readings taken of double placed on the surface of the sample only, and was due not to our use of thermocouples six placed before and after the sample was different metal alloy being placed between two metal electrodes made of copper and thus a difference in thermal conductivity which was caused an error in the measurements.

**Method of Cold Working**

Working percentage to test samples and calculate. A rolling machine had two rolls as shown in figure (4) was used. It is a rolling machine with one-way and roll diameter (36) mm and loaded rolling which was applied manually through lever designed for this purpose and had been determined of the primary thickness Sample (ta) by using micrometer external measure, and then the sample entered to the machine rolling, and after passing one was measured thickness sample (tb), and then re-process many
times until access to the percentage required working and calculated according to the following equation. Then repeated the process for each alloy until access to the required percentage and the best ratio of working.

Figure 4: Rolling machine

\[ r = 1 - \frac{t_a}{t_b} \]  

(1)

Figure 5: Wear apparatus
Method Calculations
In this research was calculating of temperature properties of Al-355 alloy cold working as follows:

Accounts Specific Heat
Theoretical basis for this experiment was a thermal balance of the system by calculating the power that stored within the system and from the first law of heat which is added energy to the system must be equal to the gained energy by the different materials in the system. The specific heat was calculated for a two-stage samples.

(Stage I): Before placing the sample as follows:
Mass and specific heat were calculated of the various components of the device (Nv) by using the first law of Dynamic Temperature:

\[ Q_i = Q_v + Q_w \]  

(2)
where the added energy:

\[ Q_i = V \times I \times \text{Time} \]  

(3)
Gained heat was calculated by the container from the following equation:

\[ Q_v = m_v \times C_v \times \Delta T \]  

(4)
Whereas

\[ N_v = m_v \times C_v \]

\[ N_{\text{average}} = \frac{\sum N_v}{4} \]

Gained heat was calculated by the water from the following equation:

\[ Q_w = m_w \times C_w \times \Delta T \]  

(5)
\[ m_w = \rho_w \times L \times W \times H \]

(Stage II): after placing the sample as follows:
Specific heat for used samples (Qa) is calculated by using the first law of dynamics heat with advantage of equations (2,3,4):

\[ Q_i = Q_v + Q_w + Q_a \]  

(6)
Whereas

\[ Q_a = M_a \times C_{va} \times \Delta T \]  

(7)
\[ C_{\text{average}} = \frac{\sum C_{va}}{4} \]

Thermal Conductivity Calculations
Heat was Form of energy in transition, moving from region high-temperature to the region low-temperature after images were (conduction, convection, radiation), had transmitted heat to one or more of these image.

The conduction heat transfer, world Fourier had created the law which noted that the transmitted heat through the middle of a given directly proportional to the temperature difference (\( \Delta T \)) and vertical area on the direction of heat flow (A), and inversely with the length of the distance traveled by the heat [8].

\[ q \propto \frac{A \times \Delta T}{\Delta x} \]  

(8)
Constant of proportionality was the thermal conductivity (k), which is property of the properties of the center carrier demonstrates its ability to thermal conductivity.

\[ q = kA \frac{\Delta T}{\Delta x} \]  

(9)
To calculate the value of the constant (k), we rearrange the equation (8) to obtain the new formula:
\[ k = \frac{q \Delta x}{A \Delta T} \quad (10) \]

Whereas
\[ A = \pi \frac{d^2}{4} \]

Rate of transmitted heat (q) can be calculated as follows:
Rate of transmitted heat through the metal = gained heat rate by electric heater
\[ q = I \cdot V \quad (11) \]

Thermal diffusivity was calculated from the following equation [11]:
\[ \alpha = \frac{k}{\rho \cdot C_{\text{average}}} \quad (12) \]

**Wear Calculation**
Samples were prepared from pure aluminum and other alloys aluminum 355 - a cylindrical diameter (10mm) and length (20mm), then cleaned samples with water and soften then air-dried chili, and then refined. The wear rate was calculated following the gravimetric method, which includes an account of the weight loss of a sample as sample weight was calculated before and after the test by an electric balance delicate precision (± 0.0001 gm) was calculating the rate of wear and tear and in accordance with the following equation:

\[ \text{Wear Rate} (W_r) = \frac{\Delta m}{2\pi r nt} = \frac{m_1 - m_2}{2\pi r nt} \quad (g/cm) \quad (13) \]

Whereas:
\[ \Delta m \text{ :- Weight lost (gm) which is the difference in mass of the samples before and after the test that the mass loss can be calculated as follows} \]
\[ \Delta m \text{ (mass loss) = m}_1 - m_2 \]
\[ m_1: \text{- Mass of the sample prior to the examination (gm)} \]
\[ m_2: \text{- Mass of the sample after examination (gm)} \]
\[ t : \text{- Sliding time (examination) minutes} \]
\[ r: \text{- The radius of the center of rotation of the center of the sample to the center of the disc} \]
\[ n: \text{- Disk rotational speed (r / min)(540 RPM).} \]

**Results and Discussion**

**Thermal Properties**

From fig(6), the thermal diffusion was increased with increasing of working % for both pure and 355 alloy and decreasing of density. The density was decreased with increasing of C.W. percentages because as C.W. increased the volume was increased and the mass was decreased due to the changing of dimension during cold working as shown in fig(7).
Figure 6: Changing the thermal conductivity alloys Al-pure & Al-355 with changing ratios of cold working.

![Graph showing thermal conductivity vs. working percentage for Al-pure and Al-355 alloys.](image)

Figure 7: Changing the density alloys Al-pure & Al-355 with changing ratios of cold working.

![Graph showing density vs. working percentage for Al-pure and Al-355 alloys.](image)

Thermal conductivity increased with increasing of cold work percentage due to the increasing of thermal diffusion with the increasing of cold working as shown in fig(8)

Figure (8): Changing the thermal diffusivity alloys Al-pure & Al-355 with changing ratio of cold working.

![Graph showing thermal diffusivity vs. working percentage for Al-pure and Al-355 alloys.](image)
Specific heat decreased with increasing of cold working due to the decreasing of thermal diffusion by cold working process as shown in fig (9)

**Figure 9:** Changing the specific heat alloys Al-pure & Al-355 with changing ratio of cold working.

Wear rate at aging temp.(175,200,225) and aging time(60,120,180)minutes was increased with the time of wear test due to the contact friction between the surface sample and disc surface as a first stage and stress cracking which developed by stage one and finally the generated heating which result from stage one and stage two, but the wear rate decreasing depends on both aging time and aging temp. so the wear rate values were decreased as aging temp. and aging time were increased as shown in figs(10-12).

**Figure 10:** The effect of aging time on wear rate at aging temp.=175 °C
From figs(13-15), the wear rate was increased with increasing of load values due to the increasing of generated heat with increasing of applied load.
Figure 13: The effect of Load on wear rate at aging temp. = 175 °C

Figure 14: The effect of Load on wear rate at aging temp. = 200 °C
Figure 15: The effect of Load on wear rate at aging temp. = 225 °C

Conclusions
1. The increasing of aging time and aging temp. lead to decrease of wear rate.
2. An increased of applied load during wear test lead to increasing of wear rate.
3. Thermal diffusivity and thermal conductivity increased with increasing of cold work percentage.
4. Density value and specific heat were decreased with increasing of cold work.

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Strategic Management Approach in Marketing Decisions

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Abstract

To realize goals and marketing objectives, a corporation or organization needs marketing strategic management. Developing marketing strategies is one of the important roles of this process. Proper implementing strategic management methods in marketing is the final part and guarantees succession of corporation in marketing. Results of different studies in strategic management context show that corporations which use strategy approach to achieve a stable competitive benefit, often face problems in strategy implementing stage in different organizational levels. First goal of this paper is to provide a classification and rating about barrier of effective implementing strategic management methods in marketing. First, a classification of obstacles from international literatures for this corporation is naturalized based on experts opinions and then classified and rated using Fridman and one sample T statistical tests. Results show that among octet classification, management barriers level has the most importance. Then, structural barriers level in second level and cultural, conceptual, strategic, operational, human force and resource obstacles class are in next levels respectively. Second goal of this paper is to study strategic management methods and making proper decisions in different levels. In this paper, strategic and management and marketing are determined based on different levels and then relation between different types of mentioned strategies studied. Paper hypothesis is evaluated in a statistical society to verify. Results show that there is coordination between strategy of market entering level with prospector strategy, growing market strategy with analyzer strategy, mature market strategy with differentiated defender strategy and declining market strategy with low cost defender strategy based on strategic reference points and better function than other states are shown.

Keywords: Marketing strategy, strategic management, strategic coordination, strategic reference points, product life cycle, obstacles.

1. Introduction
Most of theorists in strategic management context emphasis on the same factors to successful implement of strategies. For example, Aker emphasis on four key factors of structure, systems, people and culture in implementing strategies. Brison also discusses implementing strategy in different
organizational levels such as human, process, structure problems and also strategy institutionalization, to successfully implement strategies. In strategy implementation, Fred David also points out factors such as defining annual goals, policy development, resource allocation, structure changing and renewal and reengineering, revision in reward and urging programs, decreasing resistance against change, adjusting managers against strategy, reinforcing culture of protecting strategy, adjusting operational and productive processes, forming effective human resource unit to successfully implement strategies. In literature of marketing strategic planning, strategic management methods in marketing and marketing plan are considered as subset of marketing planning process. A company or organization needs marketing planning to achieve goals and marketing objectives that one of the main staff of this process is developing strategic management methods in marketing. Proper implementation of strategic management methods is the final part and guaranties succession of corporation in marketing during which related strategies should be implemented and applicable properly. McDonald, identified fourteen barriers to realize marketing planning. Although McDonald’s considered factors such as planning, marketing and process are losing, but some of them such as deficiency in planning activities of planning, its Staffs, relations, publishing results of plan, in addition lack of attention and accuracy in implementing results of plans, are still valid problems. Dib and Simkin observations added new problems to provided opinions by marketing planning experts such as Gil, Grainlee, Jain, McDonald and Piercy. They identified set of problems which also uphold concerns of McDonald and Piercy and also added to set of deterrent obstacles of marketing planning. Simkin, in his studies about big and medium productive and Service corporations in England, identified 30 main barriers in effective marketing planning. In this study, a relatively deep study has done on big and medium Britain productive and Service corporations which formally had the duty of marketing and collect and implement marketing document plans. This note (concentrating on corporations formally involve in apply and implement marketing plans) is as one of the main differences of Simkin studies in comparison with other studies. In this research, information consist of 40% in service section and 60% in production section are collected through interviewing with 50 companies about obstacles in effective implement marketing plans. Considerable points in this research, meaningful statistical difference between deterrent barriers of effective implement marketing strategies in productive companies in comparison with service companies. Findings of Simkin research about deterrent obstacles of marketing planning are listed. Frank Sespidizassigns marketing Executive problems mostly result of weak and improper relations between product management units, customer service and sell. He emphasizes on making concurrent marketing in which important and sensitive duties are mentioned, close and smooth connection is established. This researcher believes that relations should be wider and specially makes customers and product planners closer together. This problem decreases by connecting with customers and involving their view points in designing and production.

2. Studying Barriers and Methods of Strategic Management in Different Marketing Stages

Shortly, barriers can be listed from three view points as follows:

**MacDonald:** 1. Lack of top executive manager support, 2. Lack of plan for planning activities, 3. Operational management hostility, 4. Lack of support, resources and crafts, 5. Ambiguity in technology, special words and procedures, 6. Extra emphasis on details in form of annual inflexible plan, 7. Shortcut use of market share and sell numbers instead of using goals and methods of strategic management in written marketing, 8. Detaching planning from the other sections of function in company, 9. Defeat in connecting marketing planning with organizational enormous planning, 10. Submit marketing planning to planners, 11. Ambiguity and confusion between concept and function of marketing, 12. Lack of marketing knowledge and craft, 13. Ambiguity and amazing between planning process and its results, 14. Planning for the sake of planning.
Dibb, S: 1. Poor understanding of marketing concept, 2. Deficiency or lack of marketing analysis, 3. Developing strategic marketing management methods without analyzing or formulating tactical plans for marketing mix, 4. Close view of the external environment of marketing, 5. Weaknesses in intelligence, marketing and management information systems, 6. Lack of marketing intelligence subscriptions, 7. Insufficient understanding and support from senior management, 8. Poor internal communications between functional units on the market, 9. Little or lack of attention to planning, 10. Effect of internal and external operational and organizational events on planning and staff, 11. Lack of confidence, 12. Little opportunity for lateral thinking (creative thinking).


Miles & Snow (1978) developed a comprehensive framework that emphasis on different methods which organizations define their product-market territory (entrepreneurial problems), and form structures and procedures toward reaching to a competitive advantage in selected territories (Administrative and technical problems). Miles & Snow identified four main types of strategies that show how organizations focus on these problems: (1) prospectors that constantly try to make use of market opportunities and offer new products, (2) defenders trying to handle part of a whole market so they can achieve set of constant products and customers for their own (3) Analyzers that are in between of prospectors and defenders through following prospectors in new market territories and also protecting a set of constant customers and products and (4) passives that does not give special answers to entrepreneurial problems and do not have defined strategy.

In contrast, Porter (1985) states that marketing strategy should be seen as a result of company methods to create value for customer in comparison with his competitors (difference with minimum cost) and or result of how covered market territory defines (limited or wide). Michael Porter’s typology proposes two general competitive strategies to compete with other existent competitors in an industry: lower cost and product difference. A commercial unit may choose a wide market (medium or dense market targeting) or a limited market (a special section of market). Combination of these two types of target market with two mentioned competitive strategy, results in creating four types of general strategies consist of: cost leadership, differentiation, difference focus, and cost focus (Hanger and Villain 1381: 133-139).

Walker and Rokert (1987) show that in contrast to researches that strengthens two mentioned typologies, none of them is complete lonely. They provide results of their research as incorporation of two above typologies consist of prospectors, low cost defenders and differentiating defenders. Following Walker and Rokert researches, other researchers also analyzed and incorporate Porter, Miles and Snow’s two typologies in stage of selecting strategy of marketing product levels (Olsun et al, 2005, Desarbo, Benedetto, Song and Sinha, 2002, Desarbo Benedetto, Song and Sinha, 2006, Slater and Olsun, 2000 and 2001, Shortel and Zajac, 1990) results of their researches show four main types of marketing strategies: prospector, analyzer, low cost defender and differentiation defender.
3. Research Method

This is a quantity – quality research based on an applied research, based on target of explanatory research and based on type of data. Research time territory is from May, 2012 to Feb, 2013. Also collection time limit of data is the same interval. Statistical population of this research consist of all active companies in country’s industry (such as productive companies and related industries).
Judgment non-probable sampling method is used in this research. The most valid usage of this judgment sampling is in collecting experts’ opinions (Venos et al., 1996: 180). Because of specialty and of issue and necessity to accurate and complete information, it was necessary that companies selected as statistical sample, should be familiar with strategic management issues and have implemented it and on the other hand, have required information for the research. To measure type of strategy that each statistical sample companies are selected in last two years, Olsun, Slater and Holt (2005) standard questionnaire is used. Used approach in this questionnaire is using categorized questions in a paragraph 52 for each strategy (James & Hatten, 1995). To determine type of marketing strategy from research made questionnaire and based on categorizing marketing strategies by Walker et al (2003) is used.

Validity of questionnaire is studied and content validation method is used to identify questionnaire of strategic management method and also identify questionnaire of marketing strategy. Reason of selecting this method was answering to two following questions: (1) words, terms and phrases used in these questions were in a way that used strategy deducted from them and (2) these words and phrases should be understandable for the people who want to answer the questions and have the same understanding from them. In this research, guide and adviser teachers and also industry experts’ opinions in security Investment Company (judged agreed manner) used to implement content evaluation method and similar questionnaires in related articles and books studies. Since research questionnaires have not spectrum and have options that respondent should select one or more options among them, re-test method (reimplementation method) is a proper method for final evaluation.

Standard questionnaire is used to identify methods which its end is specified in last researches. So, 30 product-market are selected randomly and in primary test level, their questionnaires are given to related managers and then at data collection level also for that 30 product—market, questionnaire used again. Comparing answers of these two levels show that 6.96% of answers were equal in both levels, in other words, final coefficient of this questionnaire is 6.96%. To identify product life level, industry sells changes and number of competitors in different time intervals is used (Parasad, 2005: 37). Studying last researches show that different variables can be used to determine product life cycle (Wilson & Giligan, 2005, Walker et al, 2003, Katler 1999, Onkvisit&Shaw 1989). But the most common and valid variables are industry sell amount and number of competitors. Eleven type of product life cycle has been identified, the most common is classic life curve which has four main levels: introduction, grow, maturity, decline or age (Swan & Rink, 1982:75). Classic life curve is used in this research. To measure operation, two following questions are answered and then manner of measuring the operation is determined: (1) how should measuring approach be? (2) What index or standards should be used to measure the operation? there are four main approach to measure the operation consist of: (1) measuring operation in relation with past operation( comparing with the past), 3) measuring operation in relation with function of the same organizations or competitors (comparing with competitor organizations) and 4) combination of above methods.

The most important indexes or standards of measuring operation consist of: grow standards, competition force note, profitability (financial), using resource, attention to owners, attention to employees, and attention to people of society (Walker et al, 2003: 40). Main point to find those questions is that each selected approach or index should show synergetic and preserving organization competition advantage (Walker et all, 2003:9 & 52, Ma 2000:10, Russell, 1999:3, fortune magazine, 1997: 232, Farrell, 1993:10). In other words, existence of synergy between marketing and or between product—market of organization may explain proper function of organization.

This research studies four following main hypothesis:

**H1:** First type of strategic management method is more coordinated with first type of marketing strategy provided that it is proportion with product life cycle, and this improves operation.

**H2:** Second type of strategic management method is more coordinated with second type of marketing strategy provided that it is proportion with product life cycle, and this improves operation.
**H3:** Third type of strategic management method is more coordinated with third type of marketing strategy provided that it is proportion with product life cycle, and this improves the operation.

**H4:** Fourth type of strategic management method is more coordinated with fourth type marketing strategy provided that proportion with product lifecycle and this improves operation.

In this research, simple average is used to calculate two annual operation, geometric average to calculate market grow rate (one of the indexes of measuring product life cycle level) and average and graphs are used to describe personal characteristics of respondents. Amount 111 statistical samples (product-markets), 15 Product – market at introduction level, 32 at growing level, 38 at maturity level and 26 were at decline level. Also, number of selecting product level strategy in marketing are consist of: 30 sample used prospector strategy, 23 analyzer strategy, 36 differentiation defender strategy and 23 low cost defender strategy. In this research, because of existing hypothesis, statistical hypothesis test methods used. Selected tests analyzed using SPSS software. About achieved data in research, two following terms should be established so parametrical methods can be used for hypothesis test (Sigl, 1993: 24-25): 1. Our observations should be independent. Run test is used to randomly test the data in this research. 2. Our observations should be from statistical society with normal distribution. To test normality of distributing data, Kolmogorov-Smirnov statistical test is used.

If, based on above tests, it was found that there is significant difference between group functions, after that it should be specified that function of each group is better than the others. For this reason, LSD test is used. In studying hypothesis test statistics, if calculated significant level (a) is considered smaller than significant level, HO hypothesis is rejected otherwise, HO does not reject and estimation confidence level in this research was 95%. Variance analyzes statistical tests<Kruskal-wallis and LSD is done by SPSS software.

### 4. Results

About first goal of research, results of one sample T statistical test are provided on octet classification. In this test, mean answers of questions of each level are used to commensurability and analogy. As it is shown, these levels are not necessarily consisting of equal subset (question) numbers. These terms makes using average index to compare these levels unavoidable. According to used coding, test value equals 3 (average 1 to 5). In this way, values bigger than 3 for a level show that this level is considered as an implementation barrier and as the value is bigger, it would be considered as a more important barrier (Table 1)

<table>
<thead>
<tr>
<th>Table 1: The sample T test for octet classification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level name</strong></td>
</tr>
<tr>
<td>Human resource</td>
</tr>
<tr>
<td>Cultural</td>
</tr>
<tr>
<td>conceptual</td>
</tr>
<tr>
<td>Structural</td>
</tr>
<tr>
<td>Strategic</td>
</tr>
<tr>
<td>Resource</td>
</tr>
<tr>
<td>Operational</td>
</tr>
<tr>
<td>Managerial</td>
</tr>
</tbody>
</table>

Number of observations (N) = 44
Degree of freedom (d.o.f) = 43

According to the table, it is obvious that average of all levels from test value, means 0. Number 3 is bigger and except resource level, others have confidence level more than 0.999. Hence, it can be concluded that ranking barrier levels (top down) consist of: 1. Managerial, 2. Cultural and structural, 4. Conceptual, 5. Human resource, 6. Strategic and operational and 8. Resource. It is noteworthy that both
cultural and structural barriers are in second level and so next one (conceptual barriers) place in fourth level. And so, both strategic and operational barriers are in sixth level and hence next one (resource barrier) is in eighth level. Resource level is the only level which has no significant statistical value, means that hypothesis of equality with zero cannot be rejected about it. In other words, it can be concluded that this level does not necessarily considered as barrier and has the last priority. This test means that lack of resource is a barrier to implement strategic management methods in marketing and in this regard, company has no specific deficit. But, other levels form main barriers. To rank barriers Fridman test is also used. Results of this test are shown in figure 2.

Figure 2: Ranking octet levels based on Fridman test

<table>
<thead>
<tr>
<th>Rankings</th>
<th>Resource</th>
<th>Human Resource</th>
<th>Operational</th>
<th>Strategic</th>
<th>Conceptual</th>
<th>Cultural</th>
<th>Structural</th>
<th>Managerial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.32</td>
<td>3.04</td>
<td>4.08</td>
<td>4.1</td>
<td>4.45</td>
<td>4.98</td>
<td>5.17</td>
<td>5.68</td>
</tr>
</tbody>
</table>

Number of observations (N)= 44
Degree of freedom (d.o.f)= 7
Significant level (a)= 0.000

About second goal, by proofing first hypothesis this result show that product-markets at introduction level, if marketing strategy type of companies is the type of entering market level and selecting product level strategy in their marketing is type of prospector strategy, they have better function than those companies using other strategies of product level in strategy (analyzer, low cost defender) in this product-market.

Proofing second hypothesis this result states that, product-markets in growing level will have better operation than other companies (companies with prospector, differentiator defender and low cost defender type of selecting product level strategy in marketing in this product-market) if marketing strategy is the type of growing market strategies and selecting strategy of product level in their marketing is the type of analyzer strategy.

Proofing third hypothesis result stated that in product-markets at maturity level and if their type of marketing strategy is mature market strategy and selecting strategy of product level in their marketing is type of differentiating defender, have better operation than other companies (companies which have selecting strategy of product level in their marketing is type of prospector, analyzer and low cost defender in this product-market).

Proofing fourth hypothesis show that product-markets at decline level will have better operation than other companies (companies that their type of selecting strategy of product level in their marketing in this product-level is the type of prospector, analyzer and differentiation defender) if they have type of declining market strategies and selecting strategy of product level in their marketing is low cost defender. Above results verify conceptual framework of research.
5. Conclusion
This research has studied two consecutive goals. For the first goal, article observations can be interpreted in this way that among octet classification, managerial barriers level has highest importance. It means that, managerial problems are considered as the most important barrier toward effective implementing marketing strategies. After managerial barriers, structural barriers are at second level and cultural, conceptual, strategic, operational, human resource and resources are in the order of importance in next levels. It means that, resources are mainly not considered as barrier to implement strategic management methods in marketing. For the second goal, it can be concluded that strategic management methods should be adjusted to approved level and marketing.

Resources


Strategic Planning of Universities Based on Harvard Model

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Abstract

Today, management based on strategic planning is the key to organizations success. In fact, developing and implementing a strategic planning is a necessity in dynamic environment of universities. In order to achieve an organization’s targets determined by its vision, it is needed to make a strategic planning. The present paper represents a step by step model for developing a strategic planning by which all universities can implement their planning strategies. Harvard model is the model presented in the research. According to Harvard model, mission of organization is determined based on its vision, then four main factors including internal strengths and weaknesses of universities as well as external opportunities and threats of them will be scrutinized. The main strategy is made up of the four mentioned factors. It is possible to reach targets and missions of universities via the introduced strategy. Providing training services and educating human resources are the main missions of universities. Therefore, according to Iran 20 year vision and mission of its universities, strategic planning is defined based on pattern of Harvard model (SWOT) to improve qualitative services of universities.

Keywords: Strategy, management, university, Harvard model, mission, opportunity, threat

Introduction

Most of the theorist and authors believe that Harvard business school is the pioneer of modern strategic approaches analysis. The main ideas of this school concentrate on distinguishing internal weaknesses and strengths of an organization as well as determining opportunities and threats of its surrounding environment. The contact between organization and environment is naturally formed by considering leaders’ social responsibilities and the system of values dominating their mind. Since 1920s Harvard model has been taught at Harvard business school. This model has inspired many of the new strategic management models in governmental and private sectors. The main goal of Harvard model is to help firms develop the best strategies for themselves.

Main Body

Developing a strategic planning includes several stages which have been indicated in table number 1.
Table 1: Steps for developing a strategic planning

<table>
<thead>
<tr>
<th>Stage</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Beginning stage</td>
<td>Determining missions and announcing them</td>
</tr>
<tr>
<td>2. Input stage</td>
<td>Matrix of assessing internal factors, matrix of assessing external factors</td>
</tr>
<tr>
<td>3. Comparison stage</td>
<td>Proving SWOT matrix</td>
</tr>
<tr>
<td>4. Decision making stage</td>
<td>Developing a strategy based on four factors</td>
</tr>
</tbody>
</table>

1. Beginning Stage

The first stage of determining strategy is to determine mission and provide an announcement for it. An organization mission is determined based on its priorities, strategies, plans and duties. In the mission announcement, factors such as goals, customers, products, services, markets and main technologies are clearly determined. Some organizations provide two documents for their missions and visions. If the organization mission answers the question “why do we exist?”, its vision will answer the following question “where do we want to be in the future?”.

2. Input Stage

The second stage provides matrix of assessing internal factors as well as matrix of assessing external factors.

   External factors include economic, political, legal, cultural, social, geographical and technological factors for each of which some special indices and parameters are defined. The mentioned indicators are not fixed and can vary from one organization to another one.

   Five steps for determining matrix of assessing external factors

   Step 1: write down 10 to 20 factors that bring about opportunities of the organization as well as 10 to 20 factors that bring about threats of it. To determine opportunities and threats it is better to use ratio, percent and comparable numbers.

   Step 2: give coefficients to the mentioned factors. The coefficients vary from zero (not important) to 1 (very important). The coefficient determines effect of indices on organizational performance. In comparison with threats, higher coefficient is given to opportunity factors; however, high coefficients are also given to severe threatening factors. The sum of factors coefficients should equal 1.

   Step 3: each of the factors are marked from 1 to 4. Rank 1 stands for weak reaction, rank 2 stands for average reaction, rank 3 stands for reaction more than average level, and rank 4 stands for perfect reaction of an organization. Rank indicates amount of an organization reaction to a factor.

   Step 4: multiply coefficient of each factor by its rank to achieve the final score.

   Step 5: calculate sum of scores related to each variable in order to determine total score of the organization.

   If total score of an organization in the matrix is more than 2/5, the organization opportunities overcome its threats. If total score of an organization is less than 2/5, its threats overcome the opportunities.

Matrix of Assessing Internal Factors

Internal factors are related to internal environment of organizations and contrary to external ones, they are under control of organization management. Strengths are considered as advantages for the organization, while weaknesses are considered as inabilities of an organization. In other words, weaknesses indicate things than an organization cannot do; however, other organizations have the ability to do them. Internal factors include research and development, services and products, markets, human resources, financial resources, and managing factors. There are certain indices for each of the factors. Indices are not fixed and they may vary from one organization to the other organization.
Five Steps to Provide Matrix of Assessing Internal Factors
Step 1: write down 10 to 20 factors that are considered as strengths of an organization as well as 10 to 20 factors that are considered as weaknesses of it. To determine strengths and weaknesses it is better to use ratio, percent and comparable numbers.

Step 2: give coefficients to the mentioned factors. The coefficients vary from zero (not important) to 1(very important). The factors with highest effect on performance are given the highest coefficient.

Step 3: each of the factors are marked from 1 to 4. Rank 1 stands for weak reaction, rank 2 stands for average reaction, rank 3 stands for reaction more than average level, and rank 4 stands for perfect reaction of an organization. Rank indicates amount of an organization reaction to a factor.

Step 4: multiply coefficient of each factor by its rank to achieve the final score.

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Planning a Matrix to Assess Internal Factors of University
a. Strengths and Weaknesses Indices Determination
According to internal factors in educating, research, student activities, cultural, constructing, financial and administrative fields, indices affecting universities are recognized as weaknesses and strengths, and then some questions are made for them. The questions will be analyzed and 10 indices related to strengths along with 10 indices related to weaknesses will be determined and mentioned in table 2.

b. Factor Determination
A questionnaire will be provided based on the indices and represented to the statistical population. Respondents determine to what extent each of the indices affect the performance of universities. After analyzing the questionnaire, mean of each index is determined and means of all indices are added to one another. Moreover, it is possible to determine coefficient of each factor via ratio.

c. Rank Determination
A questionnaire based on indices is formed and distributed among individuals of statistical population to respond. Respondents determine the reaction of universities to the indices. After analyzing the questionnaire, mean of each index is obtained. Based on the obtained indices, it is possible to rank the indices from 1 to 4. If one could take advantage of numbers and ratios, there will be no need to a questionnaire and it will be possible to determine ranks based on ratio of the current position to the standard position.

d. Score
Factor of each index is multiplied by rank of it.

e. Conclusion
If the sum of scores is more than 2/5, it will indicate that strengths are more than weaknesses.

Table 2: Matrix of assessing internal factors

<table>
<thead>
<tr>
<th>Score= factor $\times$ rank</th>
<th>Rank</th>
<th>Factor</th>
<th>Index</th>
<th>Strengths / weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational field</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research field</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultural activities field</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction field</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial field</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Administrative field</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 $\leq$ score $\leq$ 4</td>
<td></td>
<td>1</td>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>
Methodology
Planning a Matrix to Assess External Factors of University

a. Opportunities and Threats Indices Determination
According to external factors such as economic, political, cultural factors, indices affecting universities are recognized as opportunities and threats, and then some questions are made for them. The questions will be analyzed and 10 indices related to opportunities along with 10 indices related to threats will be determined and mentioned in table 3.

b. Factor Determination
A questionnaire will be provided based on the indices and represented to the statistical population. Respondents determine to what extent each of the indices affect the performance of universities. After analyzing the questionnaire, mean of each index is determined and means of all indices are added to one another. Moreover, it is possible to determine coefficient of each factors via ratio.

c. Rank Determination
A questionnaire based on indices is formed and distributed among individuals of statistical population to respond. Respondents determine the reaction of universities to the indices. After analyzing the questionnaire, mean of each index is obtained. Based on the obtained indices, it is possible to rank the indices from 1 to 4. If one could take advantage of numbers and ratios, there will be no need to a questionnaire and it will be possible to determine ranks based on ratio of the current position to the standard position.

d. Score
Factor of each index is multiplied by rank of it.

e. Conclusion
If the sum of scores is more than 2/5, it will indicate that opportunities are more than threats.

Table 4: Matrix of assessing external factors

<table>
<thead>
<tr>
<th>Score= factor× rank</th>
<th>Rank</th>
<th>Factor</th>
<th>Index</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Economic environment</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Political environment</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Legal environment</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Cultural environment</td>
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</tr>
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<td></td>
<td></td>
<td></td>
<td>Social environment</td>
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<td></td>
<td></td>
<td></td>
<td>Technological environment</td>
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<td></td>
<td></td>
<td></td>
<td>Geographical environment</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Threats</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Economic environment</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Political environment</td>
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<td>Legal environment</td>
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<td></td>
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<td></td>
<td>Cultural environment</td>
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<td>Social environment</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Technological environment</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Geographical environment</td>
<td></td>
</tr>
<tr>
<td>1≤ score≤ 4</td>
<td>1</td>
<td></td>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>


Discussion and Results

Comparison Stage

SWOT (strengths, weaknesses, opportunities, threats) matrix is an important means by which managers compare information and take advantage of strategies.

Steps to make a SWOT matrix

Step1: enter the list of prioritized opportunities associated with matrix of assessing external factors in table 4.
Step2: enter the list of prioritized threats associated with matrix of assessing external factors in table 4.
Step3: enter the list of prioritized opportunities associated with matrix of assessing internal factors in table 4.
Step4: enter the list of prioritized weaknesses associated with matrix of assessing internal factors in table 4.
Step5: write down results of a comparison between internal strengths and external opportunities as well as possible strategies related to them in “SO strategies” group.
Step6: write down results of a comparison between internal weaknesses and external opportunities as well as possible strategies related to them in “WO strategies” group.
Step7: write down results of a comparison between internal strengths and external threats as well as possible strategies related to them in “ST strategies” group.
Step8: write down results of a comparison between internal weaknesses and external threats as well as possible strategies related to them in “WT strategies” group.

Table 4: SWOT matrix

<table>
<thead>
<tr>
<th>Weaknesses (W)</th>
<th>Strengths(S)</th>
<th>Matrix of assessing internal factors and matrix of assessing external factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>WO strategy removes weaknesses by taking advantage of opportunities</td>
<td>SO strategy exploits strengths by taking advantage of opportunities</td>
<td>Opportunities (O)</td>
</tr>
<tr>
<td>WT strategy reduces weaknesses and avoids threats</td>
<td>ST strategy avoids threats by taking advantage of strengths</td>
<td>Threats (T)</td>
</tr>
</tbody>
</table>

Decision Making Stage

The integration of factors included in SWOT matrix leads to the four following strategies:

- SO strategy: the goal is to exploit capabilities in order to maximize opportunities
- ST strategy: the goal is to increase capabilities and decrease threats
- WO strategy: the goal is to decrease weaknesses and increase opportunities
- WT strategy: the goal is to decrease weaknesses and threats as much as possible

The mentioned strategies make up the strategic planning of the organization.

Conclusion

The research explains a step by step process of developing a strategic planning for higher education system based on SWOT matrix model. Therefore, all researchers and individuals who are inclined to make a strategic plan for educational and non-educational institutes can act based on the represented model of the present paper as well as considering its details.
References


The Impact of Patterns of Criminal Behavior on Simple Robbery Among Adolescents

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Abstract

Among offenses committed by adolescents, robbery has a noticeable importance. Robbery is not a new phenomenon associated with the new period, it has been one of the oldest committed crimes among adolescents, and however, what matters is the prevalence of this crime among adolescents at the present time. Some of the criminologists believe that prevalence of robbery among adolescents is more that other common crimes. To their belief, it is also possible to relate the issue of children and adolescents’ crimes to their committing robberies. The main purpose of the present paper is to study impact of patterns of criminal behavior on simple robbery among adolescents. In order to achieve this purpose, 70 adolescents at the age range of 15-19 at correction and rehabilitation center located in Alborz province have been studied based on the researcher’s questionnaire, previously done researches and experts’ opinions in 2012. The researcher’s questionnaire includes demographic factors that affect prevalence of robbery among the adolescents. Results of the present paper show impact of each of the variables on prevalence of robbery among adolescents. In fact, beta weight of parental crime background equals 0.336, beta weight of adolescent’s friends’ crime background equals 0.139, beta weight of having a tendency toward modeling friends’ criminal behaviors equals -0.508, beta weight of offense commitment at adolescents’ educational environment equals 0.150, beta weight of watching movies in which robbery is committed equals -0.190, and beta weight of living in areas where lots of crimes occur equals 0.137. Generally, with regard to the corrected coefficient of coordination determination, beta weight equals 0.62.

Keywords: Behavioral patterns, robbery, adolescents, criminal

Introduction

The research attempts to precisely study the impact of patterns of criminal behavior on robbery among adolescents. Therefore, based on the theories of learning a criminal behavior is learned through the process of having a relation with others especially in small groups (Ahmadi, 2012, p: 94). Researchers such as Bandura, Sutherland, and Tarde believe that behavioral patterns are formed in adolescents via observing others’ behaviors. If the patterns are criminal, they will enhance criminal attitudes in adolescents and accelerate the possibility that they might get criminals in the future. Family is the first area for modeling behavior and as a social unit, it has the most influential impact on individual’s
behavior. In fact, patterns present norms, criteria, and rewards that play an important role in cognitive development, improvement of the concept of “self”, and establishment of the identity in children (Biabangard, 2009, p:152). In this condition, if the family experience immortality, addiction, separation of family members, divorce, and robbery, the adolescent will find an opportunity to model such criminal behaviors of the family and get a criminal. In fact, families prepare the adolescents to accept social norms by planning educational and behavioral patterns, and playing social roles or better to say by performing socialization methods. If families could not transfer social norms to their adolescents, probably adolescents’ behavior would not be in accordance with norms of the society and such a behavior would be called criminal from perspective of the society (Elmi, 2006, p:44). Peers group is the second area that models behaviors for adolescents. From perspective of social psychology, making groups has an important role in forming social behavior of adolescents and presenting behavioral patterns to them. One of the most important patterns refers to the behavior of the peers group (Kaveh, 2012, p: 401). For adolescents, no matter is more important than getting accepted in peers group. Therefore, in adolescence, they feel alone and peers group could influence them. By being present in peers groups, for the first, the adolescents would be able to make a relation with others based on equity (Sharepour, 2004, p: 312). Therefore, the adolescents select peers group as a reference for their thoughts and behavior (Ahmadi, 2003, p: 96-97). As a result, it is obvious that peers group has a considerable impact on teenagers’ behaviors. Adolescents who are present in correction and rehabilitation centers usually introduce their “bad friends” as the main cause of their committing crimes. Schools are third area that affects adolescents’ behavior. After the family, the school is the second center for socialization and learning social norms and a considerable part of adolescents’ behavior and character is formed through school interactions and experiences (Ahmadi, 2012, p:137). In fact, teachers’ and classmates’ behaviors have an important impact on adolescents’ positive or negative behavior modeling. In fact, a great part of adolescents’ criminal behaviors is product of their educational environment. Anyhow, role of media and place of life should not be ignored either. Researchers have always considered these two factors in their applied researches. The media are not only considered as a means of spending spare time, their variety had a role as important as role of a university in teaching constructive or destructive behaviors. Place of life is also a place in which the adolescent’s social identity is formed. If many crimes happen in an adolescent’s place of life, it could provide patterns of criminal behaviors for adolescents. In this research, the impact of patterns of criminal behavior on simple robbery among adolescents has been studied in the behavioral realm. "Sometimes it is stated that criminal and non-criminal performances have their origins in similar learning principles; so, it is not necessary to present a particular theory about learning offensive behavior" (quoted by Ayllon and Milan, 1979).

Having such a viewpoint is not completely acceptable. If criminals are not born criminals, they must be changed into criminals. In fact, as people could learn to read and write, they could learn to commit criminal acts (Vinferi, 2009, p: 258). Therefore, presence of theories for responding to questions such as” what is exactly learned by criminals about committing crimes?” seems necessary.

Today, behavioral issues related to adolescents are studied based on behavioral sciences. Adolescents’ modeling or following a behavioral pattern is one of the issues considered by behavioral studies. Behavioral specialists present different definitions for the term of adolescents’ modeling. Some believe that adolescent’s modeling refers to the fact that an individual follows one’s behavior, as a result of observing his/her behavior (Seif, 2012, p: 352). Another belief is that adolescents imitate one’s behavior, words, and acts consciously or unconsciously (Hoseini, 1994, p: 148). The other group believes that modeling a behavior is an attempt to reflect an external act, so that it could be similar to its original form (Lotfi, 2001, p: 148). Modeling and imitating behaviors have two parts, acceptance and following. Therefore, family, peers group, school, living place, and media provide the behavioral patterns for adolescents. Therefore, the adolescents model the behaviors through these areas. In this
condition, if there are criminal behaviors in the mentioned areas, the process of modeling them could encourage the adolescents to get criminals.

Research Hypotheses
1. ‘Family’ is the first center of adolescents’ socialization among other areas mentioned for patterns of criminal behaviors. Moreover, it considerably affects their willingness to commit the crime of robbery.
2. There is a significant relation between criminal background of adolescents’ parents and their willingness to commit robbery.
3. There is a significant relation between adolescents’ friends’ criminal background and the adolescents’ committing robbery.
4. There is a significant relation between having a tendency to model friends’ criminal behaviors and the adolescents’ commitment of robbery.
5. There is a significant relation between commitment of crimes at the adolescents’ educational environment and their committing robbery.
6. There is a significant relation between watching movies in which the robbery occurs and the adolescents’ committing robbery.
7. There is a significant relation between living at places where lots of crimes occur and the adolescents’ committing robbery.

Methodology
In order to study impact of patterns of criminal behaviors on simple robbery among adolescents, a research was done based on field and library methods. First, a written questionnaire was formed based on the most important bases of criminology associated with adolescents’ behavioral patterns of committing robbery via library resources, previous researches, and the experts’ opinions. The prepared questionnaire included individuals’ personal characteristics and behavioral patterns in areas such as family, school and so forth. After providing the questionnaire, they were distributed to 70 adolescents of correction and rehabilitation center to achieve statistical samples and study them. In the next stage, two descriptive and inferential methods were used to collect questionnaire content, categorize information, transfer it to computers, process the categorized information, and assess it by statistical criteria. These two methods were presented and studied in analysis section of statistical findings.

Statistical Population
The statistical population of the study consists of over 96 adolescents who have committed robbery and now spend time in Fardis and central correlation and rehabilitation centers of Karaj located in Alborz province.

Measuring Tools
In this research, a written questionnaire including fifty questions has been used to collect the needed data and study it. The questionnaire is designed based on theoretical principles, research background, variables definition, concepts definition, measuring levels, and variables assessments. The questionnaire includes two or multi-part questions at the level of nominal or sequential measures. The questions are made following Likert spectrum. The questionnaire validity is confirmed via confirmatory factor analysis (CFA) and face validity. Moreover, the questionnaire reliability is confirmed via test-retest method and Cronbach’s alpha of 0.89. The most fundamental bases of the questionnaire to study impact of patterns of criminal behaviors on simple robbery among adolescents are mentioned as follows:
1. Individuals’ demographic characteristics and family’s personal information
2. Amount of willingness to commit robbery in relation with the mentioned variables
3. Impact of behavioral pattern presented at schools on committing robberies
4. Impact of friends’ and peers’ behavioral pattern on committing robbery
5. Impact of behavioral pattern presented by family on committing crime
6. Impact of behavioral pattern presented in living place on committing crime
7. Impact of the media behavioral pattern on committing robbery

Statistical Analysis Method
In the present paper, encoded information has been analyzed by SPSS software. The descriptive statistic includes frequency tables and figures. Inferential statistical methods of Pearson coefficient correlation at level of $P \leq 0.05$, and regression analysis have also been used to test research hypotheses regarding variables that affect simple robbery among adolescents.

Discussion and Results
Characteristics of the Statistical Population

a. Respondents’ Distribution Based on Age

Table 1: Respondents’ distribution based on percent and frequency of age

<table>
<thead>
<tr>
<th>Relative frequency (percent)</th>
<th>Absolute frequency</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2</td>
<td>3</td>
<td>12-14 years old</td>
</tr>
<tr>
<td>57.2</td>
<td>40</td>
<td>15-17 years old</td>
</tr>
<tr>
<td>38.6</td>
<td>27</td>
<td>18-20 years old</td>
</tr>
<tr>
<td>100</td>
<td>70</td>
<td>total</td>
</tr>
</tbody>
</table>

Respondents’ distribution based on percent and frequency of age indicates that 4.2 percent of them are at age range of 12-14 years old, 57.2 percent of them are at range of 15-17, and 38.6 percent of them are at age range of 18-20. The results show that majority of respondents are at age range of 15-17 years old.

Figure 1: Respondents’ distribution based on percent and frequency of age 10
Inferential Section

Research Hypotheses
What area of patterns of criminal behavior is more effective on adolescents’ committing crime?

Table 2: Results of Pearson correlation test between patterns of criminal behavior and adolescents’ committing robbery

<table>
<thead>
<tr>
<th>patterns of criminal behavior</th>
<th>Sample size (N)</th>
<th>Nominal value of Pearson correlation</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>70</td>
<td>0.727</td>
<td>0.000</td>
</tr>
<tr>
<td>Living place</td>
<td>70</td>
<td>0.568</td>
<td>0.000</td>
</tr>
<tr>
<td>Friends</td>
<td>70</td>
<td>0.456</td>
<td>0.000</td>
</tr>
<tr>
<td>Media</td>
<td>70</td>
<td>0.431</td>
<td>0.000</td>
</tr>
<tr>
<td>school</td>
<td>70</td>
<td>0.341</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Results of Pearson correlation test shows that Pearson test for all criminal patterns is significant at level of one percent. Therefore, the presented hypothesis is confirmed. It means that there is a positive and significant relation between patterns of criminal behavior and adolescents’ committing robbery. The results show that patterns of criminal behavior associated with family have the most influential impact on adolescents’ committing robbery. In fact, family is the first entity that has the most psychological and sociological impact on adolescents and adolescents introduce their family members as their best paradigms. After family as the most important entity patterns of criminal behavior associated with living place, friends, media, and school respectively have the maximum impact on adolescents’ committing robbery.

Figure 2: Amount of correlation between patterns of criminal behavior and adolescents’ committing robbery

Results of regression analysis related to impact of patterns of criminal behavior on adolescents’ committing simple robbery

With regard to correlation test, the relation between independent variables has been studies. In order to summarize research results, the multiple-regression is used. The multiple-regression also studies impact of different variables on changing level of committing robbery, and determines main determinant of the variable. According to the present regression analysis, first the strongest independent variables enter the equation one by one, and the process continues to the time that error of
statistical test arrives at 5 percent. Therefore, other variables whose test error is more than 0.05 percent cannot enter the regression equation.

Table 3: Analysis of variance related to independent variables and adolescents’ committing robbery

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of squares</th>
<th>Degree of freedom</th>
<th>Mean square</th>
<th>F statistic</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>1158.998</td>
<td>5</td>
<td>192.833</td>
<td>18.110</td>
<td>0.000</td>
</tr>
<tr>
<td>Residual</td>
<td>606.939</td>
<td>57</td>
<td>10.648</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>1763.938</td>
<td>63</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The obtained results of the above table indicates that regarding F-test value and its significance at confidence level equal to 1 percent, regression equation is valid and its results are analyzable.

Table 4: Regression coefficients and coefficient of determination associated with independent variables and adolescents’ committing robbery

<table>
<thead>
<tr>
<th>Non-standardized</th>
<th>Standardized</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>coefficients</td>
<td>coefficients</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Std. error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>Fixed value</td>
<td>3.61</td>
<td>1.964</td>
<td>7.037</td>
</tr>
<tr>
<td>Adolescents’ parental criminality</td>
<td>.165</td>
<td>.031</td>
<td>.336</td>
</tr>
<tr>
<td>Adolescents’ friends’ criminal background</td>
<td>1.237</td>
<td>.260</td>
<td>.139</td>
</tr>
<tr>
<td>Willingness to model friends’ criminal behaviors</td>
<td>-.799558</td>
<td>.167</td>
<td>-.508</td>
</tr>
<tr>
<td>Crimes occurrence at adolescents’ educational environment</td>
<td>.558</td>
<td>.212</td>
<td>.150</td>
</tr>
<tr>
<td>Watching movies that show robberies occurrence</td>
<td>-.917</td>
<td>.206</td>
<td>-.190</td>
</tr>
<tr>
<td>Living at criminal places</td>
<td>.87</td>
<td>.26</td>
<td>.137</td>
</tr>
<tr>
<td>R=.81</td>
<td>R square= 0.65</td>
<td>Adjusted R squares=.62</td>
<td></td>
</tr>
</tbody>
</table>

Dependent Variable: Committing Robbery

Multiple-regression analysis is used to predict committing robbery by adolescents based on six variables (Adolescents’ parental criminality, adolescents’ friends’ criminal background, willingness to model friends’ criminal behaviors, crimes occurrence at adolescents’ educational environment, watching movies that show robberies occurrence, and living at criminal places). With regard to the above table, value of the multiple-correlation coefficient of the six variables equals 0.81, the value indicates intensity of the relation between the dependent variable and independent variables. Moreover, coefficient of determination equals 0.66; this value indicates that 66 percent of changes related to dependent variable (committing robbery by adolescents) is related to adolescents’ parental criminality, adolescents’ friends’ criminal background, willingness to model friends’ criminal behaviors, crimes occurrence at adolescents’ educational environment, watching movies that show robberies occurrence, and living at criminal places.

Therefore, analysis of regression equation is presented as follows:

\[ Y = 3.61 + 0.139X_2 + 0.508X_3 + 0.150X_4 – 0.190X_5 + 0.137X_6 \]

Conclusion

The issue of adolescents’ deviance and criminality has always been considered in human societies. At the present time, many of the experts of human sciences fields call it as one of the most important social deviances. Prevalence of robbery in the world indicates that robbery is one of the important disasters of the societies. Adolescents’ committing robbery is considered both as a crime and a social deviance, and its prevalence is considerable in most of the societies. Over time, it has confronted many
changes; however, disapproval of it has always been constant. What distinguishes robbery from other crimes is its presence among all age groups, moreover, its prevalence among adolescents is considered as a warning for the future communities. Therefore, the present paper has attempted to study this social deviance based on a new attitude and applied approach in order to fight against this phenomenon based on a better understanding of adolescents’ behavioral modeling of robbery. Generally, there is a positive and significant relation between patterns of criminal behavior and adolescents’ committing robbery. According to the investigated behavioral areas, family pattern of criminal behavior has the maximum impact on adolescents’ committing robbery. Family is known as the first entity that is responsible for teaching the correct behavior to the family members. Therefore, adolescents are mostly in contact with family behavioral patterns. Sutherland believes that juvenile delinquency occurs as a result of families’ mistake in teaching them the norms and values. Consequently, if the youth confront issues such as family criminal background, parents’ imprisonment, divorce, and lack of intimacy among family members during the modeling process, they will find a tendency toward delinquency and crimes such as robbery. Hence, teaching the youth the correct behaviors in the family environment is one of the ways to establish ones’ personality. It should be noticed that relations within the family has an important role in directing the adolescents’ modeling and imitating behavioral patterns.

In order to decrease prevalence of committing robbery among adolescents some suggestions have been presented here:

1. Providing counseling programs and social help for families to teach the parents points related to adolescents’ characteristics, and their tendency toward modeling behaviors. This teaching process could lead to development of the adolescents’ imitation process and prevent from their willingness to commit robbery.

2. According to field studies, majority of the respondents’ parents have been used to beat each other and act violently. Therefore, informing parents -as the main reference for adolescents’ modeling- of the correct way of interacting with each other and making a friendly relation with their children could be an effective solution for decreasing the adolescents’ tendency toward committing robbery.

3. Statistical results of the present paper shows that a high percent of parents have a weak observation on the respondents’ telephone conversations, time of leaving home and coming back home, and their friends’ behavioral characteristics. Therefore, to decrease the adolescents’ modeling criminal behaviors, teaching parents is needed. In other words, teaching parents increases cultural level of families, and sense of their responsibility for their children. The result of the teaching leads to decrease of adolescents’ committing robbery in a long period of time.

4. Since visual media is an important reference for adolescents’ modeling behaviors, parents should control the programs their adolescents are interested in and they should even limit the hours that they watch satellite programs. In other words, if visual media do not present constructive programs, limiting the time of watching their programs is a way to prevent form teaching the adolescents different methods of committing crimes such as robbery.

5. Regarding the results of the present paper, over 70 percent of the respondents have left education and found a tendency toward committing robbery. Therefore, changing schools in an intimate environment provides educational patterns for students and does not let them get willing to model criminal behaviors for themselves.

6. Adolescents who live in criminal areas should be encouraged to take part in making assemblies whose purpose is to perform cultural and useful activities. This act brings about an opportunity for the adolescents to spend their time on doing right activities and be far from committing criminal acts such as robbery.

7. Since understanding the adolescents’ motivation for committing robbery helps to correct them, it has been suggested to make personality cases for them with the purpose of analyzing their motivation and finding the area to which their act belongs. Consequently,
some solutions will be suggested to correct that recognized area and decrease rate of committing robbery among the adolescents.

8. Adolescents present at the center of correction and rehabilitation are not separated from one another based on their committed crime, as a result, the adolescents who are sent to these centers for the first time as a result of committing robbery, will learn new crimes or new methods for committing different robberies. The suggestion is to separate the place where adolescents with the first experience of committing robbery are held from that of the adolescents with a long experience of committing crimes.

9. Adolescents at correction and rehabilitation centers will face irreparable damage. They will learn new patterns of criminal behaviors at the centers; therefore, they should be kept at family environment and take advantage of family members’ support.

References

Application of Microstrainer in Recycle of Spent Filter Backwash Water of Conventional Water Treatment Plants

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**Abstract**

Conventional treatment plants, by definition (40 CFR 141.2), employ the following four unit processes: coagulation, flocculation, sedimentation, and filtration. In this study, microstrainer application in recycle of Spent Filter Backwash Water (SFBW) has been investigated. The results show that physicochemical and biological quality of SFBW can be added to the inlet water but it must be treated with microstrainer filter. The SFBW was passed through standard membrane with 5, 18, 40, 70 µm size and filtered SFBW was analyzed. 5, 18 and 40 µm membrane showed respectively the best results. Applying 5 µm membrane that the best results found removing amount of biological factors include: diatom 85.77 to 90 percent, Cyanophyceae 100%, Crustacean 100%, Rotifer 100%, and removing percent of physicochemical parameters include: Turbidity 44.78%, Iron 51.24% and Manganese 35.35%. In present study 18 µm membrane is economical membranes because after filtering the SFBW with 18 µm membrane can be added to the inlet water.

**Keywords:** Water reuse, Water Treatment Plant, Spent Filter Backwash Recycling, Microstrainer

**1. Introduction**

The Filter Backwash Recycling Rule (FBRR) establishes regulatory provisions governing the way that certain recycle streams are handled within the treatment processes of conventional and direct filtration water treatment systems. The FBRR also establishes reporting and recordkeeping requirements for recycle practices that will allow States and EPA to better evaluate the impact of recycle practices on overall treatment plant performance [1]. Iran water resources are limited because it is located in arid and semi-arid climatic zone. In one hand, shortage of drinking water, and low rain fall mean (about
250mm yearly) in comparison with world mean (about 750 mm), non-normative withdraw groundwater, water pollution with domestic SFBW, agricultural SFBW and industrial SFBW are major challenges in water resources management [2-4].

Increasing population and limited water resources on one hand. Reduced per capita share of water than 14,000 m$^3$ at the beginning of this century to 1800 m$^3$ if that this trend continues, this share reaches to 1360 cubic meters[2, 5, 6]. So, reuse of renewable resources is very important. By studying water treatment process, filter backwash recycling is necessary. In order to prevent water lose, usually SFBW is collected in small pond then returned to inlet water of water treatment plant after removing water impurities. Backwashing is the process of reversing the water flow and the velocity of the water as it passes through a filter. For dewatering of sludge produced in water treatment plant sludge drying beds and sludge dewatering equipment are used.

In conventional water treatment process, about 2 to 3 percent of treated water is intended for filter backwashing. Before 1965 SFBW returns to water resources was common. But after 92-500 rule and reform in law of water pollution control in 1972, this act be forbidden. As a result, SFBW from washing (backwashing) of filters and outlet sludge from sedimentation tanks be grouped in industrial SFBW and water treatment plant is obligated to regard laws. These laws are published by National Pollutant Discharge Elimination System (NPDES) [8, 9]. After 92-500 general law approval, many of water treatment plant return SFBW from washing (backwashing) of filters to beginning of line with or without sedimentation.

For this purpose, its pollutants and suspended solids should be removed. Removal and treatment usually is done in primary and secondary sedimentation tanks or thickener tank which requiring large land and is time consuming [10-13]. To solve problems of land and time, microstrainer can be used. All water treatment plant which use surface water and underground water have proper and direct filtration or reuse overflow water in thickener tank or water from sludge drying beds should regard to filter backwash recycling Rules (FBRR). The Filter Backwash Recycling Rule (FBRR) establishes regulatory provisions governing the way that certain recycle streams are handled within the treatment processes of conventional and direct filtration water treatment systems. The FBRR also establishes reporting and recordkeeping requirements for recycle practices that will allow States and EPA to better evaluate the impact of recycle practices on overall treatment plant performance. Water recycling is effective in treat ability to removal and to inactive pathogens; return flow has high concentration of pathogens and other pollutants which they are trapped by filters. So, recycled water control chemically and biologically is very important. About FBRR rules, reporting information on recycled water include: number of nematode, Giardia and Cryptosporidium per liter, total suspended solids (TSS), heavy metals like Manganese (Mn), Zinc (zn), Iron (Fe), Aluminum (Al), Total organic carbon (TOC), Dissolved organic carbon (DOC) and Trihalomethanes (THM$_S$).

The microstrainer filter (MF) is a part of the tertiary stage of the waste water treatment process. It is used in processing industry, cooling water circuits and processes where it is necessary to reduce the quantity of insoluble substances in the hydro-mixture, possibly BOD and COD.

The design of the filter utilizes many well-tried features of foreign manufacturers complemented with the latest developments in the field of water filtration; the focus is on reliability, corrosion-proof quality, automatic operation and easy maintenance. The polluted water flows into the microstrainer filter while the insoluble substances are separated on the inner side of the filter. Filtrate water flows through the microstrainer and leaves the filtrating device. The flow capacity of the filter is gradually reduced due to increasing layer of the entrapped sludge. Thus the difference of water levels before and behind the device is increasing. The difference is scanned by a level sensor that triggers the cylinder drive and a rinsing pump; the pump cleans the microstrainer using the filtrated water and special cleaning nozzles with controlled flat stream. Sludge water flows out to another section of the device where a sewage pump controlled by level sensors drives the water out of the filter. The sludge water can flow out of the microstrainer filter by means of gravitational forces, according to local conditions [14-17].
There is very little head to force the fluid through a micro-strainer, so the mesh size of the screen must be coarse to get a practical filtration rate. Consider the screen shown in the sketch and some algae of different sizes and shapes. Some algae have beautiful spiral components, but this was too hard to draw [14].

Microstrainers can be used to remove algae and planktons from water which stored behind dams [18]. The algae marked is only slightly larger than the mesh opening. It is likely to clog the mesh, and some may pass through if the screen is not uniform. Compression of the filtered material is not likely to be too bad because that is the idea of the microstrainer to minimize forces.

Some of the shapes and sizes should collect well while others will pass the screen easily. The cylindrical organisms are of particular interest because their orientation is important. If they hit the screen on their long side, they are captured easily. When they approach lengthwise, they go right through.

Raw water has large amount of algae and planktons which are problematic for coagulation, they are usually suspended because their specific weights are less than 1.

Therefore, microstrainers be installed before coagulation and improves the performance of sedimentation tanks. If we chlorination raw water its alga create unpleasant flavor and odor due to forming substitute compounds. Algae removal before chlorination and coagulation has beneficial effects on the taste and odor control and more reduced Trihalomethanes (THM₃) and other compounds from the chlorination. Also using microstrainers reduces chlorine consumption in the pre-chlorination.

Material and Methods

- Standard sieves with 5-18- 40-70 µm mesh, for passing flavor samples with 15 cm diameter.
- Sampling dishes from simple crystal or borosilicate and PTF according to table I: standard method book for performing flavor and water testes.
- Microscope with zees Brand, primo star model.
- Knf brand 0-1200 mbar vacuum pump, LABOPORT model and its accessories.
- Spectrophotometer, HACH brand, DR/4000 model
- HACH turbidity meter system, 2100 AN model
- METROHM brand PH-meter system, 780 model
- HACH brand magnetic mixer, IKA-RCT basic model
- HACH brand electrical direction- system, session 5 model.
- BRAND transferpipette and micropipette

Sampling is compound and samples be passed instantly in standard meshes with 70 mm, 40mm, 18mm and 5mm sizes in lab.

Sampling and Samples Protection

According to standard methods book, 21 editions in 2005, sampling be done, then with regard to "sample should be part of whole rule. Experiments were done in Physicochemical and microbiological laboratory Fifth Tehran water treatment plant. Sampling basis (dishes, sample volume, storage time and condition) according to table I: 1060 standard meted book and US Environmental Protection Agency (US.EPA) is determined.

Sampling duration is 20 minutes and each minute 20 liter of flavor sample re over and after homogenizing it will be analyzed biologically and physic- chemically. Table 1 show average amount of turbidity and quality parameters of SFBW from backwashing of filters.

Samples should be taken at different time intervals and Compound because turbidity of SFBW from backwashing of filters in 2-3 minutes the first backwashing stage reaches its maximum.
**Measurement Methods**

Turbidity was measured according to standard methods with nephelometric method by N_{2100} machine, HACH brand. pH and temperature were measured by METROHM brand pH-meter machine, 780 models by using standard buffer solutions was calibrated daily. Electrical conductivity (EC) is measured METROHM brand pH-meter machine. TSS and TDS were measured according to the instruction of the standard methods book. Total organic carbon (TOC) is measured by spectrophotometer, HACH brand, DR/4000 model. To removal organic materials from dishes such as Beaker and pipette which be used along with Sulfochromic acid according to the instruction of the US.EPA washed at first by distilled water then by demineralised water with electrical conduction less than %5 µs/cm.

Fe, Mn, Cu and Zn were measured by spectrophotometer, HACH brand, DR/4000 model by 8008, 8149, 8026 and 8009 methods respectively. Machines before using accordance with the instructions of machine guide were calibrated.

**Mesh Properties used in Research**

Standard meshes which were used in research include SEFAR (filtration solution- open mesh fabrics-precision wren synthetic monofilament fabrics).

**Results and Discussion**

The physicochemical characterization of filtered samples with different sizes microstrainer was found that reducing the size microstrainer turbidity, iron and manganese are reduced. In tables 1 and 2, this process has been shown. This decreasing process is seen in biological organisms by doing experiments on meshes with different standard pore size that table 2 shows them.

**Table 1:** Physicochemical characteristic of Filter Backwash SFBW before using microstrainer and after treatment by microstrainer with different pore size

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before Microstrainer</th>
<th>After Microstrainer with different pore size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5 µm</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>22.4</td>
<td>3.03</td>
</tr>
<tr>
<td>pH</td>
<td>8.02</td>
<td>8.02</td>
</tr>
<tr>
<td>T (°C)</td>
<td>14.20</td>
<td>14.2</td>
</tr>
<tr>
<td>EC(µs/cm)</td>
<td>359</td>
<td>357</td>
</tr>
<tr>
<td>TDS(mg/l)</td>
<td>230</td>
<td>229</td>
</tr>
<tr>
<td>Fe(mg/l)</td>
<td>9.71</td>
<td>1.016</td>
</tr>
<tr>
<td>Mn(mg/l)</td>
<td>1.03</td>
<td>0.028</td>
</tr>
</tbody>
</table>

**Table 2:** Biological characteristic of Filter Backwash SFBW before using microstrainer and after treatment by microstrainer with different pore size

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before Microstrainer</th>
<th>After Microstrainer with different pore size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5 µm</td>
</tr>
<tr>
<td>Diatom</td>
<td>46800</td>
<td>6200</td>
</tr>
<tr>
<td>Chlorophyceae</td>
<td>22800</td>
<td>7800</td>
</tr>
<tr>
<td>Cyanophyceae</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Protozoa</td>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>Rotifer</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Crustacean</td>
<td>72</td>
<td>0</td>
</tr>
<tr>
<td>Nematode</td>
<td>24</td>
<td>0</td>
</tr>
</tbody>
</table>
Microbiological and physicochemical result show that except color factor which is due to chloroferric, other parameters of SFBW from backwashing of filter are less than inlet water to water treatment plant. So, the inlet raw water has the ability to accept the SFBW. Maximum removal efficiency in studied meshes with pore sizes 5-18-40-70 µm belongs to 5 µm membrane. Minimum removal efficiency in studied meshes with pore sizes 5-18-40-70 µm belongs to 70 µm membrane.

**Conclusion**

During the investigation it was found that biological and physicochemical water quality of the sedimentation tank and filters outlet is better than water quality from microstrainer outlet (using a 5µm mesh), so the idea that sand filters can be replaced with microstrainer is rejected but using microstrainers in comparison with other SFBW treatment methods is more economical. According to the results obtained in this study 18 µm membrane is economical membranes that removal efficiency of physicochemical parameters with using 18 µm mesh for Turbidity 30-50%, Iron 22-50%, Manganese 25-35% and TOC is 5% and removal efficiency of Biological parameters with using 18 µm mesh for diatom 49-96.7%, Protozoa 67-100%, Rotifer 67-100%, Cyanophyceae 100%, Crustacean 83-100% and nematode is 67-100%.

**Acknowledgment**

From the CEO supply and Treatment Company Tehran Water and SFBW and Deputy Maintenance and operation of Tehran water and SFBW treatment plant who worked in this study are greatly appreciated.

**References**


Application of Microstrainer in Recycle of Spent Filter Backwash Water of Conventional Water Treatment Plants

study of wetland assimilation using natural wetlands in Breaux Bridge, Louisiana, Ecological Engineering, 38, 114-118


Development and Verification of an Entrepreneurial Model for Increasing the Customers' Loyalty in Volleyball Spectators in Iran

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Abstract

Without the presence of spectators in sports, there wouldn't be any modern competition. If spectator be removed from professional sports, no one would compete and consequently all its marginal issues will be disappeared. The aim of the present study is to identify the attraction factors and to propose strategies for increasing the customers' loyalty of the spectators in the 2012 Asian volleyball Games. Therefore, 206 randomly chosen spectators completed the revised questionnaire of Corea, Steve and Trail. The findings of statistical model of SEM showed that motivational, social and place-time factors as well as financial and physical facilities in indoor sports (volleyball), have significant relationships with the tendency to participate in stadiums (p<0.01). This study is consistent with the findings of previous researches in this area. It should be noted that the entrepreneurial model mentioned in this study could be used in other fields of sports management.

Keywords: Attendance, spectator, volleyball, Structural equations model

Introduction

Nowadays, sports as a part of economic, in both scientific and spectacular aspects, have a significant role in the production and consumption of goods, sports services and economical developments in various societies and is now considered to be one of the most effective factors in national economic development and one of the most money making industries in the 21st century (Brown and Nagel, 2002). Motivation is a strong sense which is originated within the individuals and guides them toward doing a task or a purpose. Studying the motivation is simply to find out why individual do the tasks in a special way and basically what causes their activeness (Lee, 2001). Based on the research, sports is a
scientific achievement that through making a sense of personal identity, social recognition and feeling of interest has a strong motivation sense so that with a clear, considerable attractiveness and solidarity can gather all the people around the world to watch the games that we should not ignore its importance as a tool for attracting spectators today (Armstrong and Peretto Stratta, 2005). One common aspect between entrepreneurship and marketing is the study of methods through which marketing concepts and principles could be applied in the field of entrepreneurship. Because this issue has been repeatedly acknowledged that the marketing techniques used by entrepreneurs are somehow different from the concepts presented in the literature and traditional marketing contracts (Hall et al., 2010; Kolabi et al., 2011).

For entrepreneurs and owner managers of small enterprise, marketing is a method or in other words, a tactic for catching opportunities. They don’t consider marketing as an organizational culture or a strategic process, rather their definition of marketing have been taken from their own subjective and have great emphasis on using promotion techniques to attract customers while ignore other non-promotional aspects of marketing such as product development, pricing and distribution strategy. Most of the owner managers of small enterprise believe that their business relies on word of mouth marketing so they have no need to use informal marketing techniques. This does not necessarily mean that they do not have peers on fundamental aspects of marketing, but in fact they are not familiar with the concepts and terminology in this area and their assumption comes from their personal experiences (Hall et al., 2010, Kolabi et al., 2011; Mansouri et al., 2011).

The aim of the present study is to identify the attraction factors and to propose strategies for increasing the customer loyalty of the spectators in the 2012 Asian volleyball Games. Then, the study firstly presents a brief literature review, and then the methodology is discussed. Afterwards, the entrepreneurial model is presented and findings are elaborated.

**Literature Review**

In the literature, entrepreneurial behavior has been attributed to sports complexes. The nature of an entrepreneurial acting involves three dimensions including: innovation, risk taking and proactiveness; and since SMEs face some limitations such as having few major customer, financial constraints in field of marketing and limited resource, their effort especially in current turbulence environment, associated with higher risk and they need more creativity and innovation to face the risks. With a research in the field of social media we will reach to the idea that the sports factor has pervaded in all aspects of life and marketing competitions is also mainly institutionalized in our contemporary culture and in our era. The fame of sports stars, professional sports advertisements and at the university level, the quality improvements of Olympic Games and thousands of television channels and publications especial for sports, are examples of marketing high level games. The disorder base of this activity requires sports managers and corporate sponsors to attract sportsmen and advance their activities. Considering these disorders in this kind of activity most of the providers of advertising channels, legal and corporate supporters or sponsors require to attract people to increase the use of these sports equipments (Hall et al., 2010).

Spectators are of the most important factors in every sports game that by attending in games in addition to supporting the team also leads to making high profits which their study of behavior motivation in the way of watching the games is one of the most important achievements of the present study. Considering the given statistics in the recent years the number of basketball spectators, despite being less than other sports, is decreasing considerably and only leads to the last games of the leagues. This continuous decrease causes some problems in the sports community of Iran such as losing main capitals of sports which are the spectators, a decrease in the sports clubs' profit making and its reduction of importance among people (MohammadKazemi, 2007).

Based on a thorough literature review and interviews with soccer fans and industry experts, Marko Sarstedt et.al. (2012) developed an analytical model for measuring soccer fan satisfaction (FANSAT). The impact-performance map results of the driver analysis showed that stadium features,
Aspects of the stadium, club management, and fan-based support for the club are the most important determinants of fan attendance (Abel et al., 2007).

Spectators spend a lot of money during their presence in games. Sports team managers and marketers should use marketing strategies and models to increase the presence of spectators in stadiums and more profit making. To increase the spectators' attendance it is necessary to identify effective factors, both mental/internal and external/environmental factors, and the importance of each on their presence is measured (Abel et al., 2007).

The aim of the Hyun-Duck Kim et al. (2006) was to identify the effects of five factors of service quality, including tangibles, reliability, responsiveness, assurance, and empathy on customer satisfaction, and repurchase intention for Korean professional basketball league spectators. The findings of analysis of variance indicated that demographic variables including education, income, and season ticket status were significantly related to the mean levels of service quality. The results from the regression model indicated that the factors of reliability and assurance were the most influential factors on overall customer satisfaction. This finding indicates that the performances of service encounters have substantial potential for making a significant impression on customer perceptions of service attributes at the professional sport event. The regression model involving the five factors of service quality and repurchase intention revealed that the factors of tangibles and assurance were identified as the most critical related to overall repurchase intention (Won and Kitamura, 2006).

Mainly there are several theories which are in relation with motivating and the presence of spectators in games such as Schwartz's success theory about spectators role in team's success, Hardy's emotional drain theory about emotional drain caused by the decrease in aggression due to watching the game, Mullin's positive effects theory about the spectators' viewpoint toward the games as the recreation and health aspect that lead to a lot of spectators attraction, we can also name different ways such as advertisement, team identity, financial costs, setting a safe environment and athlete's skill. The question that what theories and factors influence the spectators' attraction to games has drawn researchers' and sports marketers' minds towards itself. The main and key factor is the collapse or failure of sports organizations, the lack of applying customer's behavior strategy and sports advertisement techniques. In competitions, it is considered that the determinant factor is the ultimate success. For any successful marketing planning or advertisement plan in sports, the spectators' and sports customers' recognition should be set as the base. The strategy proposed by "Cutler and Turner", identifying the groups of customers with common characteristics and with marketing responses are the same. Applying the strategy for a consumer's market, requires a grouping under the categories of (age, sex, and income) and psychological (lifestyle and personality) and behavioral studies (profit status of the consumer, consumption rate, loyalty and attitude). Understanding the factors of attracting spectators' attention to sports activities, is the key developmental programs to guide the processes and the strategy to develop our goals, because the purpose of marketing and sport, is having the skills to do something that is interesting to the participants (Won and Kitamura, 2006).

Steve Chen and et al. (2010) examined the ticket purchasing motivation and interests of 334 season-ticket holders. The participants' purchasing motivation and interests were surveyed onsite in the 2008-9 season by utilizing a 12-item self-created instrument with a high level of internal reliability. The results indicated that the participants' ticket purchasing motivation was mainly influenced by the competition and psycho-social related factor (CPR) and price and promotion (P&P) factor (Hong and Kim, 2008).

Sport marketing is unique, because its' customers are not like the customers of other products. Creators of sporting events cannot predict its' aspects due to the free nature of the activities, instability of the events and uncertainty of the results (Brown and Nagel, 2002). The necessity to globalize sports that began in the 1980s changed the role of sport in society and provided many profitable opportunities for individuals, enterprises and various media [8]. In many cases, situational factors have a specific effect on customers' behavior where the use of assessment tools, lifestyle and individual characteristics all together are a very effective way in promoting multiple marketing strategies. Individuals do not face
with situations accidentally. Instead, most people chose or make the situations that they are faced with. The growth in marketing services is focused on the importance of physical and social elements and other important factors that are effective on the spectators' behavior (Lee, 2001).

Physical and social factors are two important factors in a marketing strategy where services are consumed. Services are quite mixed with the environment in which they are manufactured and this can give marketers a unique opportunity to be more effective in examining the managing factors of environmental parameters as a tool for creating marketing strategies (Mullin et al., 2007).

Regarding the above instances, the present study intends to find the effective factors on attracting spectators to the volleyball competitions in 2012 Asian Competitions in Urmia due to the potential of this field in Iran, which is one of the most important sporting events in Asia and Iran, and to find answers to the question that "What factors have a significant impact on attracting spectators in sports events?"

**Figure 1:** The entrepreneurial conceptual model assumed to assess the factors influencing the spectator's re-attendance in 2012 Asian Volleyball Games

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**Research Methodology**

This research is operational regarding the purpose, and in terms of gathering correlational data is a structural equation model. The study comprised 206 spectators of 2012 Asian Volleyball Games in Urmia who had gotten the ticket and had attended the game, and have been chosen randomly from among all the spectators. To determine the effective factors (motivation, promotion, social, physical and economic) on attraction and the tendency to re-attendance of the spectators in 2012 Asian Volleyball Games the revised questionnaire of (Corea and Steve, 2009) and (Trail, 2007) was used. The questionnaire included demographic data of the spectators (8 questions), 5 questions for factors affecting the attendance, 4 questions for motivational factor, 7 questions for propagation factor, 9 questions for social factors, 6 questions for physical factors and 4 questions for the economic factors. Likert's 7 value scale (from totally disagree to totally agree) id used to answer questions about the factors affecting the reattendance. Face validity of the questionnaire was obtained by experts and the reliability of the questionnaire was obtained in a pilot study through Cronbach's alpha of 0.91.
Average statistical methods, cumulative frequency and simple frequency were used to describe the data and the Cronbach’s alpha test with a confidence level of 95%, and for testing the reliability of the tool the SPSS software version 16.5 was used. Structural equation test has also been used to test the theoretical models presented in Figure 1. in order to investigate the impact of factors influencing the spectator's reattendance in 2012 Asian Volleyball Games. The data was analyzed using the LISREL software (8.7) and with the confidence level of 95%.

Research Findings
Structural equations are based on a fitted model and certain theories which are subject to the causal relationships and solidarity between the variables. To test the assumption that the model is a proper or not, we use the fitted indexes. The findings of Table 1 indicated that the fitted indexes, comparative fitness index is close to 0.9 and the adjusted goodness fitted index is close to 1 and the goodness fitted index is greater than 0.9 and the root mean error is less than 0.1, which confirmed the validity of this model; as a result, this model has achieved the desired level of fitness and based on it we can confirm the structure of the structural equation model.

Table 1: Fitted indices of the SEM model

<table>
<thead>
<tr>
<th>RMSR</th>
<th>AGFI</th>
<th>GFI</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>0.90</td>
<td>0.93</td>
<td>0.97</td>
</tr>
</tbody>
</table>

In the chart below, each standardized coefficient shows the relationship between the factors considered. Considering that all the coefficients were positive, the relationship between the present parameters in the model is direct. The significance of these coefficients is investigated in the next section. In this section we investigate the relationship between the parameters and the theories. Each equation includes components of the error variance, standard and non-standard coefficient, the value of $R^2$, standard error and the T-value.
The Results of the Structural Model

The findings of Table 2 showed that there was a significant relationship between both motivational and attraction factors (P<0.05), there was a significant relationship between both propagation and attraction factors (P<0.05), there was a significant relationship between both social and attraction factors (P<0.05), there was a significant relationship between both physical and attraction (P<0.05), there was a significant relationship between both economical and attraction factors (P<0.05), and there was a significant relationship between both attraction and reattendance (P<0.05).
Table 2: Evaluation of the relationship between the factors and studying the research hypothesis about the spectators in 2012 Asian Volleyball Games

<table>
<thead>
<tr>
<th>factors</th>
<th>Sig.</th>
<th>Significance level T-Value</th>
<th>Error of measurement</th>
<th>Determination index R²</th>
<th>Standard index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attracting the spectator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivation factors</td>
<td>0.000</td>
<td>12.38</td>
<td>0.013</td>
<td>0.89</td>
<td>0.12</td>
</tr>
<tr>
<td>Promotion factors</td>
<td>0.000</td>
<td>9.999</td>
<td>0.019</td>
<td>0.89</td>
<td>0.23</td>
</tr>
<tr>
<td>Social factors</td>
<td>0.000</td>
<td>9.92</td>
<td>0.034</td>
<td>0.89</td>
<td>0.30</td>
</tr>
<tr>
<td>Time-place factors</td>
<td>0.000</td>
<td>8.99</td>
<td>0.010</td>
<td>0.89</td>
<td>0.13</td>
</tr>
<tr>
<td>Economical factors</td>
<td>0.000</td>
<td>13.25</td>
<td>0.012</td>
<td>0.89</td>
<td>0.11</td>
</tr>
<tr>
<td>Re-attendance Spectators attraction</td>
<td>0.007</td>
<td>9.42</td>
<td>0.132</td>
<td>0.83</td>
<td>0.37</td>
</tr>
</tbody>
</table>

Discussion and Conclusion

There is a significant relationship between motivational and attraction factors. This result is consistent with the findings of other studies such as Marko Sarstedt et al. (2012) Swanson et al. (2009), Hyun-Duck Kim et al. (2006), Pace and Jiang (2009), Huang et al., (2005), DeSchriver and Jenson (2002) and Zhang et al., (1998). Wu et al., (2009) divide the sports customer's motivation for participating in sport events into two categories of fans' motivation and spectators' motivation. The spectator's motivation was related to the social identity of sport and the factors that make the competitions interesting, such as the technical quality of the games, gaining excitement and entertainment, but the fans' motivation was in order to reach the team's identity and was emphasizing the strong support of the favorite team (Woo et al., 2009). The results of Wu and Bojan's study about motivating the fans and motivating the spectators were consistent with the results of this study. The reason is because most of the spectators in Iran are not just considered as simple spectators but as fans. They have team identity and their main reason of attendance is supporting their favorite team. And also the spectators' attendance in competitions in which Iran is not playing, expresses that Iranian spectators consider this sport as an exciting sport, and the beauty of these competitions will attract most of spectators to these tournaments and perhaps as these games are held in the Asian category, and therefore causes the attraction of more people to these competitions. Consequently, the attendance of star players in the team, players' skills and the technical quality of the favorite team has a considerable role in their attendance. Trail et al., (2009) divide the attracting factors of a sports event into three categories, attracting factors relevant to the stadium (stadium design, painting the stadium and the quality of grass), attracting factors relevant to the team (the presence of the famous players, the results of the recent competitions, the team's position in the table) and the attracting factors related to the competition (technical quality of the game, Derby game, several goals per game and unpredictability of the results). In this study, they found that attracting factors relevant to the team, attracting factors related to the competition and attracting factors relevant to the stadium are respectively important, and are consistent with the results of this study.

There is a significant relation between the propagation and attraction. The results of this study are consistent with the findings of Steve Chen and et al. (2010), Hwang and Kim (2008), Kim et al., (2007), Brown Weld et al., (2007). But these results are not consistent with the findings of Matthews et al., (2010) and some of the findings of Greenwell et al., (2009) are inconsistent. Matthews et al., (2010) states that although media advertisements, awarding, betting and entertainment which are considered as propagation factors, are very important for the spectators, but these factors have no significant correlation with the spectators' tendency to attend, and this shows that the spectators' attendance is related to other important factors, too. The results also showed that although the items related to the propagation factor were important for the spectators, these factors made a significant relationship with attracting more spectators. The findings of Greenwell et al., (2009) also showed that the propagation factor is only for a group of spectators who just come to the gym only for fun and excitement and even if they are a fan of a team, they do not have a certain bias towards it, establishes a strong relationship with the tendency to reattendance. But the spectators that are biased in favor of a team, the propagation factor is not important for them and has no significant relationship with attraction. It can be concluded from this
study that most of the present spectators in these competitions are the teams' biased fans and some other factors other than the propagation factor is effective in their attendance. So if we want to keep these spectators, we can first focus on the other factors that are significantly associated with their reattendance. But if we want to reconcile those spectators, who are interested in volleyball and indoor games but do not have a particular bias to any team, with the stadiums, we should work on the propagation factor in the competitions. Actually, at the first step we should introduce marketing and finally we should introduce selling tickets in most indoor competitions. For this reason, according to Brown Weld et al., (2007) we can play music in appropriate time intervals in stadiums and/or prepare entertaining programs for them or have a lottery between them, according to their ticket number, and award some of them.

There is a significant relationship between both social and attraction factors. This is consistent with the findings of Bouchet et al., (2010), Lambrecht et al., (2009). In the spectators' point of view, the most important thing in the social factor is that spectators tend to create a context for sharing information with friends. Interpersonal, within group and sub-group interactions and the team's identity are factors that lead to much attendance of the spectators Bouchet et al., (2010), the findings of the present study confirms the view point of Bouchet et al., in this case, too. And the social factor has a significant relationship with the spectators' tendency to attend. Spectators share themselves in their team's success and reach a team identity and finally experience vicarious winning that is very enchanting for them. This study is consistent with the results of all researches in this field; including Brokaw et al., (2009). In their findings, they found that factors such as violence, use of nasty words and stress there is an inverse relationship. It can be derived that such indexes are less in indoor games such as volleyball and handball due to the attendance of families and females. Whereas researchers who have worked on football have found fans' scurrilousness and misbehaving as important factors in social aspect but are consistent with some parts of Trail and James (2001) findings because he named some of the spectators as hoodlum whose goals are excitement, energy depletion, causing tension, conflict and violence. The results showed that the more the number of the spectators, the more the tendency to attend and also the tendency to reattend in the future competitions increase, and this is a meaningful relationship.

There is a significant relation between both physical and attractiveness factors. The research results are consistent with the findings of McDonald and Neager (2008) and Armstrong et al., (2005), but are not consistent with some of the findings of Caro and Garcia (2009), Wakefield and Blodgett (2009) and Ross (2007). It was recognized in the findings of Caro and Garcia (2009) that viewers who are considered as fans and come to the stadium to support their team, the factor of conditions and facilities has no significant relationship with the tendency to attend and this group of spectators attend the competition at any time and place that the event occurs unless other factors be effective in their presence such as attractiveness and social factors are the reasons of their absence. These finding are not consistent with the results of the present study and it was found in this study that although the majority of the spectators were Iranian biased fanatics, the conditions and facilities factor had a significant relationship with their attraction. Since the leagues in Spain and other European countries benefit from highly integrated planning and a full schedule of the games and locations are ready before the season starts and as much as possible, the time of the games does not change and the games are mostly held on the weekend, viewers do not have a right understanding of unscheduledness and it is supposed that due to the changes in schedules and holding the games on weekdays their attendance will gradually fade. But the Iranian spectators are familiar with the inappropriate conditions and facilities and their effect on their attendance. The findings of Wakefield and Blodgett (2009) showed that the conditions and facilities factor has a significant relationship with the attendance of the spectators with higher social and occupational status, but for the spectators with a lower socio-economic level, this relationship is insignificant and is not consistent with the findings of this research. Ross (2007) also confirmed the findings of Wakefield and stated that spectators with higher education and income, and those spectators who are present at the stadium mostly with their family, the relationship between the conditions and facilities factor and their attraction to sports events is a meaningful relationship. But in contrast, single spectators with a low level of education, occupation and income, this relationship was
insignificant and is not consistent with the findings of this research. Lee et al., (2006) found that there is a significant relationship between age and the facilities factor. So, in the spectators who were at the age of 25 to 35 and 35 to 45, no significant relationship was noticed between the condition and facilities factor and the tendency to reattend but this also didn’t have any significant relationship in other age groups. This may be due to reason that the younger age group have not yet reached the age of marriage and career and are not under pressure in terms of time and conditions and in older ages as they are mostly retirees, they are free from work and have more opportunities and therefore other factors are much more important to them (Lee, 2006). Stadium design, the quality of the stadium, cleanliness of the stadium and appropriate chairs are important factors in attracting the spectator.

There is a significant relationship between the economic factor and attraction. This finding is consistent with other researches such as (Kim and Lee, 2004). The results of (Trail et al., 2009) showed that with the increasing importance of economic factors in according to spectators, the tendency to reattend decreases and this shows that for increasing the spectators’ attendance variables relevant to the economic factor, such as ticket price and other costs should also decrease. Economic factors which include the ticket price and the costs to reach the stadium, has a negative effect on their attendance. They also state that the spectators are sensitive and non-flexible to the attendance costs in stadium such as, entrance ticket and transportation, which is consistent with the results of the research. Although no tickets were sold in these competitions, due to the economic problems that exist in the society, the economic problems became consistent with the other researches in this field.

There is a significant relation between both attraction and reattendance factors. That is consistent with the findings of marko Sarstedt et.al. (2012), Hall et al., (2010), Matthews et al., (2010), Wakefield and Blodgett (2009), Caro and Garcia (2009), McDonald and Neager (2008), Huang et al., (2008), Kim et al., (2008), Brown Weld et al., (2007), Lee et al., (2006), Armstrong et al., (2005), Ross (2007), Hyun-Duck Kim et. al. (2006) who reached the result that attraction factors has a great influence on the spectators' reattendance and their persistence. Although in most of these foreign researches, spectators and fans are separated from each other, due to the existence of solidarity and coherent groups for fanatics in Iran, we count them as spectators, too.

According to the research findings and the presented discussion we can design the model of the effective factors influencing the spectator’s reattendance in 2012 Asian Volleyball Championship Games as the following:

**Figure 3:** The final model for the study of factors affecting the spectators’ reattendance in 2012 Asian Volleyball Games
References


Assessing Extraction of Rice Bran Protein and Its Effect on Physicochemical Properties of Sausage

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Abstract

Today, consumption pattern is going to change increasingly and tendency to consume fast foods is going to be considered so important. Due to some properties like being nutritious of sausage and frankfurter, being healthy, being available and fast preparation of them, importance of using these foods would be cleared especially in industrial countries. The main objective in this study is replacing a rice bran protein instead of meat in sausage formulations. Obtained results indicate that adding 2% of rice bran protein concentrate (RBPC) would improve the texture of sausage and decrease its hardness. Adding 4% of this protein concentrate would make the texture smooth, which was not accepted by panelists. Results of cooking loss test indicated that adding rice bran protein concentrate to formulation of batches, led to decrease in cooking loss for applied sample. Respecting to results of sensory evaluation, the study found also that adding 2% of this protein concentrate would have no effect on color, smell and taste of the sausage; although, it would improve the texture. It would be considered also as the best batch for sensory evaluation comparing to other tests on this batch.

Keywords: Rice bran, rice bran protein concentrate, Physico-Chemical, Characteristics of Sausage

1. Introduction
Several approaches have been presented by different researches about extracting rice bran protein and its functional properties as follows:

Sudarat Jiamyangyue and partners (2005), applied extracted rice bran protein by alkaline for bread formulation to improve quality of this product and produce a desirable product for consumers. In this regard, they found a relationship between pH and extraction time. They found that the optimal extracting conditions is using pH=11 and 45min and reached protein content equal to 69.16%.

A research studied effects of adding rice bran to protein products. In this research, two kinds of rice bran including Rice berry bran and Sinlek rice bran were applied to improve neutral quality of sausage. In fact, sausage includes many useful Phytochemicals and fatty acids equal to 1:1.5:1 of (PUFA, MUFA, and SFA) and diet fibers. Finally, they evaluated its effects, so that physical properties like cooking, hardness, pastiness and other properties could be estimated. In this regard, cooking performance of modified sausages was considerably in high level and they had not same hardness and
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pastiness. With respect to color, Sinlek rice bran caused increase in b* and decrease in a*; although, adding Rice berry bran led to increase in b* and decrease in L* and had no significant effect on a*. [28]

Garcia and Tototas (2007), investigated mutual reaction among potato starch, carob gum, kappa carrageenan and their effects on cooking output and color of a low fat sausage, which were formulated with sodium and chloride calcium. Obtained results indicated that starch had significant effect on cooking output; although, added salt didn’t allow starch’s granules to become gelatin. This affected on moisture content and pastiness and L* negatively. Carob gum and kappa carrageenan improved also cooking process. [28][14]

Barbieri and Rivaldi (2007), presented a study on behavior of complex protein during production of processed meats, which could be used could. To investigate performance of Sarcoplasmic and Myofibrillar protein during production of pork, different steps were assessed using some techniques including electrophoretic techniques (IEF, ZDF, PAGE, and SDS) and thermometric techniques (DSC). In this study, myofibrillar proteins were extracted using brine and then protein network was provided in temperature above 62’c. Finally, value of weight loss during cooking was estimated. [28][5]

Choi and partners (2009) conducted a study on properties of emulsion system in low fat meats. In this study, effects of vegetable oil from olive, corn, soya, grape and rice bran fiber on rheological properties of meat was investigated. Fat of pork was equal to 30%, a part of which was replaced by one of the vegetable oils to 10%. Chemical combinations, cooking properties, texture and viscosity of low fat meat pastes were analyzed. Moisture content, protein, ash, pH of cooked and rare paste, hardness, pastiness, biting ability, viscosity and b* index of vegetable oil covered pastes and rice bran proteins had low cooking loss and high emulsion stability. [8][9][10] In a study, stabilized rice bran (SRB) was applied as an extender in frankfurter in various levels from 0.5% to 3.5%. In the study, different analysis like cooking, texture and color properties have been conducted and evaluated. The extender included desirable effects and would not lead to rancidity of final product. It would have also positive effect on other properties such as taste, smell and integrity. [16] In the study, due to functional properties of rice bran protein, only rice bran protein was applied in formulation of sausage, so that its effects would be evaluated on physicochemical and sensory properties of product (sausage).

In a study, to decrease in fat of meat in emulsion systems from 30% to 20%, a combination of oil of grape and rice bran was used. Finally, they evaluated chemical and cooking properties, along with physicochemical properties of viscosity texture. For low-fat meat pastes including oil of grape and rice bran, some properties were in high level such as moisture content, ash, amount of pH, integrity, biting ability and solvability of Sarcoplasmic proteins. Therefore, it could be mentioned that decrease in total fat from 30% to 20% with applied alternatives has a significant role in quality of meat pastes. [25]

In a study, effects of rice bran fiber on gel induced by solvable proteins in pork’s salt were evaluated. Respectively 0.1%, 0.5%, 1% and 2% of rice bran fiber were added to solvable protein at the same time. Moisture content was same in all samples. Samples with high rice bran fiber had high solvability of protein, L* and pH; although, highest moisture content for myofibrillar protein and capacity of water savage in all batches was based on adding 1% rice bran fiber. However, amount of brightness and redness of texture was decreased by adding rice bran fiber, electro-force gel didn’t change proteins regardless in different rice bran fiber level. [24]

Daneshvar and Azizi (2001), conducted a study to evaluate effects of wheat powder and fresh vegetables on metabolic and physicochemical quality of colonic materials. Obtained results indicated that digestive system would be improved, using wheat bran. In this study, using wheat bran was proposed for adults in various ages. [11]

According to previous studies, it could be found that extraction of rice bran protein, using proteases including Endo-proteases and Exo-proteases, can enhance extraction process up to 93%. According to previous studies, it has been found that there are several healthy combinations, which could be applied in protein products. For example, in several studies different kinds of alternatives for
fat based on carbohydrates and other materials have been applied. This would lead to decrease in fat content with no effect on technological and sensory properties. [17]

Due to shortage of nutritious materials and other micronutrients, along with diseases induced by them, formulation of reach nutrients can therefore help decrease in illnesses. According to verity of protein products and increasing tendency of people for healthy foods around the world, food industries try to consider this issue. This is because of that there was no useful measure in regard with producing foods using rice bran protein. The present study has tried to produce enriched food using rice bran protein to make protein products healthier whether a bit. [20]

2. Main Body

Production of sausage and frankfurter needs correct ratio of ingredients, so that to provide good quality and cost efficient products. Sausage and frankfurter can be produced by various kinds of moist, semi-dry and dry ingredients. Several ingredients can be combined together in various ratios. [13]

There are many effective factors on formation of emulsion such as temperature, size of lipid particles, pH, amount and kind of solvable protein. Steps of cooking product are also so important to make solvable proteins fixed and denatured. First step is formation of denaturing gel of proteins, which would be entered to this step through heating. Second step is collecting denatured proteins, which prevents integration of lipid drops through forming a layer of protein around the lipid globules. Water molecules would be also maintained by different interferences of water and protein. [33]

In protein products, joints and fillers are some dry ingredients. Some joints like soya and milk powder would affect both water and emulsification. Emulsify, maintaining fat and moisture are effective on protein products, which to improve these properties some non-meat proteins would be applied such as soya, gluten and casein. Each of these proteins would have an effective role in improving properties of final product. [15]

Several grains’ bran such as rice bran can be applied in meat products as extender. Rice bran is enriched in lipid, protein, fiber and other nutrients. It would improve functional properties such as cooking in addition to maintaining Organoleptic properties. Its fat would lead to high temperature in final product in addition to create a good taste. The protein would improve also functional properties. Rice bran is also enriched in high antioxidant, vitamins E and B and other micronutrients, which would prevent oxidation process. [23]

Rice bran can be applied by itself or along with other extenders, which includes emulsifier properties and ability to joint with water. This would cause maintenance of organoleptic properties of high protein products in addition to save time and final cost. Rice bran is in form of solvable and insolvable fractions. Solvable fractions make product enriched in oil and protein; although, insolvable fractions would be enriched just in fiber. [13]

Rice bran protein can be a good alternative for some additives. [32] Determining functional properties of rice bran protein can help understanding of its applications in food industry. The main effects of proteins on foods are as follows: improvement in forming emulsion in meat products, improvement of sausage’s texture, improvement of cooked grain products such as biscuit and improvement of noodle’s quality, improvement of stable quality of emulsions especially mayonnaise. [29]

One of the main negative effects of using protein in meat products is that it includes so much fat, which causes some diseases. For example, animal fat is one of the main reasons for cardiovascular diseases. Overweight, obesity and other fat-based diseases such as cancers (colon cancer, prostate cancer and chest cancer), gallbladder diseases, hypertension and resistance against insulin would have most negative effects on meat product industries. This has led also to decrease in acceptance of these products by consumers and increase in their tendency for low-fat foods. [35] [36] [34] [21]

Need to decrease in using fat and cholesterol is not only a general belief, but also it is perspective of many relevant organizations such as American Heart Association, American Cancer Society, American Dietetic Association, World Health Organization, National Academy of Sciences,
United States Department of Agriculture and National Cholesterol Education Program. They confirm that amount of daily received cholesterol should be equal to 300mg.\[^{[6]}\]\[^{[5]}\]

Producing high-protein and low-fat products as new products with new formulation can be significant economically.

The present study has considered modification of product, which can be effective on internal market and competitive conditions in addition to their effects on health. Through this one can enter to export markets and leave single product economics. In general, it could be mentioned that one of the main solutions for making meat product optimal is to decrease in their negative effects on health. On the other hand, improving physicochemical and organoleptic properties of meat products can be another solution.

Rice bran includes several lipase enzymes, which have their special position and lead to joint friction in points 1 and 3 of triglycerides.\[^{[25]}\]^\[^{[1]}\] In addition to lipase, rice bran includes other enzymes like amylase, Catalase, oxidize ascorbic acid, oxidize cytochrome, lipoxygenase, polyphenol oxidize, dehydrogenize and esterase. Some of these enzymes have harmful activity on oxidative rancidity.\[^{[26]}\] \[^{[27]}\] \[^{[5]}\]

Comparing to other grains, rice bran protein includes highest nutritious value because of consisting high amount of essential amino acids like lysine and threonine, which would be rarely found in other grains.\[^{[2]}\]

Rice bran protein contains also some important amino acids such as lysine, histidine, arginine, threonine, glycine, cystine, valine, methionine, leucine, isoleucine, tyrosine and phenylalanine. These amino acids are essential for human’s nutrition.\[^{[12]}\]

Rice bran protein is anticancer and would help to decrease in distribution of cancer mass same as many other biologic al vegetables and systems (Kawamura and Muramoto, 1993) Rice bran includes also hypoallergenic proteins, which can be useful in children’s food formulation (Helm and Burks, 1996). Rice bran is also enriched in diet fibers and phytochemical like tocopherols, trinoles and gamma oryzanole, which would affect health positively. This protein has efficiency equal to 2-2.5 comparing to casein.\[^{[31]}\]

### 3. Research Objectives

1. To determine functional properties of rice bran protein
2. To produce batched sausage by rice bran protein
3. To evaluate physicochemical and sensory properties of sausage produced by rice bran protein

### 4. Research Questions

1. Whether using rice bran protein is possible for sausage production?
2. Whether amount of determined protein based on the study is suitable for sausage production?
3. Whether adding rice bran protein of 2% and 4% to sausage formulation can affect physicochemical and sensory properties of product significantly?

### 5. Research Hypothesis

- Using rice bran protein for sausage production is possible
- Rice bran protein enriched sausage has desirable texture properties
- Rice bran protein enriched sausage has desirable color properties
- Rice bran protein enriched sausage has desirable sensory properties
• Amount of weight loss for rice bran protein enriched sausage is not different from sample statistically
• Rice bran protein enriched sausage includes more protein than sample
• Rice bran protein enriched sausage includes lower fat than sample

6. Methodology

Applied equipments and facilities in production process of sample sausages:

Table 1: Applied equipments and facilities in production process of sample sausages

<table>
<thead>
<tr>
<th>Row</th>
<th>Engine name</th>
<th>Model/ company</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5kg mini cutter</td>
<td>Industrial Co of Iran Steel Product SH-80</td>
<td>Iran</td>
</tr>
<tr>
<td>2</td>
<td>Filler engine</td>
<td>Vemag HP 10 E</td>
<td>Germany</td>
</tr>
<tr>
<td>3</td>
<td>0-100’c thermometer to measure central temperature of product to make sure about cooking quality</td>
<td>Testo</td>
<td>Germany</td>
</tr>
<tr>
<td>4</td>
<td>Cooking room</td>
<td>Iran Steel Product</td>
<td>Iran</td>
</tr>
<tr>
<td>5</td>
<td>Meat grinder above 0’c</td>
<td>80 NECUTTER BAB</td>
<td>U.S.A</td>
</tr>
<tr>
<td>6</td>
<td>Fridge above and below 0</td>
<td></td>
<td>Iran</td>
</tr>
</tbody>
</table>

Table 2: Applied equipments and facilities for tests

<table>
<thead>
<tr>
<th>Row</th>
<th>Engine name</th>
<th>Model/ company</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Protein measuring, Kjeldahl</td>
<td></td>
<td>Germany</td>
</tr>
<tr>
<td>2</td>
<td>Oven</td>
<td>Memmert UE500</td>
<td>Germany</td>
</tr>
<tr>
<td>3</td>
<td>Soxhlet</td>
<td>Behr Labor-Technik</td>
<td>Germany</td>
</tr>
<tr>
<td>4</td>
<td>pH meter</td>
<td>Metrohms Hersia E532</td>
<td>Switzerland</td>
</tr>
<tr>
<td>5</td>
<td>Texture meter</td>
<td>HOUNSFIELD/H5KS</td>
<td>UK</td>
</tr>
<tr>
<td>6</td>
<td>Color meter</td>
<td>HUNTERLAB-D25-9000</td>
<td>U.S.A</td>
</tr>
<tr>
<td>7</td>
<td>Aw measuring machine</td>
<td>ST LAB-FA</td>
<td>Switzerland</td>
</tr>
<tr>
<td>8</td>
<td>Digital carriage scale with accuracy of 0.0001g</td>
<td>A80 Limited</td>
<td>Japan</td>
</tr>
<tr>
<td>9</td>
<td>Ben marry</td>
<td>Chemical Technique (Shimi Fan)</td>
<td>Iran</td>
</tr>
<tr>
<td>10</td>
<td>Incubator 37’c</td>
<td>Binder</td>
<td>Germany</td>
</tr>
<tr>
<td>11</td>
<td>Colony counter</td>
<td>RTC</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Furnace 500-550’c</td>
<td>Vecstar</td>
<td>Germany</td>
</tr>
</tbody>
</table>

7. Formulation of Sample Sausages

To produce sausage during primary tests, formulation of table3 has been selected. To regulate its adjustment with standard properties of protein, fat, moisture and ash, this formulation has been presented. To make the study applicable, formulation of German sausage has been considered.

Table 3: Formulation of German Sausage

<table>
<thead>
<tr>
<th>Row</th>
<th>Product</th>
<th>Values (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Meat</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>Oil</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Starch</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>Gluten</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Isolate soya</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Mixed additives</td>
<td>0.75</td>
</tr>
<tr>
<td>7</td>
<td>Sodium polyphosphate</td>
<td>0.4</td>
</tr>
<tr>
<td>8</td>
<td>Water</td>
<td>23.293</td>
</tr>
<tr>
<td>9</td>
<td>Sodium nitrite</td>
<td>0.012</td>
</tr>
</tbody>
</table>
Table 3: Formulation of German Sausage - continued

<table>
<thead>
<tr>
<th></th>
<th>Stabilizer</th>
<th>10</th>
<th>Capsicum</th>
<th>11</th>
<th>Garlic</th>
<th>12</th>
<th>Flour</th>
<th>13</th>
<th>Salt</th>
<th>14</th>
<th>Ascorbic acid</th>
<th>15</th>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Two formulations were considered for production of rice bran enriched sausage. These formulations were iterated in 5kg batches 2 times. In the formulations, meat was replaced by rice bran protein to apply in test.

1. Formulation No 1: included 40% meat as formulation of control sausage
2. Formulation No 2: included 38% meat and 2% rice bran protein as enriched sausage No1
3. Formulation No 3: included 36% meat and 4% rice bran protein as enriched sausage No2

Table 4: Compounds of produced sample formulations

<table>
<thead>
<tr>
<th>Row</th>
<th>Compounds (g) / formulation</th>
<th>Control sausage</th>
<th>Enriched sausage No1</th>
<th>Enriched sausage No2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Meat</td>
<td>2000</td>
<td>1900</td>
<td>1800</td>
</tr>
<tr>
<td>2</td>
<td>Liquid oil</td>
<td>750</td>
<td>750</td>
<td>750</td>
</tr>
<tr>
<td>3</td>
<td>Starch</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>4</td>
<td>Gluten</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>Isolate soya</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>6</td>
<td>Mixed additives</td>
<td>37.5</td>
<td>37.5</td>
<td>37.5</td>
</tr>
<tr>
<td>7</td>
<td>Flour</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>8</td>
<td>Sodium polyphosphate</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>Sodium nitrite</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>10</td>
<td>Water</td>
<td>1164.65</td>
<td>1164.65</td>
<td>1164.65</td>
</tr>
<tr>
<td>11</td>
<td>Ascorbic acid</td>
<td>2.25</td>
<td>2.25</td>
<td>2.25</td>
</tr>
<tr>
<td>12</td>
<td>Salt</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>13</td>
<td>Stabilizer</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>14</td>
<td>Capsicum</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>15</td>
<td>Garlic</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>16</td>
<td>Rice bran protein</td>
<td></td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
</tr>
</tbody>
</table>

8. Data Collection Method
Questionnaire has been applied for sensory test and for other tests, obtained results have been presented through tables, along with statistical analysis.

9. Variables
Independent variable: extracted protein of rice bran
Dependent variables of extracted protein of rice bran are as follows:
- Determining capacity of emulsifying
- Determining capacity of foaming
Dependent variables of sample produced sausages are as follows:
- Rheological properties of sample sausages (maximum required energy to cut samples and surface under the obtained curve)
- Color properties (L*, a*, b*)
• Organoleptic properties (taste, color, texture and smell)
• Cooking loss rate
• Fat rate
• Protein rate
• Microbial test

10. Statistical Population, Sampling Method and Sample Size
Based on research methodology, control sausage was produced with 11.28 % protein and 2 rice bran protein enriched batches. The 3 formulations were iterated 2 times. Sampling of all applied samples was done randomly and physicochemical and sensory tests were conducted for them 3 times.

Final test of rice bran protein
Determination of foaming capacity of rice bran protein
Rice bran protein dispersion is produced by the ratio of (1:100) in citrate buffer (PH 5/0-9/0,0/1 M). In systems involving salt and sugar, Rice bran protein dispersion is produced in citrate buffer (PH 7/0,0/1 M) with Nacl (0/5-1/5%) or sucrose (5-15%). Finally, the Rice bran protein dispersion produced in Blender is mixed for 2 minutes and it is transmitted to measurement cylinder .
Overflow percentage= volume of foam / solution volume ×100 (Chandi and Sogi, 2007)
Determination of emulsion capacity of rice bran protein
Emulsions were made in PH: 5-9 with 0.5-1.5% salt, and 5-15% sugar.
Rice bran protein (0.25 gram), buffer citrate (PH 7/0,25ml,0/1M) and 0.5 ml Peanut oil were used in the sample. The mixture was blended for two minutes in blender and it was transmitted to 100 ml cylinder and the total height is measured to determine the sustainability of emulsion and this could be done in 7 days. Any change in height is shown in percentage.

Final test of sample sausages;
Chemical tests;
Before doing tests, Preparation and Homogenization of Samples based on AOAC (983.18 ) standard were done. For chemical analysis and measuring the amount of fat in the sample, fat excretion done by Petroleum ether solution and this was exactly relevant with the AOAC (991.30). Homogenization of Protein samples was done by Kjeldahl method based on AOAC (981.10 ) standard. moisturization of samples homogenized by Avan method at 125 degrees centigrade and based on AOAC (950.46), was done. Measuring the amount of ash in the sample was done based on AOAC (920.153) standard, and through this the amount of ash homogenized was calculated using Electric furnace at 550 degrees centigrade. 10 gram of the homogenized sample was distilled water with 100 ml volume and PH of this solution was measured by Metrohm Hersia E532 Digital meters equipped with Metrohm 6.0202.100 electrode. [30]

• physical tests;
During this test, sample’s weight has been measured after and before heating and cooling of sample sausages. Weight loss of samples has been investigated after production during maintaining them in 4’c temperature. Weight loss test has been iterated for each formulation 5 times and generally 15 tests have been conducted for produced samples.

• Colorimetric test;
Evaluation of color changes of products and effects of evaluation of rice bran protein have been done by hunter lab machine on some shear parts of products. Three factors of L*, b* and a* have been measured in samples. Colorimetric test has been iterated 3 times for each formulation. Three mentioned factors have been also estimated 9 times for each formulation. In general 27 tests have been conducted for whole sample. [22]
• Texture test;
  To evaluate texture of samples, Warner-Bratzler test has been applied. This test has been done by Texture Analyzer Machine in room temperature on samples with thicknesses of 4cm and 2.6cm. Two factors of shear power and required energy for cutting have been measured by peak point of curve and lower surface of curve respectively. Texture analyzing test has been iterated 4 times for each formulation. In general, 12 tests were conducted on sample products. [4]

Figure 1: Hunter lab machine

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Figure 2: Texture analyzer machine

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• Sensory evaluation;
  For sensory analysis, samples were evaluated by 20 skillful analyzers and were tested several days after production using hedonic test. Samples of 3 formulations were presented as some slices in white plates. Properties, which have been analyzed, are as follows: taste, color, smell and texture. Scores were arranged from 1 to 6 (very bad to excellent). [7]

  Microbial test;
  Microbial test of products were done according to (standard 2303), Standard Organization and Iran’s Industrial Researches. In this step, some issues would be considered as follows: counting all bacteria, molds, yeasts, staphylococcus aureus, salmonellas, clostridium perfringens, Escherichia coli and coliform. [18]
11. Statistical Analysis of Data

For statistical analysis of obtained results from physicochemical tests and sensory evaluations, Mini-tab software has been applied. Statistical model of the study was random method. Conducted tests for each batch are as follows: 2 iterations for physicochemical tests, 4 iterations for texture analyzing test and 3 iterations for colorimetric test. Outputs of the study have been analyzed using One-Way ANOVA and Two-Way ANOVA software in Excel program. P<0.05 indicates significant difference between batches.

Foaming Capacity;

PH(5-9):
Foaming Capacity of rice bran protein in PH: 5 is equal to 0.3%. Foaming Capacity is improved with changing PH from acidic feature to Alkaline feature, which it is reported 7/10 and 9/20 respectively in PH: 7 and PH: 9.

Salt (0.5-1.5%);
Rice bran protein concentrate in salt concentration of 5% (pH=7), have a desirable foaming ability equal to 10.2%. Through increase in salt concentration from 0.5% to 1%, foaming ability would be decreased and reach 7.66%; although, through increase in salt concentration from 1% to 1.5%, a few changes would be appeared and foaming ability would reach 7.69%.

Sugar (5-15%);
Foaming ability of rice bran protein in 5, 10 and 15% sugar (pH=7), would be 7.82%, 7.56% and 5.43% respectively. Thus, through increase in sugar from 5% to 10%, foaming ability of rice bran protein would decrease slightly; although, through increase in sugar content to 15%, foaming ability of rice bran protein would decrease.

Emulsifying capacity;
Emulsions would be created through presence of hydrophobic and hydrophilic.(Chandi and Sogi, 2007) Emulsifying ability of rice bran protein has been investigated in different conditions including pH (5-9), salt (0.5-1.5%) and sugar (5-15%). Emulsion capability of rice bran protein has been presented in figures 3, 4 and 5.

pH (5-9);
The most emulsion capability of rice bran protein is equal to 36% in pH=7; although it would be decreased to 24% and 20% for pH=9 and pH=5 respectively. Horizontal orbit indicates time of study equal to 7 days and vertical orbit shows height of cream and Aqueaus in measuring cylinder.

Figure 3: Emulsion property in pH=7

![Emulsion property in pH=7](image)
According to figures 3, 4 and 5 during 7-day study of emulsions, they would not break; although, over the time emulsions resulted from rice bran protein concentrate in pHs, would leave cream and enter to Aqueaus.

Salt (0.5-1.5%);

Emulsion capability of rice bran protein concentrate in different concentrations of 0.5%, 1% and 1.5% is equal to 35%, 25% and 25% respectively. Figures 6, 7 and 8 show these values. Most emulsion amount of rice bran protein is salt concentration of 0.5%. All emulsions resulted regardless changes of salt concentration, showed desirable stability. In figures 6, 7 and 8, horizontal orbit shows time of study equal to 7 days and vertical orbit shows height of cream and Aqueaus in measuring cylinder.
Figure 6: Emulsion property in salt concentration of 0.5% (pH=7)

- cream
- Aqueaus

![Graph showing emulsion property in 0.5% salt concentration](image)

Days

Volume (ml)

Figure 7: Emulsion property in salt concentration of 1% (pH=7)

![Graph showing emulsion property in 1% salt concentration](image)

Days

Volume (ml)

Figure 8: Emulsion property in salt concentration of 1.5% (pH=7)

![Graph showing emulsion property in 1.5% salt concentration](image)

Days

Volume (ml)
According to figures 6, 7 and 8, during 7-day study of emulsions, they would not break; although, over the time emulsions resulted from rice bran protein in different salt concentrations, would leave Cream and enter to Aqueaus.

**Sugar (5-15%);**
Rice bran protein concentrate presents desirable emulsion in sugar systems. Maximum emulsion of rice bran protein is equal to 56% in sugar concentration of 5%. Through increase in sugar concentration to 10% and 15%, emulsion capability would reach 48% and 41% respectively. In figure 9, 10 and 11, horizontal orbit shows time of study equal to 7 days and vertical orbit shows height of Cream and Aqueaus in measuring cylinder.

**Figure 9:** Emulsion property in sugar concentration of 5% (pH=7)

<table>
<thead>
<tr>
<th>Volume (ml)</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cream</td>
<td></td>
</tr>
<tr>
<td>Aqueaus</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 10:** Emulsion property in sugar concentration of 10% (pH=7)

<table>
<thead>
<tr>
<th>Volume (ml)</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cream</td>
<td></td>
</tr>
<tr>
<td>Aqueaus</td>
<td></td>
</tr>
</tbody>
</table>
According to figures 9, 10 and 11, during 7-day study of emulsions, they would not break; although, over the time emulsions resulted from rice bran protein in different sugar concentrations, would leave Cream and enter to Aqueaus.

- Chemical characteristics of the control and observed sausages

The effect of replacing meat with other alternatives as rice bran protein on Chemical characteristics of the control and observed sausages has been represented in table 5.

- Total fat in observed sausage, and the total fat in enriched sausage with 2% rice bran protein(sample 2), and also in enriched sausage with 4% rice bran protein(sample 3) was reduced to 17.75%, 17.45% and 17.26% which this shows 1.7% and 2.76% reduction of total fat in product.
- Protein in observed sausage was about 11.28%, and the protein in enriched sausage with 2% rice bran protein(sample 2), and also in enriched sausage with 4% rice bran protein(sample 3) was reduced to 12.67% and 13.95% which this shows 13% and 24% increase of protein in product.
- The extent of Moisture is observed sausage is 54.83 and the moisture in enriched sausage with 2% rice bran protein(sample 2), and also in enriched sausage with 4% rice bran protein(sample 3) was reduced to 52.89% and 51.59% which this shows 3.53% and 5.9% reduction of moisture in product.
- The ash is about 2.52% in observed sausage and it is about 2.53% and 2.55% in sample 2 and 3, which in comparison with observed sausage there is no significant difference.
- The extent of PH in observed sausage is 6.12% which it is 6.12% in enriched sausage with 2% rice bran protein(sample 2), but it was reduced to 6.13% in enriched sausage with 4% rice bran protein(sample 3); hence, it could be stated that the extent of PH in sample 3 comparing to extent of PH in observed sausage was increased about 0.16 which no significant difference with observed sample is reported.

<table>
<thead>
<tr>
<th>Row</th>
<th>Factor / sample</th>
<th>Fat(%)</th>
<th>Ash (%)</th>
<th>Protein (%)</th>
<th>Moisture (%)</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Formula one (observed sausage)</td>
<td>a: 17/75±0</td>
<td>a: 2/52±0</td>
<td>a: 11/28±0</td>
<td>a: 54/83±0</td>
<td>a: 6/12±0008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20/20</td>
<td>0±20</td>
<td>±0/15</td>
<td>±0/12</td>
<td>±0/008</td>
</tr>
<tr>
<td>2</td>
<td>Formula two (2% enriched sausage)</td>
<td>a: 17/45±0</td>
<td>a: 2/53±0</td>
<td>b: 12/67±0</td>
<td>b: 52/89±0</td>
<td>a: 6/12±0008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20/20</td>
<td>0±20</td>
<td>±0/15</td>
<td>±0/12</td>
<td>±0/008</td>
</tr>
<tr>
<td>3</td>
<td>Formula three (4% enriched sausage)</td>
<td>a: 17/26±0</td>
<td>a: 2/55±0</td>
<td>c: 13/95±0</td>
<td>c: 51/59±0</td>
<td>a: 6/13±0008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20/20</td>
<td>0±20</td>
<td>±0/15</td>
<td>±0/12</td>
<td>±0/008</td>
</tr>
</tbody>
</table>
The results in two production periods and three tests for each production have been represented. In any column, different characters are used for values which a significant difference (p<0.05) has been reported as well.

- Physical features for observed sample and sausage samples
  Weight loss percentage
  The effect of replacing meat with other alternatives as rice bran protein on Weight loss percentage of the control and observed sausages has been represented immediately after production and one month later production and it could be observed in table 6.

Table 6: Weight loss percentage for sausages

<table>
<thead>
<tr>
<th>Row</th>
<th>Factor / sample</th>
<th>Weight loss percentage after production</th>
<th>Weight loss percentage after one month production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Formula one (observed sausage)</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9/69±0/005</td>
<td>12/65±0/004</td>
</tr>
<tr>
<td>2</td>
<td>Formula two (2% enriched sausage)</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7/94±0/005</td>
<td>11/34±0/004</td>
</tr>
<tr>
<td>3</td>
<td>Formula three (4% enriched sausage)</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6/58±0/005</td>
<td>9/86±0/004</td>
</tr>
</tbody>
</table>

In any column, different characters are used for values which a significant difference (p<0.05) has been reported as well.

Weight loss percentage for observed sample after production is 9.69 which it was reduced to 7.94 and 6.58 in sample one and two reporting reduction as 18.05% and 32.09%; also, Weight loss percentage for observed sample is 12.65 one month after production which the value for Weight loss percentage in sample one and two is 11.34 and 9.86 showing 10.35% and 22.05% reduction.

Colorimetric test
The effect of adding rice bran protein Concentrate on samples of sausages has been represented in table 7.

Table 7: The effect of adding rice bran protein Concentrate on samples of sausages

<table>
<thead>
<tr>
<th>Row</th>
<th>Factor / sample</th>
<th>a*</th>
<th>b*</th>
<th>L*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Formula one (observed sausage)</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>09±0/315/</td>
<td>84±0/186/</td>
<td>58±0/8328/</td>
</tr>
<tr>
<td>2</td>
<td>Formula two (2% enriched sausage)</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65±0/314/</td>
<td>08±0/187/</td>
<td>15±0/8328/</td>
</tr>
<tr>
<td>3</td>
<td>Formula three (4% enriched sausage)</td>
<td>b</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>26±0/314/</td>
<td>28±0/187/</td>
<td>27/98±0/83</td>
</tr>
</tbody>
</table>

L*, b* and a* means product Brightness, product tendency to redden, product tendency to yellowish, which the difference between observed sausage is reported as well. In any column, different characters are used for values which a significant difference (p<0.05) has been reported as well.

Tissue Examination Survey
The effect of adding rice bran protein Concentrate on samples of sausages has been represented in table 8.

Table 8: Tissue Examination Survey of observed sausages

<table>
<thead>
<tr>
<th>Row</th>
<th>Factor / sample</th>
<th>Essential energy for shear (N . mm)</th>
<th>Shear force (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Formula one (observed sausage)</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>128/98±22/14</td>
<td>17/54±1/73</td>
</tr>
</tbody>
</table>
Table 8: Tissue Examination Survey of observed sausages - continued

<table>
<thead>
<tr>
<th></th>
<th>Formula two(2% enriched sausage)</th>
<th>115/89±22/14</th>
<th>a</th>
<th>16/76±1/73</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Formula three(4% enriched sausage)</td>
<td>104/93±22/14</td>
<td>a</td>
<td>27±1/7314/</td>
</tr>
</tbody>
</table>

In any column, different characters are used for values which a significant difference (p<0.05) has been reported as well. According to table 8, by applying rice bran protein Concentrate, shear force and Essential energy for shear in comparing to observed sample reduce; in other words, Tissue have become softer in sausage samples.

Sensory features for observed sample and sausage samples

To determine the best sample, sensory measurement is essential in viewpoint of consumers and then, the results would be compared with results of physical test for samples chosen. Through this, a pertinent percentage of rice bran protein Concentrate could be recommended to be used in formulation of meat products.

The effect of adding rice bran protein Concentrate on sensory features of sausages has been represented in table 9.

Table 9: Sensory features of sausages

<table>
<thead>
<tr>
<th>Row</th>
<th>Factor / sample</th>
<th>Smell</th>
<th>Color</th>
<th>Tissue</th>
<th>Taste</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Formula one (observed sausage)</td>
<td>5/20± 1/04</td>
<td>1/25± 5/65</td>
<td>05±1/135/</td>
<td>15±1/265/</td>
</tr>
<tr>
<td>2</td>
<td>Formula two (2% enriched sausage)</td>
<td>5/08± 1/04</td>
<td>1/25± 5/20</td>
<td>18±1/35/</td>
<td>a b</td>
</tr>
<tr>
<td>3</td>
<td>Formula three (4% enriched sausage)</td>
<td>4/98± 1/04</td>
<td>1/25± 4/50</td>
<td>03±1/134/</td>
<td>15±1/264/</td>
</tr>
</tbody>
</table>

In any column, different characters are used for values which a significant difference (p<0.05) has been reported as well. In this survey, observed sausages based on other factors and also in comparison with sample 1 and 1 have higher scores and only tissue in sample 2 comparing to observed sample has been improved.

Microbial features of observed sample and sausage samples

In table 10, Microbial features of observed sample and sausage samples have been represented.

Table 10: Microbial features of observed sample and sausage samples

<table>
<thead>
<tr>
<th>Sample</th>
<th>Total counting</th>
<th>coliform</th>
<th>E.coli</th>
<th>Salmonella</th>
<th>Staphylococcus aureus</th>
<th>Clostridium Prem Franzhz</th>
<th>Mold and yeast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>10^7</td>
<td>10 &lt;</td>
<td>Negative</td>
<td>Negative</td>
<td>10 &lt;</td>
<td>50</td>
<td>102</td>
</tr>
<tr>
<td>Formula 1</td>
<td>3/4x10^4</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>10 &lt;</td>
<td>10 &lt;</td>
<td>10 &lt;</td>
</tr>
<tr>
<td>Formula 2</td>
<td>3/1x10^4</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>10 &lt;</td>
<td>10 &lt;</td>
<td>10 &lt;</td>
</tr>
<tr>
<td>Formula 3</td>
<td>2/9x10^4</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>10 &lt;</td>
</tr>
</tbody>
</table>

Conclusion

- Investigation of sensory properties of batches indicated that batch2 (including 100gr/5kg rice bran protein concentrate), is not significantly different from control sample statistically. Although, batch 3 (including 200gr/5kg rice bran protein concentrate), is significantly different from control sample statistically. Thus, through statistical analysis of obtained results from sensory properties of sausages, it could be noted that sensory properties of batch 2, are similar to control sample.

- According to results of physicochemical tests, using rice bran protein concentrate in formulation of produced batches of 100gr/5kg and 200gr/5kg, there would be desirable output of increase in protein and decrease in cooking loss.
Desirable results of texture analyzing indicated that using 200gr/5kg rice bran protein would improve smoothness of sausage comparing to control sausage; although, batches of 100gr/5kg rice bran is similar to control sausage regarding its texture properties. Decreasing in weight loss and using protein concentrate would not cause significant change in pH rate.

According to obtained results from statistical analysis of chemical, physical and sensory tests, best properties are related to batch2. Therefore, this batch, including 100gr/5kg rice bran protein, could be introduced as the best batch in the study.

Suggestions

1) Functional properties of rice bran protein concentrate and its operational issues should be considered mostly.
2) According to healthy role of rice bran protein in human’s diet, it should be applied in food industry.
3) Using rice bran protein continuously, along with other nutritious compounds. Should be considered in further studies.
4) To develop and improve in rice bran protein enriched meat products, desirable standards of these products should be provided.

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Odd and Even Gracefulness of Some Classes of Graphs

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Abstract

In this paper, we prove that the caterpillar graphs, $B_{n,m}$, $C_4(k_1, n)$ and the Dutch windmill graph $D_n^{(m)}$ for some specific values of $n$ are all odd graceful and the caterpillar graphs, $D_2(P_n)$, $D_2(k_1, n)$, $B_{n,m}$ and $C_4(k_1, n)$ graphs are all even graceful. A function $f$ is called an odd graceful labeling of a graph $G$ with $q$ edges if $f$ is an injection from the vertices of $G$ to the set $\{0, 1, 2, ..., 2q-1\}$ such that when each edge $xy$ is assigned the label $|f(x) - f(y)|$, the resulting edge labels are distinct odd numbers. A graph, which admits an odd graceful labeling, is said to be an odd graceful graph. A function $f$ is called an even graceful labeling of a graph $G$ with $q$ edges if $f$ is an injection from the vertices of $G$ to the set $\{0, 1, 2, ..., 2q\}$ such that when each edge $xy$ is assigned the label $|f(x) - f(y)|$, the resulting edge labels are distinct even numbers. A graph, which admits an even graceful labeling, is said to be an even graceful graph.

Keywords: Odd graceful labeling, Even graceful labeling, Caterpillar graphs, Dutch Windmill graph and Shadow graph.

1. Introduction

All graphs considered in this paper are simple, finite and undirected. Most graph labeling methods trace their origin to one introduced by Rosa [8] in 1967, or one given by Graham and Sloane [6] in 1980. Rosa [8] called a function $f$ a $\beta$-valuation of a graph $G$ with $q$ edges if $f$ is an injection from the vertices of $G$ to the set $\{0, 1, \ldots, q\}$ such that, when each edge $xy$ is assigned the label $|f(x) - f(y)|$, the resulting edge labels are distinct. Golomb [5] subsequently called such labeling graceful and this is now the popular term. For all terminology and notation Bondy [1] has been followed. The concept of ‘odd gracefulness’ of a graph has been introduced by R.B.Gnanajothi [4] in 1991. S.K.Vaidya and B.Lekha [9] have shown that the shadow graphs $D_2(P_n)$ and $D_2(k_1, n)$ are odd graceful. In this paper, we prove that the caterpillar graphs, $B_{n,m}$, $C_4(k_1, n)$ and the Dutch windmill graph $D_4^{(m)}$ are all odd graceful and the caterpillar graphs, $D_2(P_n)$, $D_2(k_1, n)$, $B_{n,m}$ and $C_4(k_1, n)$ graphs are all even graceful for some specific values of $n$. 
Definition 1.1
A graph labeling is an assignment of labels, traditionally represented by integers, to the edges or vertices, or both of graphs.

Many kinds of labeling have been studied and an excellent survey on graph labeling is found in Gallian [2].

Definition 1.2
A graceful labeling (or $\beta$-valuation) of a graph $G = (V, E)$ with $m = |V|$ vertices and $n = |E|$ edges is a one-to-one mapping $\Psi$ of the vertex set $V (G)$ into the set $\{ 0, 1, 2, \ldots, n \}$ with the following property:

If we define, for any edge $e = uv \in E (G)$, the value $\Psi^* (e) = |\Psi(u) - \Psi(v)|$ then $\Psi^*$ is a one-to-one mapping of the edge set $E (G)$ onto the set $\{1, 2, \ldots, n\}$. A graph, which admits a graceful labeling, is called a graceful graph.

Definition 1.3
A graph $G = (V (G), E (G))$ with $p$ vertices and $q$ edges is said to admit an odd graceful labeling if $f:V (G) \rightarrow \{0, 1, 2, \ldots, 2q - 1\}$ is injective and the induced function $f^*:E(G) \rightarrow \{1, 3, 5, \ldots, 2q-1\}$ defined as $f^*(e = uv) = |f(u) - f(v)|$ is bijective. The graph which admits odd graceful labeling is called an odd graceful graph.

Definition 1.4
A function $f$ is called an even graceful labeling of a graph $G$ with $q$ edges if $f$ is an injection from the vertices of $G$ to the set $\{0, 1, 2, \ldots, 2q\}$ such that when each edge $xy$ is assigned the label $|f(x) - f(y)|$, the resulting edge labels are distinct even numbers. A graph, which admits an even graceful labeling, is said to be an even graceful graph.

2. Main Results
Definition 2.1 A caterpillar is defined as a graph such that deletion of every vertex of degree one results in a path.

Theorem 2.1 All caterpillars are odd graceful.

Proof: Let $G$ be a caterpillar then $|V (G)| = n$ and $|E(G)| = n - 1$. Let $k_i$ represent the vertices on the spine of the caterpillar and $N (k_i)$ the neighborhood of $k_i$.

\[
\begin{cases}
2|N (k_i)| - 1, & \text{if } i \text{ is the first vertex of the spine} \\
2|N (k_i)| - 2, & \text{if } i \text{ is the last vertex of the spine} \\
otherwise
\end{cases}
\]

Case 1: If ‘$i$’ is even
- Label the first vertex of the spine as 0.
- Label the last vertex of the spine as $2n - (u_1 + u_3 + \ldots + u_{i-1} + i)$.
The caterpillar with odd graceful labeling

\textbf{Example 2.1(a)}

Odd graceful labeling of a caterpillar graph (i even) is shown in the following Figure 1

\textbf{Figure 1:} An odd gracefully labeled caterpillar

\textbf{Case 2: If 'i' is odd}
- Label the first vertex of the spine as 0.
- Label the last vertex of the spine as $u_2+u_4+\ldots+u_{i-2}+i-1$
Example 2.1(b)

Odd graceful labeling of a caterpillar graph (i odd) is shown in the following Figure 2

**Figure 2:** An odd gracefully labeled caterpillar.

Theorem 2.2 All caterpillars are even graceful.

**Proof:** Let $G$ be a caterpillar then $|V(G)| = n$ and $|E(G)| = n-1$. Let $k_i$ represent the vertices on the spine of the caterpillar and $N(k_i)$ the neighborhood of $k_i$.

\[
u_i = \begin{cases} 
2|N(k_i)| - 1, & \text{if } i \text{ is the first or the last vertex of the spine} \\
2|N(k_i)| - 2, & \text{otherwise}
\end{cases}
\]

Case 1: If ‘$i$’ is even
- Label the first vertex of the spine as 0.
- Label the last vertex of the spine as $2n-(u_1+u_3+...+u_i+1+i)$

Example 2.2(a)

Even graceful labeling of a caterpillar graph (i odd) is shown in the following Figure 3

The caterpillar with even graceful labeling
Case 2: If ‘i’ is odd

- Label the first vertex of the spine as 0.
- Label the last vertex of the spine as $u_2 + u_4 + \ldots + u_{i-1} + i-1$

Example 2.2(b)

Even graceful labeling of a caterpillar graph (i even) is shown in the following Figure 4

**Definition 2.2** The graph $B_{n,m}$ is defined as the graph obtained by joining the center ‘u’ of the star $K_{1,n}$ and the center ‘v’ of another star $K_{1,m}$ to a new vertex w.

**Theorem 2.3** The graph $B_{n,m}$ is an odd graceful graph.

**Proof:** Let G be $B_{n,m}$ then $|V(G)| = n+m+3$ and $|E(G)| = q = n+m+2$. Let $\{v, v_1, v_2, \ldots, v_n\}$ be the set of vertices of the star $K_{1,n}$, $\{v^1, v_1^1, v_2^1, \ldots, v_m^1\}$ be the set of vertices of the star $K_{1,m}$ and w be the vertex between v and $v^1$. Define $f: V(G) \rightarrow \{0, 1, 2, \ldots, 2q-1\}$ by $f(v) = 2q-1$. 

![Figure 3: A even gracefully labeled caterpillar](image)
Odd and Even Gracefulness of Some Classes of Graphs

Theorem 2.4 The graph $B_{n,m}$ is an even graceful graph.

**Proof:** Let $G$ be $B_{n,m}$ then $|V(G)| = n+m+3$ and $|E(G)| = q = n+m+2$ and let $\{v, v_1, v_2, \ldots, v_n\}$ be the set of vertices of the star $k_{1,n}$ and $\{v_1, v_1^1, v_2^1, \ldots, v_m^1\}$ be the set of vertices of the star $k_{1,m}$ and $w$ be the vertex between $v$ and $v_1$.

Define $f: V(G) \rightarrow \{0, 1, 2, \ldots, 2q\}$ by

- $f(v) = 2$
- $f(w) = 2n+4$
- $f(v_1) = 0$
- $f(v_i) = 2i+2$, $i = 1, 2, \ldots, n$
- $f(v_i^1) = f(w)+2i$, $i = 1, 2, \ldots, m$

The above defined function $f$ provides an even graceful labeling for $B_{n,m}$.

Example 2.3

The graph $B_{6,5}$ and its odd graceful labeling is shown in the following Figure 5

![Figure 5: The graph $B_{6,5}$](image)

Example 2.4

The graph $B_{4,5}$ and its even graceful labeling is shown in the following Figure 6

![Figure 6: The graph $B_{4,5}$](image)
Theorem 2.5 The graph $C_4(k_1, n)$ is an odd graceful graph.

Proof: Let $G$ be $C_4(k_1, n)$ then $|V(G)| = 4n+4$ and $|E(G)| = q = 4n+4$ and let $\{u_1, u_2, u_3, u_4, v_1, v_2, v_3, \ldots, v_{4n}\}$ be the set of vertices. Define $f: V(G) \rightarrow \{0, 1, 2, \ldots, 2q - 1\}$ such that

$f(u_1) = 2q-1$
$f(u_2) = 0$
$f(u_3) = q-1$
$f(u_4) = \frac{q}{2}$

The above defined function $f$ provides odd graceful labeling for $C_4(k_1, n)$.

Example 2.5

The graph $C_4(k_1, 6)$ and its odd graceful labeling is shown in the following Figure 7

Figure 7: The graph $C_4(k_1, 6)$

Theorem 2.6 The graph $C_4(k_1, n)$ is an even graceful graph.

Proof: Let $G$ be $C_4(k_1, n)$ then $|V(G)| = 4n+4$ and $|E(G)| = q = 4n+4$ and let $\{u_1, u_2, u_3, u_4, v_1, v_2, \ldots, v_n, v_{n+1}, \ldots, v_{4n}\}$ be the set of vertices. Define $f: V(G) \rightarrow \{0, 1, 2, \ldots, 2q\}$ such that

$f(u_1) = 2q$
$f(u_2) = 0$
$f(u_3) = q$
$f(u_4) = \frac{q}{2}$

The above defined function $f$ provides even graceful labeling for $C_4(k_1, n)$. 
Example 2.6
The graph $C_4(k_1, 6)$ and its even graceful labeling is shown in the following Figure 8

**Figure 8:** The graph $C_4(k_1, 6)$

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**Definition 2.3** The Dutch windmill graph $D_n^{(m)}$ is the graph obtained by taking $m$ copies of the cycle graph $C_n$ with a vertex in common.

**Theorem 2.7** The Dutch windmill graph $D_4^{(m)}$ is an odd graceful graph.

**Proof:** Let $G$ be $D_4^{(m)}$. Then $|V(G)| = p = (n-1) m+1$ and $|E(G)| = q = mn$ $(n=4)$. Let ‘$u$’ be the vertex of degree $2m$ and let $u_1, u_2, \ldots, u_{2m}$ be the vertices joined with ‘$u$’ and $v_1, v_2, \ldots, v_m$ be the vertices joined with $u_1$ and $u_2, u_3$ and $u_4, \ldots, u_{2m-1}$ and $u_{2m}$ respectively.

Define $f: V(G) \rightarrow \{0, 1, 2, \ldots, 2q-1\}$ such that

$f(u) = 0$; $f(u_i) = 2q-(2i-1)$; $i = 1, 2, \ldots, 2m$ and $f(v_i) = 2q-4(2i-1)$; $i = 1, 2, \ldots, m$.

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Example 2.7
The graph $D_4^{(5)}$ and its odd graceful labeling is shown in the following Figure 9
Definition 2.4 Shadow graph $D_2(G)$ of a connected graph $G$ is obtained by taking two copies of $G$ say $G'$ and $G''$, join each vertex $u'$ in $G'$ to the neighbors of the corresponding vertex $u''$ in $G''$.

Theorem 2.8 The graph $D_2(P_n)$ is an even graceful graph.

Proof: Let $G$ be $D_2(P_n)$ then $|V(G)| = 2n$ and $|E(G)| = q = 4(n-1)$ and let $\{v_1, v_2, ..., v_n\}$ be the vertices of first copy of path $P_n$ and $\{v'_1, v'_2, ..., v'_n\}$ be the set of vertices of second copy of path $P_n$.

Define $f: V(G) \rightarrow \{0, 1, 2, ..., 2q\}$ such that

$$f(v_i) = \begin{cases} 
4(i-1); & \text{when } i \text{ is odd} \\
4(2n - i); & \text{when } i \text{ is even}
\end{cases}$$

and

$$f(v'_i) = \begin{cases} 
4(i-1) + 2; & \text{when } i \text{ is odd} \\
4(2n - i) - 4; & \text{when } i \text{ is even}
\end{cases}$$

From the above assignment the vertex labeling are distinct even numbers and also the resulting edge labels are distinct even numbers.

Example 2.8

Even graceful labeling of the graph $D_2(P_5)$ is shown in the following Figure 10.
Theorem 2.9 The graph $D_2(k_1, n)$ is an even graceful graph.

Proof: Let $G$ be $D_2(k_1, n)$ then $|V(G)| = 2(n+1)$ and $|E(G)| = q = 4n$ and let $\{v, v_1, v_2, \ldots, v_n\}$ be the set of vertices of first copy of star $k_{1,n}$ and $\{v^1, v^1_1, v^1_2, \ldots, v^1_n\}$ be the set of vertices of second copy of star $k_{1,n}$.

Define $f: V(G) \rightarrow \{0, 1, 2, \ldots, 2q\}$ by:

- $f(v) = 0$;
- $f(v_i) = 8n-4(i-1)$, $i = 1, 2, \ldots, n$;
- $f(v^1) = 2$;
- $f(v^1_i) = 4i$, $i = 1, 2, \ldots, n$.

The above defined function $f$ provides an even graceful labeling for $D_2(k_1, n)$.

Example 2.9

Even graceful labeling of the graph $D_2(k_1, 4)$ is shown in the following Figure 11

Figure 11: The graph $D_2(k_1, 4)$

3. Conclusion

In this paper, we have proved that the caterpillar graphs, $B_{n,m}$ and $C_4(k_1, n)$ are both odd and even graceful. We have also proved that $D_2(P_n)$ and $D_2(k_1, n)$ are even graceful. Further the Dutch windmill graph $D_n^{(m)}$ is odd graceful when $n = 4$. When $n$ is odd $C_n$ should have two consecutive vertices with odd labels or even labels and hence $D_n^{(m)}$ can not be odd graceful.

References
