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The Acute Toxicity of The Organ phosphorus Dimethoate to Male and Female Swiss Albino Mice, Mus musculus.

Z. K. Mohamed* and A. I. Mohamed**

ABSTRACT

Dimethoate is among the most used organophosphorus (OP) in agriculture and public health pest control. The compound was classified as a moderately toxic to mammals and accidental poisoning in human is very common. The objective of the present work was to further evaluate dimethoate acute toxicity as well as its effects on body weight change and some blood parameters of male and female swiss albino mice, *Mus masculaus*. The LD$_{50}$ of dimethoate to female mice was 134.5 mg/kg and hence was considered as moderately toxic. No significant change in body weight of male or female exposed to 24 and 38 mg/kg dimethoate as compared to control groups after 10 weeks of experiment. The mean values for male body weight were 31.39, 31.18 and 32.71 gm for control, 24 mg/kg and 38 mg/kg dimethoate treated, respectively. Whereas, body weight for female were 32.09, 31.82 and 32.09 gm for control, 24 mg/kg and 38 mg/kg dimethoate respectively. Treated males and females WBC and RBC showed higher values in both the 24 and 38 compared to control group. The Hb values of 24 and 38 mg/kg dimethoate treated males were comparable or slightly higher as compared to control. Whereas, the same parameters of the treated females showed higher values in both doses as compared to control.

Key words: Dimethoate, Toxicity, LD$_{50}$, Albino Mice, Body Weight, Blood Parameters.

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INTRODUCTION

The organophosphorus compounds (OP) appear to represent an extremely important class of synthetic organic insecticides that are widely used all over the world. Commonly the OPS insecticides are considered among the most hazardous agents that people are exposed to them daily in the food they eat, the water they drink and the air they breath (Landis & Yu 2003). The effects of OPS compounds are similar in both the nerve gases and the insecticides in the acetyl-cholinesterase inhibition (Matsumura 1985). Dimethoate is one of the most important OP compounds and was introduced in 1950. Since them it has been extensively used in agriculture and public health against a wide range of insects and mites as systemic and contact insecticide (Sayim 2007a).

Food and Agriculture Organization and World health Organization (FAO & WHO, 2003), have classified Dimethoate as moderately toxic, following the results of the toxicity depending on the formulation. Nielson et al (2004) have stated that many formulations of Dimethoate including dust, aerosol spray and emulsifiable concentrate are available in the market today. Hence many long–range studies were concerned for the physical and chemical properties as well as the non–target toxicity of Dimethoate. Hodgson and Levi (1977) has stated that Dimethoate can be degraded in the environment to another more toxic metabolic compound called Omethoate (Oxygen analog) that can inhibit acetylcholine–esterase.

Several studies noted the median lethal dose (LD$_{50}$) of Dimethoate, among whom were FAO/WHO (1980) who predicted that the LD$_{50}$ of this compound for human was 30 mg/kg, whereas, Pesticide News (2002) and FAO/WHO (2003) stated that the LD$_{50}$ of the compound in rats ranged from 130 to 400 mg/kg body weight. These studies revealed that the LD$_{50}$ in mice (orally) was
equivalent to 150 to 160 mg/kg body weight, whereas, in rabbits was equal to 400 to 500 mg/kg body weight.

Toxicity of dimethoate to aquatic animals was observed by Begum & Vijayaraghavan (1995). They emphasized that dimethoate has toxic effects on enzymes and carbohydrates metabolism of various spices of fishes and concluded that it induces an alteration in proteins metabolism and that fish with low protein is unfit for human consumption.

Tarbah et al (2007) investigated the level of dimethoate distribution in the postmortem specimens after fetal organophosphate intoxication. They revealed high concentrations of dimethoate in blood with lower concentrations in the other organs.

Dimethoate toxicity on pregnancy of albino mice was evaluated by Mahadevaswami & Kaliwal (2004) who reported that this compound caused reduction in the number of implantations, increase in abortion and decrease in weight of ovaries, uterus and liver. They concluded that all of these effects could be due to hormonal imbalance or toxic effects on the embryo.

The objective of the present work aimed at further evaluate the toxic effects of dimethoate on female mice as well as the effects of sublethal doses on the body weight and blood parameters of both sexes.

**MATERIALS AND METHODS**

Several pairs of both male and female Swiss albino mice *Mus musculus* were brought from the animal house of the Faculty of Medicine, University of Garyounis. Breeding of the animal was started in the zoology laboratory to obtain the required numbers for the experiment. Rearing was conducted under $27 \pm 2 \, ^\circ C$, relative humidity of $71 \pm 11\%$ and 14 to 10 hours of light and dark
periods. Diets was supplied daily and clean bottles 350 cc in size were used for watering.

Dimethoate 40 EC organophosphorus insecticide (C₅H₁₂No₃Ps₂) was selected for this study. The compound was obtained as an original non expired commercial bottle from a local pesticide market in Benghazi. This insecticide formulation was manufactured by Stahlertec Deutschland GMbH & CO.,KG, Germany.

A total of 84 female mice with approximate close age and weight were chosen for the acute toxicity of the insecticide under study. The experiment involved seven treatments, 12 mice each, and six dimethoate dosages: 47, 96, 146, 166, 196 and 236 mg dimethoate / kg mice body weight. The seventh treatment served as control. Each treatment consisted of three replicates, four animals each. The water suspended insecticide dosages were orally delivered to the animals using mouth gavage. Animals were observed daily for mortality at 24, 48, 72 and 96 hours post-treatment.

For the evaluation of dimethoate effects on other biological functions of the mice, two sublethal doses were used 24 and 38 mg/kg body weight. A total of sixty animals (30 males and 30 females) were used for the body weight change and bloob parameters. The experiment involved 12 males treated with 24 mg/kg and 12 males treated with 38 mg/kg both were in two replicates. The same numbers of females were used and treated as in the males, whereas, six males and six females served as control. The experiment designed for 10 weeks and the oral gavage of the dimethoate aqueous suspension on weekly bases were performed. Treated mice behavior and initial body weight as well as weekly body weight were reported.
At the end of the experiment (10 weeks) the seeping blood of the anesthetized head decapitated mice were collected in clean glass tubes containing EDTA anticoagulant for the measurement of blood parameters including Red Blood Cells (RBC), White Blood Cells (WBC) and Hemoglobin (Hb).

Finney probit analysis was performed for the estimation of the LD$_{50}$, whereas, body weight and blood parameters data were subjected to Statistical Package for the Social Sciences (SPSS) for any significant differences in body weight change and blood parameters.

**RESULTS**

**Dimethoate acute toxicity:**

The acute toxicity of the organophosphorus dimethoate to female Swiss albino mice is presented in Fig (1). The probit mortality curve revealed that the lethal dose for the 50% (LD$_{50}$) of the tested female mice was 134.5 mg dimethoate per kg of the female body weight, with a minimum and maximum values of 110 and 156 mg/kg respectively. The reported LD$_{50}$ suggested that dimethoate is moderately toxic to the female mice. The observed symptoms in the treated mice particularly in those received high doses 146 to 236 mg/kg started with tendency for aggregation, fast breathing, slow movement and sweating. However, these symptoms disappeared in recovered mice, whereas, became more severe in those died.
Figure 1: Probit mortality analysis of adult female mice treated with Dimethoate 47, 96, 146, 166, 196 and 236 mg/kg, LD$_{50}$ = 134.5 mg/kg (range between 110 – 156), $r = 2.772$.

**Body weight change:**

When both male and female mice were treated with $\frac{1}{6}$ LD$_{50}$ dimethoate (24 mg/kg) or $\frac{1}{4}$ LD$_{50}$ (38 mg/kg) for 10 weeks, data did not show significant body weight difference between control and treated male or female groups (Fig 2A & Fig 2B), respectively. The reported mean difference between control and treated male mice, showed relatively higher mean value in the 38 mg/kg treated mice compared to that of 24 mg/kg treated mice and control but that was not significantly different ($F = 2.721$, $P > 0.05$). The reported Means ± SD for the three groups were 31.39 ± 3.85 gr for control, 31.18 ± 2.27 gr for 24 mg/kg Dimethoate treated male and 32.71 ± 3.96 gr for 38 mg/kg Dimethoate treated male (Fig 2A). On the other hand when female mice were treated with either 24 or 38 mg/kg Dimethoate, the differences in the body weight were not significant ($F = 0.860$, $P > 0.05$) after 10 weeks of treatment. The Means ± SD of the three groups were 32.09 ± 3.48 gr for control, 31.83 ± 2.44 gr for 24 mg/kg dimethoate and 32.09 ± 3.43 gr for 38 mg/kg Dimethoate treated females (Fig 2B).
Figure. 2A. Means ± SD of body weight changes of control, 24 mg/kg and 38 mg/kg of Dimethoate treated male mice after 10 weeks. No significant difference between control and treated mice was observed.

Figure. 2B. Means ± SD of body weight changes of control, 24 mg/kg and 38 mg/kg of Dimethoate treated female mice after 10 weeks. No
significant difference between control and treated mice was observed.

**Blood parameters:**

The means ± SD of WBC revealed no significant difference between control and both the 24 mg/kg and the 38 mg/kg Dimethoate treated male mice (F=1.135, p>0.05). The recorded means ± SD values for all three groups were 9.955 ± 0.064 (x10³/μL) for control, 10.95 ± 1.061(x10³/μL) for 24 mg/kg and 13.15 ± 3.61 (x10³/μL) for 38 mg/kg. Likewise no significant differences were noticed between control and the two groups of treated female mice (F=1.449, p>0.05). The means ± SD values for the three groups were 8.42 ± 0.297 (x10³/μL) for control, 9.085 ± 0.757 (x10³/μL) for the 24 mg/kg and 8.300 ± 0.283 (x10³/μL) for the 38 mg/kg (Fig. 3).

![Figure 3](image)

**Figure. 3.** WBC means ± SD of control and the two groups of Dimethoate treated mice of both sexes after 10 weeks. No significant differences between the two sexes were.
No significant difference between control and Dimethoate treated male mice RBC means (F=6.997, p>0.05). Control male mice mean was 7.735 ± 0.212 (x 10^3 / μL ). On the other hand the means ± SD for male mice treated with 24 mg/kg was 9.935 ± 0.233 (x 10^3 / μL ) and that for male mice treated with 38 mg/kg was 9.035 ± 0.997 (x 10^3 / μL ). However, female mice RBC means have shown a significant differences (F=17.461, p<0.05) between control and the 38 mg/kg treated female mice, but not that of 24 mg/kg treated female mice. The means ± SD values were 9.255 ± 0.346 (x 10^3 / μL ) for control, 10.25 ± 0.354 (x 10^3 / μL ) for the 24 mg/kg and 11.20 ± 0.283 (x 10^3 / μL ) for the 38 mg/kg. (Fig. 4).

**Figure. 4.** RBC means ± SD of control and the two groups of Dimethoate treated male mice revealed no significant difference. On the other hand the difference between control female mice and the two treatment groups after 10 weeks was significant.
HB means did not show significant difference between control and treated male mice for both doses (F= 1.148, p > 0.05), in female mice, however, significant differences were observed between control and both 24 mg/kg and 38 mg/kg treated female mice (F= 18.375, p < 0.05). The reported means values were 13.8 ± 0.28 (G/dl), 15.9 ± 0.57 (G/dl )and 15.9 ± 0.28 (G/dl ) for control, 24 mg/kg and 38 mg/kg Dimethoate, respectively (Fig. 5).

![Graph showing Hb means ± SD of control male mice and the two groups of Dimethoate treated mice.](image)

**Figure. 5.** Hb means ± SD of control male mice and the two groups of Dimethoate treated mice show insignificant difference. Significant difference was observed between control and both 24 mg/kg and 38 mg/kg treated female mice after 10 weeks.

**DISCUSSION**

The results of the present study concerning the acute toxicity of the OP dimethoate to female mice with an LD$_{50}$ 134 mg/kg came in an agreement with previous studies on the acute toxicity of OPs compounds. FAO/WHO (2003)
has reported that the LD$_{50}$ of dimethoate to mice was 150 mg/kg, whereas, Khogali et al (2005) has found that the LD$_{50}$ of this compound in male mice was equal to 160 mg/kg. Toxicity of dimethoate has already been confirmed as due to its effects on several organs as stated by Costa (2006) who stated that OPs were primarily recognized for their ability to induce toxicity in mammals through inhibition of acetylcholinesterase (AchE) and subsequent activation of cholinergic receptors.

Although no significant differences in body weight change were observed between control and treated mice (males and females) with either 24 and 38 mg/kg dimethoate, a reduction of weight as compared to the initial weight in both treated mice were observed. This finding certainly reflecting that dimethoate has a negative effects on body weight. This finding fully supports the finding of Samet et al (2008) who revealed in their results that dimethoate significantly decreased rats body weight by up to 25% in the female and up to 48% in their offspring as compared to control. Confirmation of this finding also came from Chang et al (2002) and Kalender et al (2006), where the first documented that the OP flupyrazon decreased rats body weight, whereas, the later documented that the OP diazinon resulted in rats body weight reduction. Mahadevaswami and Kaliwal (2004) have also noted a decrease in the body weight of female mice exposed to 20 mg/kg dimethoate and attributed that such decrease in body weight may be due to stress associated with the decrease in food consumption or due to physiological and biochemical changes in the treated animals.

The effects of the sublethal doses of dimethoate 24 & 38 mg/kg on blood parameters RBC, WBC and Hb revealed insignificant differences between control and treated mice. However, the values of these parameters were slightly elevated in the treated mice compared with control groups. These results came
to support the finding of Bhatia and Kaur (2000) who reported a non-significant increase of RBC and WBC of dimethoate treated mice. Meanwhile, our results came to contradict the finding of Reena et al. (1989) and El-Bakary et al. (1995) who found a decreased values of RBC, WBC and Hb in treated mice. In a more recent works, Elias & Saif (2009) and Elias (2010) have indicated that OP compounds, including dimethoate, decreased RBC and Hb levels. These effects of OP compounds on animals blood parameters were discussed by Hazarika et al. (2003) and Vidyasagar et al. (2004) who related such effects with the ability of OPs to form free radicals. This fact may ensure the hypothesis of Elias & Saif (2009) who showed that using of the antioxidants vitamins A, C and E in methiodathion (OP) has reduced the toxicity of the compound.

In conclusion dimethoate as a member of OP compounds can inflict various toxicities to the non target vertebrates ranging from acute toxicity (direct mortality) at relatively high dose to biochemical effects at sublethal doses. Further work by the authors will focus on the effects of dimethoate on blood chemistry and histopathology of the treated mice.
REFERENCES


السمية الحادة للمبيد الحشري الفسفوري دايمثويت لذكور وإناث الفأر الأبيض السويسري

Mus musculus

عبد الله إبراهيم محمد
زياد كمال محمد

الملخص

يعدم هذين المبيدات الفوسفورية استخداماً في مجال مكافحة حشرات المحاصيل وحشرات صحة المجتمع. وقد تم تصنيف هذا المركب على أنه نسبياً متوسط السمية، إلا أن سمته العارضة للإنسان تعد شائعة جداً. لذا فقد جاءت هذه الدراسة التي تهدف إلى معرفة المزيد حول سمية هذا المركب الحادة بالإضافة إلى كشف تأثيراته على التغير في وزن الجسم والتغير في عوامل الدم المختلفة لكل من ذكور وإناث الفأر الأبيض السويسري لكونه أحد اللبان الذي تتشابه في وظائفها الحيوية للإنسان. أوضحت النتائج أن قيمة الجرعة اللازمة لموت 50% من الإناث المعروضة (LD₅₀) كانت 134.5 mg/kg وهذا تقع ضمن المركبات المتوسطة السمية. كما أنه لم يحدث تغيير في أوزان أي من الإناث أو الذكور المعاملة بتركيزاتها السائدة 24 و 38 mg/kg بعد 10 أسابيع من المعاملة مقارنة مع حيوانات السيطرة (غير المعاملة). حيث جاءت متوسطات الأوزان على النحو التالي 31.39، 31.18 و 32.71 ملغم في الذكور والإناث المعاملة. أما في الإناث فقد جاءت هذه القيم 38 mg/kg، 24 mg/kg والسيطرة على التوالي. أما في الذكور فنتج عنها القيم 38 mg/kg و 24 mg/kg و 32.09 ملغم لكل من التوالي. كما أوضحت الدراسة أن خلايا الدم البيضاء (WBC) وخلايا الدم الحمراء (RBC) كانت نسبياً مرتفعة بالمقارنة مع مثيلاتها في حيوانات السيطرة (غير المعاملة)، أما قيمة الهيموجلوبين في الذكور المعاملة بجرعة 24 mg/kg و 38 mg/kg كانت مقارنة إلى مرتفعة قليلاً مقارنة بذكور مجموعة السيطرة، ففي حين جاءت قيمة الهيموجلوبين في الإناث المعكلة أعلى مما هو عليه في إناث السيطرة.

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Market Orientation and Business Performance in North Africa: Evidence from Libya

Sabri G. M. Elkrghli *

Abstract

Purpose - This paper focuses on exploring the extent to which organisations in Libya, as a representative to North African countries, adopt the concept of market orientation. The study examines the influences of type of business and ownership on market orientation and hence, on business performance.

Methodology/Method - Questionnaire survey was used to collect data. 400 questionnaires were circulated 276 returned with 233 considered valid for data analysis. Narver and Slater’s construct was adopted to measure market orientation. Business performance measured subjectively by high level executives.

Findings - There is growing level of market orientation especially in the private sector, which is judged to be best performance. Positive association between market orientation and business performance is detected. Ownership and business nature have an influence on business performance.

Implications – The paper provides valuable theoretical and managerial applications to academics and practitioners. Market orientation; ownership and business nature have proved to have great influence on business performance.

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Originality / Value - The paper comes as a response to scholars who have called for investigating market orientation practices in different cultural contexts to explain the cultural effect. Hence, it fills the gap in the literature. Also, foreign businesses who have the desire to do business in Libya might consult such research.

Limitations/ Future Research – This paper has some limitations that open the door for intriguing future research. The paper mixes data from different sectors and business size could not be tested. Future research might focus on the effect of size; competition and sector on market orientation-business performance linkage.

Key Words Market Orientation, Business Performance, North Africa, Libya

Paper type Research paper
I. Introduction

Libya is one of the countries in North Africa and has been undergoing massive economic reforms since more than two decades. These reforms have taken many forms. Privatization of public sector companies, allowing the private sector to participate in various economic activities, allowing international companies and their products to enter the Libyan market, reducing customs’ tariffs on imports are major steps taken in this respect.

The lifting of the embargo imposed on Libya was another major reason that significantly changes the nature of the Libyan business environment. These changes have posed challenges and threats to the public businesses as the official reports show that those businesses are unprofitable, in the recent years, and have been included in the privatization programme undertaken by the state. At the same time, new emergent ventures have been noticed to be growing and making great success.

Based on that, this paper looks at market orientation application in Libya as a critical factor for business success in the new business environment characterised by the appearance of new local and foreign ventures and growing competition.

II. Research problem

Market orientation is one of the key themes that have been hotly debated among marketing scholars for more than two decades. A great number of articles have been written on this topic in developed economics e.g., US (Kohli and Jaworski, 1990; Narver and Slater, 1990), Canada (Deng and Dart, 1994), the UK (Greenley, 1995), and Netherlands (Langerak et al, 1996), Spain, (Jimenez and Navarros, 2007). However, in developing
countries less attention has been paid to this theme: India (Singh, 2003), Thailand (Sittimalakorn, 2004), Turkey (Demirbag et al, 2006). As a result, the current paper focuses mainly on discovering to what extent businesses in Libya have adopted the market orientation concept as a consequence to economic reforms and whether that adoption is associated with higher business performance.

III. Research objectives

The current paper seeks to achieve the following objectives:

1. To determine to what extent businesses in Libya have adopted the market orientation concept.

2. To find out whether market orientation embracing differs according to ownership and nature of business.

3. To detect whether there is a link between market orientation application and business performance in the Libyan context.

IV. Research hypotheses

To achieve the research objectives the following hypotheses have been formulated:

H1. Business performance depends on ownership type and nature of business.

H1A Business performance is more likely in the private manufacturing sector.

H1B Business performance is more likely in the private service sector.
H1C Business performance is more likely in the public manufacturing sector.

H1D Business performance is more likely in the public service sector.

H2. There is a positive relationship between overall market orientation and business performance.

H2A There is a positive link between customer orientation and business performance.

H2B There is a positive link between competitor orientation and business performance.

H2C There is a positive link between inter-functional co-operation and business performance.

V. Literature Review

The extensive survey of the market orientation literature explained that around 87% of the previous studies have proved the existence of positive influence of market orientation on corporate performance. Narver and Slater (1990), for example, investigated the relationship between market orientation and business performance by using sample of commodity and non-commodity industries and the findings were that market-oriented companies are more successful. Also, the findings of Kohli and Jaworski (1993) concluded that market orientation has positive effect on business performance. In addition, this phenomenon also reflects Kotler’s (1988) statement that market orientation is likely to cause greater customer satisfaction, repeat business and subsequently more profitability.

1 The author reviewed market orientation literature from 1989 to 2009 and presented only a summary due to word limit.
In recent work carried out by Hooley et al. (2003); Gopalakrishna and Subramanian (2004); Demirbag et al (2006); Martin-Consuegra and Esteban (2007); Subhash et al (2008), and Olavarrieta and Friedmann (2008) the findings showed that market orientation has strong positive impact on business performance.

Despite a great deal of effort that closely focused on the conceptualisation of the market orientation construct in the literature (e.g. Narver and Slater, 1990; Kohli and Jaworski, 1990; Ruekert, 1992; Deng and Dart, 1994, Matsuno, 2005), no agreement has been reached among scholars on the conceptualisation of this term.

Analysing the literature shows that Narver and Slater’s construct (1990), and Kohli and Jaworski’s construct (1990) are the widely used constructs. No significant advancement has been added by new attempts to develop a market orientation construct.

In defining the conceptual domain of market orientation, Narver and Slater (1990) reviewed the literature, concluding that a market orientation construct consists of the following three behavioral components: customer orientation, which involves understanding target buyers now and over time in order to create superior value for customers; understanding the economic and political constraints in the channel; competitor orientation which involves acquiring information on existing and potential competitors, and understanding the short term strengths and weaknesses and long term capabilities of both the key current and potential competitors; and inter-functional coordination, which is the coordinated utilisation of company resources in creating superior value for target customers.
Narver and Slater (1990: 21) were very clear about the definition of the market orientation as organisational culture when they stated ‘Market orientation is the organizational culture that most effectively and efficiently creates the necessary behaviors for the creation of superior value for buyers and thus continuous superior performance for the business’.

Kohli and Jaworski (1990) reviewed the literature and conducted 62 interviews with both marketing and non-marketing managers in industrial, consumer and service industries, with organisations ranging in size from four employees to tens of thousands. Ten business academics at two large US universities were interviewed. Based on that, Kohli and Jaworski (1990: 6) proposed this definition: ‘Market orientation is the organisation-wide generation of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments, and organisation-wide responsiveness to it’.

Ruekert (1992) developed a measure of market orientation that is similar to that of Kohli and Jaworski (1990) and Narver and Slater (1990). Ruekert (1992) cites Shapiro (1988) who argues that the market driven organisation possesses three critical characteristics: information on all important buying influences permeates every corporate function; strategic and tactical decisions are made inter-functionally and inter-divisionally; divisions and functions make well-coordinated decisions and execute them with a sense of commitment. He further argues that work by Shapiro (1988), Kohli and Jaworski (1990) and Narver and Slater (1990) shares common characteristics: a market orientation results in actions by individuals toward the markets they serve; such actions are guided by information obtained by the market place; such actions cut across
functional and organisational boundaries within the division. Ruekert (1992: 228) then defines a market orientation as: ‘The degree to which the business unit obtains and uses information from customers; develops a strategy which will meet customer needs; and implements that strategy by being responsive to customers’ needs and wants’.

From this discussion, it is evident that all three conceptualisations of market orientation are concerned with behaviors. The respective measures are fairly similar in that they focus on obtaining and disseminating information on customers (and competitors) in order to attain a competitive advantage. It is interesting to note that while the respective measures include a focus on the customer, only those by Kohli and Jaworski (1990) and Narver and Slater (1990) acknowledge the importance of a competitor orientation.

Deng and Dart (1994) reviewed the literature, concluding that market orientation is comprised of the following sub-constructs: customer orientation; competitor orientation; inter-functional coordination; and profit orientation. They argue that their market orientation scale contributes to the literature in the following ways: (1) it is a four component construct; (2) it is relatively concise; (3) it encompasses a more comprehensive variable set than previous scales. However, the scale can be criticised on the following grounds:

The inclusion of profit orientation items is the first criticism. There is general agreement in the literature that profit orientation is a consequence of market orientation not part of market orientation (Farrell, 2002). Second, the scale is primarily a derivative of the MKTOR scale, with the addition of several extra items. As such, little theoretical advance was made. The resulting scale is also awkward, and would be time consuming
for respondents to complete if part of a study containing several other variables.

Given this, Cadogan and Diamantopoulos (1995) synthesise the two conceptualisations of market orientation, with a view to developing a measure of market orientation that may be useful in an international context. On this point, Cadogan and Diamantopoulos, (1995) state that development of a new measure of market orientation should include exploratory research to obtain preliminary insights into the re-specified construct’s domain, and followed by thorough development procedures (Farrell, 2002).

Pelham (1997) developed a measure of market orientation that was derived from Narver and Slater (1990) and Jaworski and Kohli (1993). The scale by Pelham consists of nine items, of which eight were taken from the Narver and Slater measure.

Lado et al., (1998: 34) also attempt to build up an alternative measure of market orientation. They define market orientation as ‘the extent to which firms use information about their stakeholders to coordinate and implement strategic actions’.

They state that a market orientation consists of: final customers, distributors, competitors and environment, with what they argue are the two major stages of the market orientation process, (analysis and strategic actions), plus a component that is termed inter-functional coordination.

In general, the scale items focus on behaviors/ activities, which is consistent with the MARKOR and MKTOR constructs.
A similar attempt to develop an alternative measure of market orientation is that by Gray et al., (1998). Clearly they believe that the existing measures have some weaknesses, given the title of their paper, ‘Developing a better measure of market orientation’. The aim of their study was to replicate and extend the market orientation research of both Narver and Slater (1990), and Jaworski and Kohli (1993) ‘validate what appear to be promising measures and to develop managerially useful and parsimonious scales for measuring market orientation in the New Zealand context’. Their study ‘utilised parts of three different instruments’, (Narver and Slater 1990; Jaworski and Kohli, 1993; and Deng and Dart 1994) and they produced a five dimensional model of market orientation: customer orientation; competitor orientation; inter-functional coordination; responsiveness; and profit emphasis.

Despite the claims of the authors to have developed a ‘better’ measure of market orientation, some drawbacks to their study need to be considered. First is the fact that little theoretical advance has been made. The random grouping together of items from alternative scales makes little sense. It would have been more fruitful to clearly define the domain of the market orientation construct, as in the Lado et al., (1998) study. Given that the authors were aiming to come up with a better scale based on empirical methods alone, it is also unclear why the Ruekert construct (1992) was not considered. The grouping together of the constructs is also problematic. It can be argued that the grouping together of the constructs affects the manner in which the respondent completes the items. According to Perrien (1997) this may produce results that are demand biased. Similarly, the authors did not take into account the problem of order effects in completing the questionnaire.
In essence, order effects may be encountered when respondents become tired of answering similar items from different measures. To overcome this potential problem, researchers alternate the order of the measures in the questionnaire. The inclusion of the four items measuring profit emphasis is also a problem given the argument that profit emphasis is a consequence of market orientation. Kohli and Jaworski (1990: 3) state that ‘without exception, interviewees viewed profitability as a consequence of market orientation rather than a part of it’. They further state, ‘this finding is consistent with Levitt’s (1969: 236) strong objection to viewing profitability as a component of market orientation, which he (Levitt) asserts is like saying that the goal of human life is eating’. Furthermore, Narver and Slater (1990) found a lack of empirical proof to support the suggestion that profitability is a part of market orientation. The scale is also longer than the MKTOR scale and the same length as the MARKOR so no advance has been made.

In a similar study, Deshpande and Farley (1998) empirically examined three measures of market orientation, namely Narver and Slater (1990), Kohli, Jaworski and Kumar, (1993), and Deshpande et al., (1993) note that the measure developed by Deshpande et al., (1993) actually measures customer orientation, and not the broader construct of market orientation. In brief, Deshpande and Farley (1998) asked 82 marketing executives from 27 companies to complete a questionnaire containing the three aforementioned measures of market orientation and hence, no mention is made of the problem of order effects in filling in the questionnaire. Analysis of the scales revealed that all appear interchangeable and that substantive conclusions reached with each apply generally to the others (Deshpande and Farley, 1998).
Given this, Deshpande and Farley (1998) set out to develop a more rigorous scale, by factor analysing the items of all three scales together. This process resulted in MORTN scale. However, their measure is criticised by Narver and Slater (1998) on the grounds that the conceptualisation is too narrow. In short, the Deshpande and Farley (1998) measure is primarily composed of items that focus on the customer, ignoring what Narver and Slater (1998) call critical behaviors for creating superior value for customers: (1) a business being clear to its value discipline and value proposition; (2) a business leading its targeted customers by discovering and satisfying also their latent needs; (3) a business seeing and managing itself as a service business; (4) a business managing its targeted customers as customers for life.

Recently, Matsuno et al., (2005) have attempted to improve market orientation conceptualisation and measurement by conceptually and empirically comparing three different scales of market orientation, the two scales of Kohli and Jaworski, Narver and Slater and another newly developed extended market orientation scale called (EMO). The scale evolved from a combination of exploratory qualitative interviews (a total of 12 business executives), a review of the market orientation literature and two survey pretests of the scale.

The proposed construct incorporates various antecedents, an extended construct of market orientation (or EMO) as the focal construct, performance consequences of EMO and moderators on the relationships between EMO and the performance consequences.

This comprehensive construct (EMO) incorporates more than just customers and competitors in the domain of organisational intelligence-related activities. It consists of a set of intelligence generation and
dissemination activities and responses pertaining to the market participants (e.g., competitors, suppliers and buyers) and influencing factors (e.g., social, cultural, regulatory and macroeconomic factors).

In spite of being a relatively new and more sophisticated construct, this construct could be described as a very broad and comprehensive scale to measure market orientation and there has, as yet, been no agreement on the use of this scale. Therefore, more studies are needed to validate this scale.

Most recently, in the Dibb and Simkin work (2009), the market orientation concept was not too different from previous definitions. Dibb and Simkin work (2009: 6), define the market-oriented organisation as:

‘the one that devotes resources to understanding the needs and buying behavior of customers, competitors’ activities, and strategies, and of market trends and external forces - now and as they may shape up in the future; inter-functional coordination ensures that the organisation’s activities and capabilities are aligned to this marketing intelligence’.

To sum up, there is no agreement among marketing scholars on the conceptualisation of market orientation. Hence, different results emerged as a consequence to implement the market orientation concept. In addition, different methodological approaches have been adopted which, in turn, produced different outcomes. Finally, the vast majority of previous articles on market orientation found positive association between market orientation and business performance. This, in fact, emphasises the idea that market orientation is a critical universal concept.
VI. Research Methodology

In this paper, data were collected through questionnaire survey directed to high level executives in Libyan companies. Eight different industries in the public and private sectors were targeted. Fifty three businesses out of eighty three responded. A considerable sample of (278) questionnaires were returned, with (233) questionnaires considered valid for analysis.

Market orientation was measured by Narver and Slater’s construct (1990). The choice was made based on the reliability and applicability of this scale to developing countries. Business performance was measured subjectively by nine items taken from the literature. Likert scale ranged from 1 strongly disagree to 5 strongly agree was employed.

VII. Data Analysis

For the sake of this research, descriptive analysis such as frequencies and mean scores have been used. In addition, more analytical techniques were used such as analysis of variance, correlations and path analysis as a sort of Structural Equation Modeling.

1. Descriptive Analysis

The ideal analysis was to focus on the key three variables: ownership type; nature of business; and business age. However, due to the sample was incomparable, the focus was made on only two variables: ownership type and nature of business.
Table I: Ownership Type by Age of Business and Nature of Business

<table>
<thead>
<tr>
<th>Nature of Business</th>
<th>Ownership Type</th>
<th>Age of Business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5-9 Years</td>
<td>10 Years and More</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Private</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Public/ Is Being Privatised</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Privatised</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>Services</td>
<td>Private</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Public/ Is Being Privatised</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Privatised</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Total responses</td>
<td>18</td>
<td>35</td>
</tr>
</tbody>
</table>

Table above shows that there is no companies in the privatised service sector. Hence, it is rational to exclude the privatised sector. Also, there is no companies under 9 years age. Therefore, the variable age could not be used.

2. Business Performance

In terms of measuring business performance, the subjective assessment was used. The scale reliability values of business performance construct reached a high level of (0.95). This value greatly exceeded the satisfactory, widely-accepted cut-off value of (0.70). This indicated the performance scale yielded a satisfactory reliability with the data collected in Libya since strong correlation was detected among the nine items.  

---

1 Under privatisation process conducted by the state.
2 Due to word limit the reliability analysis process was excluded and can be provided based on request.
Table II: Business Performance, Financial and Market Performance

<table>
<thead>
<tr>
<th>Scale</th>
<th>Coefficient</th>
<th>Business Performance</th>
<th>Financial Performance</th>
<th>Market Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Performance</strong></td>
<td>Pearson Correlation</td>
<td>1.00</td>
<td>0.92**</td>
<td>0.98**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>233</td>
<td>229</td>
<td>228</td>
</tr>
<tr>
<td><strong>Financial performance</strong></td>
<td>Pearson Correlation</td>
<td>0.92**</td>
<td>1.00</td>
<td>0.82**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>229</td>
<td>229</td>
<td>224</td>
</tr>
<tr>
<td><strong>Market performance</strong></td>
<td>Pearson Correlation</td>
<td>0.98**</td>
<td>0.82**</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>228</td>
<td>224</td>
<td>228</td>
</tr>
</tbody>
</table>

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

Table above shows strong positive correlations among the three scales: business performance, financial performance and market performance, implying that using one of these scales would be sufficient to measure business performance.

Regarding business performance and ownership type, the study targeted four types of business ownership, this section is dedicated to identifying whether there is a difference between these types of ownership. The mean and standard deviation of scores on the business performance scale for the three major ownership types is given in the table below.

---

1 Nine items were divided to two scales: 3 items measure financial performance and 6 items measure market performance and the total 9 items measure business performance.
Table III: Business Performance and Ownership Type

<table>
<thead>
<tr>
<th>Ownership Type</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>3.83</td>
<td>0.43</td>
<td>91</td>
</tr>
<tr>
<td>Public/ Is Being Privatised</td>
<td>2.96</td>
<td>0.99</td>
<td>122</td>
</tr>
<tr>
<td>Privatised</td>
<td>2.14</td>
<td>0.73</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>3.23</td>
<td>0.96</td>
<td>233</td>
</tr>
</tbody>
</table>

The privately owned companies were judged the most successful (3.83)\(^1\), while privatised businesses were the least successful (2.14). Public and under privatisation companies were judged better than the privatised ones with an average score of performance equal to (2.96).

Analysis of variance with performance as the dependent variable and ownership as the single independent factor showed that there was a significant difference in mean performance scores between ownership types \{ F (2,230) = 50.96, p < 0.01 \}.

Table IV: ANOVA Performance Relative to Competitors

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>65.10</td>
<td>2</td>
<td>32.55</td>
<td>50.96</td>
<td>0.00</td>
</tr>
<tr>
<td>Within Groups</td>
<td>146.91</td>
<td>230</td>
<td>0.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>212.00</td>
<td>232</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) The criteria in this research is that if the average score was three out of five based on Likert scale then a company can be considered successful. In this case, (3.83 out of 5) points are equals to (77\%) which means that the private companies are successful.
The above table explains big differences among the different types of ownership as P value was less than 0.01, and the difference can also be noted through Post Hoc Tests below.

**Table V: Multiple Comparisons (Post Hoc Tests)**

<table>
<thead>
<tr>
<th>(I) Ownership Type</th>
<th>(J) Ownership Type</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>Public/Is being privatised</td>
<td>0.86692*</td>
<td>0.110</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Privatised</td>
<td>1.68727*</td>
<td>0.197</td>
<td>0.00</td>
</tr>
<tr>
<td>Public/Is being privatised</td>
<td>Private</td>
<td>-0.86692*</td>
<td>0.110</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Privatized</td>
<td>0.82036*</td>
<td>0.193</td>
<td>0.00</td>
</tr>
<tr>
<td>Privatised</td>
<td>Private</td>
<td>-1.68727*</td>
<td>0.197</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Public/Is being privatised</td>
<td>-0.82036*</td>
<td>0.193</td>
<td>0.00</td>
</tr>
</tbody>
</table>

*The mean difference is significant at the 0.05 level.

Post Hoc Bonferroni multiple comparison tests table explains that all three ownership types were significantly different from each other at the 5% significant level which means that the performance of the three ownership types of businesses is significantly different.

The three variables business performance, ownership type and business nature can be presented in the same table. This part of the analysis explains how business performance is different based on the two pillars: ownership type and nature of business.
Table VI: Business Performance, Business Nature and Ownership Type

<table>
<thead>
<tr>
<th>Ownership Type</th>
<th>Business Nature</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>Manufacturing</td>
<td>3.96</td>
<td>0.35</td>
<td>50</td>
</tr>
<tr>
<td>Private</td>
<td>Services</td>
<td>3.67</td>
<td>0.47</td>
<td>41</td>
</tr>
<tr>
<td>Public/ Is Being Privatised</td>
<td>Manufacturing</td>
<td>1.91</td>
<td>0.62</td>
<td>30</td>
</tr>
<tr>
<td>Public/ Is Being Privatised</td>
<td>Services</td>
<td>3.30</td>
<td>0.85</td>
<td>92</td>
</tr>
</tbody>
</table>

Table above shows that the private sector performs much better than the public sector both in: the services sector (3.67 against 3.30) and the manufacturing sector (3.96 against 1.91). To clarify, a two-way analysis of variance with performance as dependent variable and both nature of business and ownership as independent factors was carried out. As discussed earlier, it was not possible to include privatised companies in the analysis so that both factors are two levels.

Table VII: Two Way ANOVA: Performance Relative to Competitors

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>84.76</td>
<td>3</td>
<td>28.25</td>
<td>64.66</td>
<td>0.00</td>
</tr>
<tr>
<td>Intercept</td>
<td>1859.73</td>
<td>1</td>
<td>1859.73</td>
<td>4255.99</td>
<td>0.00</td>
</tr>
<tr>
<td>Ownership Type (A1_2)</td>
<td>65.65</td>
<td>1</td>
<td>65.65</td>
<td>150.23</td>
<td>0.00</td>
</tr>
<tr>
<td>Nature of Business (A1_3)</td>
<td>13.68</td>
<td>1</td>
<td>13.68</td>
<td>31.31</td>
<td>0.00</td>
</tr>
<tr>
<td>A1_2 * A1_3</td>
<td>31.82</td>
<td>1</td>
<td>31.82</td>
<td>72.82</td>
<td>0.00</td>
</tr>
<tr>
<td>Error</td>
<td>91.33</td>
<td>209</td>
<td>0.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2537.48</td>
<td>213</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>176.09</td>
<td>212</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R Squared = 0.48 (Adjusted R Squared = 0.47)
The two-way analysis of variance shows that there was a significant main effect of ownership on business performance as P value was less than 0.01, \( F (1,209) = 150.231, p< 0.01 \) and a significant main effect of business nature on business performance as P value was less than 0.01, \( F (1,209) = 31.036, p< 0.01 \). However there was also a significant interaction effect as P value was less than 0.01, \( F (1,209) = 72.817, p< 0.01 \).

3. **Market Orientation**

The reliability analysis of market orientation construct (15 items) was conducted. The internal consistency reliability (Cronbach’s alpha) reached a high level of (0.93). This value exceeded the cut-off value of (0.70). This indicated the scale yielded a satisfactory reliability with the data collected in the Libyan context. In addition, the internal consistency and correlations among the construct’s statements are highly positively correlated, indicating strong consistency among them¹. Ownership and business nature have an impact on market orientation embracing as explained below.

¹ Due to word limit the reliability analysis process was excluded and can be provided based on request.
Table VIII: Market Orientation, Ownership Type and Nature of Business

<table>
<thead>
<tr>
<th>Ownership Type</th>
<th>Nature of Business</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>Manufacturing</td>
<td>3.86</td>
<td>0.40</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Services</td>
<td>3.15</td>
<td>0.34</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.54</td>
<td>0.51</td>
<td>91</td>
</tr>
<tr>
<td>Public/Is being privatised</td>
<td>Manufacturing</td>
<td>2.23</td>
<td>0.24</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Services</td>
<td>2.62</td>
<td>0.28</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2.53</td>
<td>0.32</td>
<td>122</td>
</tr>
<tr>
<td>Total</td>
<td>Manufacturing</td>
<td>3.25</td>
<td>0.87</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Services</td>
<td>2.79</td>
<td>0.39</td>
<td>133</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2.96</td>
<td>0.65</td>
<td>213</td>
</tr>
</tbody>
</table>

From the table above it is clear that the private sector, both manufacturing (3.86) and service (3.15), enjoy higher degree of market orientation, while the public sector is characterised by a weak market orientation degree for both industrial (2.23) and service (2.62) sector.

To identify whether there is a difference among these dimensions, a two-way analysis of variance with was used.
Table IX: ANOVA for Market Orientation, Ownership and Business Nature

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>68.21</td>
<td>3</td>
<td>22.74</td>
<td>226.25</td>
<td>0.00</td>
</tr>
<tr>
<td>Intercept</td>
<td>1586.77</td>
<td>1</td>
<td>1586.77</td>
<td>15789.82</td>
<td>0.00</td>
</tr>
<tr>
<td>Ownership Type (A1_2)</td>
<td>52.25</td>
<td>1</td>
<td>52.25</td>
<td>519.89</td>
<td>0.00</td>
</tr>
<tr>
<td>Nature of Business (A1_3)</td>
<td>1.13</td>
<td>1</td>
<td>1.13</td>
<td>11.24</td>
<td>0.001</td>
</tr>
<tr>
<td>A1_2 * A1_3</td>
<td>13.92</td>
<td>1</td>
<td>13.92</td>
<td>138.48</td>
<td>0.00</td>
</tr>
<tr>
<td>Error</td>
<td>21.00</td>
<td>209</td>
<td>0.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1953.79</td>
<td>213</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>89.21</td>
<td>212</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R Squared = 0.77 (Adjusted R Squared = 0.76)

Analysis of variance suggests that the type of ownership of the company, the nature of its business and the interaction between have an influence on the degree of embracing the market orientation concept as all (p) values are < 0.01. There is significant main effect of ownership on market orientation (F (1,209) = 519.891, p< 0.01) and a significant main effect of business nature on market orientation (F (1,209) = 11.24, p < 0.01). However there was also a significant interaction effect (F (1,209) = 138.48, p< 0.01).
4. Market Orientation-Business Performance Relationship

To identify the degree of correlation between market orientation and business performance, Pearson correlation coefficient was used.

**Table X: Market Orientation and Business Performance**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Coefficient</th>
<th>Performance against competitors</th>
<th>Market orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance against competitors</td>
<td>Pearson Correlation</td>
<td>1.00</td>
<td>0.58**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>233</td>
<td>233</td>
</tr>
<tr>
<td>Market orientation</td>
<td>Pearson Correlation</td>
<td>0.58**</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>233</td>
<td>233</td>
</tr>
</tbody>
</table>

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

Table above shows that there is a significant moderate to strong correlation between market orientation and business performance as \( r = 0.58 \) and \( p < 0.01 \). This demonstrated that overall market orientation has a positive influence on business performance.
Table XX: Market Orientation Components and Business Performance

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Customer Orientation</th>
<th>Competitor Orientation</th>
<th>Inter-functional Cooperation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance against competitors</td>
<td>0.62**</td>
<td>0.30**</td>
<td>0.66**</td>
</tr>
<tr>
<td>Customer Orientation</td>
<td></td>
<td>0.67**</td>
<td></td>
</tr>
<tr>
<td>Competitor Orientation</td>
<td></td>
<td></td>
<td>0.51**</td>
</tr>
<tr>
<td>N = 233</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Table above shows significant positive correlations among the three scales. The table also shows the correlations of the three dimensions with business performance.

Again all the correlations are positive and significant but the correlations between competitor orientation and business performance was considerably lower than the other two dimensions indicating that an orientation towards competitors was not closely related to business performance.

5. **Hypotheses testing**

To test research hypotheses, Path Analysis was used as produced the following two models.
Figure I: Ownership, Business Nature, Market Orientation and Business Performance
As shown in the figure and the table above, it is clear that a strong positive relationship between private manufacturing and performance is noticed (standard path coefficient = 0.53, p < 0.01). Therefore, the hypothesis H1A is supported.

Strong positive relationship between private service and performance is also observed (standard path coefficient = 0.51, p < 0.01). Therefore, the hypothesis H1B is supported. However, the hypothesis H1C will not be supported as a negative association between public manufacture and performance is discovered (standard path coefficient = -0.02, p >0.01).

The hypothesis H1D is supported as a positive relationship between public service and performance is noticed (standard path coefficient = 0.59, p < 0.01).

### Table XXX: Ownership, Business Nature, Market Orientation & Performance

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Relationships</th>
<th>link</th>
<th>Standard Regression Coefficients</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1A</td>
<td>Private manufacture-Performance</td>
<td>Positive</td>
<td>0.53</td>
<td>***</td>
</tr>
<tr>
<td>H1B</td>
<td>Private service-Performance</td>
<td>Positive</td>
<td>0.51</td>
<td>***</td>
</tr>
<tr>
<td>H1C</td>
<td>Public manufacture-Performance</td>
<td>Negative</td>
<td>-0.02</td>
<td>0.82</td>
</tr>
<tr>
<td>H1D</td>
<td>Public service-Performance</td>
<td>Positive</td>
<td>0.59</td>
<td>***</td>
</tr>
<tr>
<td>H2</td>
<td>Market orientation-Performance</td>
<td>Positive</td>
<td>0.32</td>
<td>***</td>
</tr>
</tbody>
</table>

*** Standardised path coefficient is statistically significant (p<0.001)
The last hypothesis H2 is supported as a significant positive relationship between overall market orientation and performance (standard path coefficient = 0.32, \( p < 0.01 \)) is observed.

It is observed that the model accounted for (0.55) of the variance in performance.

Despite this overall positive effect of market orientation on performance, it has been necessary to identify the individual effects of the three sub-dimensions of market orientation on business performance.

**Figure II: Ownership, Nature of Business, Market Orientation and performance**
As shown in the figure and the table above, it is clear that type of ownership, nature of business and market orientation still have an effect on business performance even after the inclusion of the three market orientations dimensions.

It can be observed that a strong positive relationship between private manufacturing and performance is detected (standard path coefficient = 0.57, p < 0.01). Therefore, the hypothesis H1A is supported.
A strong positive relationship between private service and performance is also observed (standard path coefficient = 0.42, p < 0.01). Therefore, the hypothesis H1B is supported. However, the hypothesis H1C will not be supported as a negative association between public manufacture and performance is detected (standard path coefficient = -0.12, p >0.01).

Hypothesis H1D is supported as a positive relationship between public service and performance is noticed (standard path coefficient = 0.35, p < 0.01).

A significant positive relationship between customer orientation and performance is noticed (standard path coefficient = 0.24, p < 0.01). Therefore, the hypothesis H2A is supported.

However, and contrary to expectations, a moderate but significant negative link between competitor orientation and performance is spotted (standardised path coefficient = -0.36, p < 0.01). Therefore, hypothesis H2B is not supported. The last hypothesis H2C is supported as a significant position relationship between inter-functional co-ordination and performance is observed (standard path coefficient = 0.32, p < 0.01).

It should be noted that the inclusion of the three sub-components in this model has caused a change in the expected effects of the variables of the model and is also further clarified more in the variance in the performance variable. That means when the three separate market orientations were added, an additional (0.10) of variance in performance was accounted for.

This is a moderate effect and is statistically significant. Overall, the model accounted for (0.65) of the variance in business performance.
Based on the analysis process shown above, the acceptance and rejection of the hypotheses of this research can be summarised as follows.

**Table L: Modelling and Hypotheses Testing**

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Supported/ Not Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business performance is more likely in the private manufacturing sector</td>
<td>Supported</td>
</tr>
<tr>
<td>Business performance is more likely in the private service sector</td>
<td>Supported</td>
</tr>
<tr>
<td>Business performance is more likely in the public service sector</td>
<td>Supported</td>
</tr>
<tr>
<td>Business performance is more likely in the public manufacturing sector</td>
<td>Not Supported</td>
</tr>
<tr>
<td>There is a positive link between overall market orientation and business performance</td>
<td>Supported</td>
</tr>
<tr>
<td>There is a positive link between customer orientation and business performance</td>
<td>Supported</td>
</tr>
<tr>
<td>There is a positive link between competitor orientation and business performance</td>
<td>Not Supported</td>
</tr>
<tr>
<td>There is a positive link between inter-functional coordination and business performance</td>
<td>Supported</td>
</tr>
</tbody>
</table>

From table above, it can be clearly noted that the two variables: ownership type and nature of business have an effect on business performance. Also, market orientation and its components has an effect on business performance as well.
VIII. Discussion

The outcomes of this research have provided some interesting findings. For example, the privately owned businesses in manufacturing and services sectors were seen perform much better than other ownership types. There is also a growth in embracing the market orientation concept during the transition process. This result is in line with previous research conducted in transitional economies (e.g. Soehadi, 2001; Singh, 2003; Recela et al., 2007; Demirbag et al., 2006; Wong and Ellis, 2007; Subhash et al., 2008). In addition, considerable variation in the degree of adoption the concept among the respondent businesses is noted. At a time when there is growth in embracing the market orientation concept in the private sector, weak orientation towards the market has been noted in the public sector, the privatised sector and those being privatised.

The orientations towards customers and internal coordination are the most important components of the market orientation. This finding is in line with Deshpande’s (1993) finding in Japan. Also, the finding is in line with the finding of Sin et al., (2000) in Hong Kong; Noble et al., (2002) and Ge and Ding (2005) in China. However, the finding is inconsistent with Voss and Voss (2000) who found a negative relationship between customer orientation and performance in US non-profit businesses. This implies that customer orientation is an important element for business performance in the Libyan market. Inter-functional coordination was also detected to be positively connected to performance. Inter-functional coordination is critical element for business success. This result is in line with McDermott et al., (1993) finding who found a positive effect of inter-functional coordination on performance in the US
hospitality sector. Also, the finding is consistent with the Voss and Voss (2000) finding in non-profit US businesses.

Regarding competitive orientation, very low attention was paid to this component. The relationship between competitor orientation and performance was negative. This constituent is currently irrelevant to performance as the number of competitors in this cross-sectional study not enough to detect the positive effect of this factor. This result contradicts the results of Kumar and Subramanian (2000) and Dawes (2000) who asserted that competitor orientation appears to be the stronger positive effect component on performance. This result is also contradicts the findings of Day and Wensley (1988), and Narver and Slater (1990) who proposed that a balanced mix of customer; competitor orientation and inter-functional co-ordination is required for maintenance of a competitive advantage in the marketplace. The result is noticed to be consistent with only two previous studies found in the surveyed literature conducted by Grewal and Tansuhaj, (2001), and Noble et al, (2002).

This result might be interpreted as follows. Firstly, in the Libyan market, state-owned businesses are still the dominant businesses. Secondly, the growing level of competition in a small number of sectors such as food industries is not enough to show the effect of the competitor orientation in this study. Hence, competition cannot be considered an important drive to performance under current Libyan market circumstances. In the coming years with the entry of more new international companies this element is expected to have strong positive relationship with performance. Also, this element is expected to have positive strong effect on performance in case new studies focused on the competitive Libyan food industry sector.
In addition to that, a positive correlation between market orientation and performance is detected in Libya. This means that market orientation still has an influence on business performance in the transition economies such as Libya. This result is consistent with previous studies conducted in different contexts and detected positive influence of market orientation on performance (e.g. Narver and Slater, 1990; Hooley et al., 1990; Kohli and Jaworski, 1993; Deshpande and Farley, 1998; Oczkowski and Farrell, 1998; Harris, 2001; Vazquez et al., 2002; Oliver et al., 2003; Olavarrieta and Friedman, 2008; Subhash et al., 2008). The result is also consistent with Hooley and Lynch, (1985) who found the more successful companies, called the high-fliers, shared some common characteristics, the first of which was a genuine market orientation. Also, this result is consistent with Fritz study (1996) in Germany. His study realised that there are certain factors contributing positively to business performance. Market orientation was the more important critical factor for corporate success along with production orientation, cost orientation and employee orientation. However, this finding conflicts some other authors’ findings. However, the finding contradicts the finding of Caruana et al., (1998) who did not observe any association between market orientation and performance in the Australian public sector. Also, the result conflicts with the result of Esslemont and Lewis (1991) in New Zealand; Greenley (1995) in the UK; Caruana et al., (1999) in South Africa, and Hynes and Mollenkopf (2006) in the Canadian, British and Australian contexts.

Finally, the degree of market orientation adoption in the manufacturing sector is much higher than that in the service sector, which means that nature of business has an effect on the adoption of market orientation concept. This result conflicts with previous research found stronger link between market orientation and business performance of services
businesses (e.g. Kotler and Levy, 1969; Lado et al., 1998; Gray and Hooley’s, 2002; Cynthia R.C. et al., 2004).

IX. Research Implication

In the light of the paper’s results, the main implications can be explained as follows:

1. Theoretical Implications

This paper provides some vital theoretical implications. It was initially assumed in the extant literature that the consequences of market orientation may vary under different national circumstances. Therefore, this study examines market orientation and business performance applications from the viewpoint of non-Western practitioners.

Previous research also shows that the majority of Western studies have confirmed the positive relationships either directly or indirectly. However, some scholars have argued that it is not always true to find the strong relationship in all contexts. Despite this, this study is in line with the findings mostly found in Western countries and shows that market orientation can be applied effectively in a culturally different country such as Libya. Based on the evidence from most studies in the past and from the results of this research, it can be concluded that market orientation is universal concept in the business world.

Prior research on market orientation has been on the combined effects of the market orientation components (e.g. Han et al., 1998). Treating the concept of market orientation as an aggregate construct of equal importance for each component can be confusing. This study found that
there are different associations between market orientation components and business performance in Libya as the study detected unbalanced weights of the three components. Customer orientation and inter-functional coordination were found to be positively associated with business performance. Contrary to expectations, competitor orientation is found to have negative link with business performance.

Last, but not least, the Libyan market is still a raw research environment and since the market is still lacking this kind of studies, it is anticipated that this research will significantly contribute to opening the door and stimulating many future studies.

2. Managerial implications

In addition to theoretical implications, some managerial implications can be suggested. Businesses’ owners, decision makers, policy makers, the Libyan Authorities and international businesses are all might benefit from these implications.

The study advises the Libyan Authorities, public companies’ decision makers and privatised companies’ decision makers to follow the successful management and marketing practices embraced by the private sector and increase the awareness of management and marketing skills. The study also recommends establishing a close relationship with leading business institutions to develop training programmes.

The study clearly supports that market orientation has a positive effect on business performance. Thus, it is worthwhile for businesses to continue and increase their efforts in embracing a higher degree of market orientation.
With growing the number of international companies in Libya, the study recommends the Libyan Authorities and decision makers to consult and recruit experts in market orientation and customer orientation fields, and that requires building customer database updated regularly focused on current and latent customers’ needs.

Regarding inter-functional co-ordination, managers must be willing to listen to input from all members of the organisation and all functions must work together as a team to serve their customers needs.

In terms of the competitive pressure, competitor orientation has a negative association with business performance. This factor is expected to be more important with opening the Libyan borders more to international competition. Also, this factor might be very important if the study confined to a particular sector characterised by high competition as it is the case in food industry. Therefore, managers have to be aware of the level of competition in their sector as that will help them in formulating and adopting the appropriate strategy and taking the necessary actions.

In addition, the focus should be placed on opportunities in private manufacturing and services sector and also opportunities in public services sector. Focusing on the public manufacturing sector will not be a source of success. This has many implications for new ventures. Foremost is the fact that working in the private manufacturing and service sectors will be productive and profitable; while the focus of the public sector should be on the service sector rather than manufacturing.

Effective marketing strategies with regard to pricing, promotion, advertising, focusing on the characteristics and the functionality of the products, creating customer value and delivering goods to customers are
noticed to be important especially with the opening of the Libyan borders. Finally, entering any new international market can be tricky and the Libyan market is not an exception. Therefore, international businesses who are interested in doing business in Libya should build a good relationship with local consultant agencies in Libya.

X. Limitations

As is the case in academic research, the current paper has some limitations. First, the study mixes data from different manufacturing and services businesses. Hence, the study does not explain the independent effect of each type of business (banking, insurance, etc) on market orientation and business performance. Second, market orientation was measured in the research based on Narver and Slater’s construct. Therefore, the results may differ if another market orientation scale was used. Third, the distribution of responses across the categories of these three key pillars (ownership type, nature of business and business age) was not consistent. Finally, the study managed to obtain data from high level executives (SBU's, managers, etc). Junior managers and bottom line employees could not be consulted.

XI. Future Research

The limitations mentioned above open the door for new fruitful area of investigations.

First. Despite the importance of employees and customers views’, it has been difficult to target employees and customers. Therefore, future research might seek employees and customers’ perceptions to measure market orientation and business performance. Second, for the purpose of obtaining a more accurate image about market orientation and business
performance, future research should perhaps focus on certain industries such as food industry characterised by intense competition. Third, the current study adopted Narver and Slater’s construct to measure market orientation. Future studies could consider other market orientation scales and compare the results with the findings of the current research. Fourth, future research could focus on other business orientations: production orientation, sales orientation, quality orientation, entrepreneurial orientation and their impact on business performance. Seventh, the vast majority of existing literature focused mainly on high organisational levels. However, given that market orientation places a special emphasis on the dissemination of and responsiveness to market intelligence, it would be of interest to compare employees’ perceptions at different organisational levels to understand better the market orientation theory. Eighth, it has been difficult to include business size. Future research might consider this factor to test its expected effect on market orientation adoption. Finally, the component competitor orientation was found to be negatively connected with business performance. An intriguing future research would be to test the effect of this component in two different sectors one characterised by high level of competition and another one with less competition.
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