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Differential Person Functioning in Early Mathematics

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Differential Item Functioning (DIF) is a widely used term in test development and item characteristics diagnostic analysis literature. While it is very important to analyze data for DIF since It is a serious threat to test validity, it is also very important to analysis data for Differential Person Functioning (DPF) for person performance diagnostic purposes. When DPF exists, it means that such a case has different performance characteristics and therefore, the need for a special individual plan of teaching and training does exist as well.   The purpose of this paper is to encourage the use of DPF analysis in mathematics aptitude tests as a diagnostic approach through two examples illustrating the presence of DPF from data of the Test of Early Mathematics (TEMA3).

The public attention on the value of high quality preschool and childhood education has increased worldwide. Language reading, writing and speaking along with mathematics got the focus of that attention because they are important basics and essentials to ensure individuals' school readiness.

Research on learning in preschool years of life indicates how important is the early mathematical knowledge and experiences. According to … 2004, confidence and ability to comprehend and use mathematics of a child can be developed through an engaging and encouraging climate of education.

A successful early childhood education should effectively introduce mathematical concepts, methods, and language through a variety of appropriate examples, illustrations, experiences and research-based teaching strategies.   By guiding youngsters to see connections in between mathematical ideas and connections with other subjects along with real life situations, teachers can and will improve children's abilities to communicate and explain their mathematical knowledge and experience in deep and sustainable manners.

During their early years of life, children experiment different mathematical experiences like comparing quantities, finding patterns, and dividing an apple fairly with a friend. Although it is the responsibility and mission of teachers to ensure that their students are understanding and fully comprehending what was thought, but it is also true that this goal may not be achieved with all students in reality. For different reasons, some students do not understand the concepts presented at the same time with other students. Other students need more time or more examples and different methods of teaching to understand concepts than their colleges.   Some other students fail in connecting ideas and bridging concepts. Accordingly, a student may present a high performance in some aspects of mathematics and still presents poor performance in other aspects. Such a case is not noticed easily even when a diagnostic test is being used because it would appear with about average general performance.

According to Johanson (1997), Differential Item Functioning (DIF), is a commonly-used technique for test and items diagnostic purposes. Through DIF items on which specific demographic groups perform differently though a logical criteria was set for that comparison (i.e,. overall skill level). DIF analysis is an important procedure to assure test validity.

When students being diagnosed for mathematical performance, it is usually the case that their scores on a general multi-dimensional mathematical test are examined. Sometimes, a closer look is devoted to the performance on each section or dimension for diagnoses or comparison reasons. In such cases, it is almost always expected to find that a student has succeed on some items and failed on others within each dimension, but overall he presented better performance in one dimension than another one. This finding could be referred as *impact*. Again, it is common, expected and logical. However, if the items in both dimensions were controlled according to a specific criterion (I,e,. item difficulty, item discrimination), then a students' performance on the items of one dimension was always better across all categories of that criterion than his performance on the items of the other dimension, then this student is in fact is functioning differentially on those two dimensions. This is a case that is referred to as Differential Person Functioning (DPF).

In item bias research, item bias has considerable ramifications at a policy, administrative, and classroom level. As such, bias can lead to systematic errors that distort the inferences made in the classification and selection of students (Zumbo, 1999). Learners who have similar knowledge of the material on a test (based on total examination results) should perform similarly on individual examination items, regardless of their gender or any other grouping variable. Similarly, in DPF research, DPF cases can lead to systematic diagnostic errors that distort the inferences made in the classification and selection of students. Learners who have similar knowledge of the material on a test (based on total examination results) should perform similarly on examination items that are similar on a specific criteria such as item difficulty level regardless of the dimension the item belongs to (I,. e, formal or informal math).

DPF is a notion that did not appeared much in research. Searching ERIC data base and EBSCO data bases under the keywords "Differential Person Functioning" as keywords in the title has indicated only five entries. Analyzing for Differential Person Functioning is extremely important to clarify strengths and weaknesses in a student's performance specially in multi-dimensional tests. Therefore, the purpose of this research is to present more examples of DPF that were taken from real data.

Method

Sample

Data were collected from responses of 756 youngsters in the first, second and third elementary classes in the public schools of three different randomly chosen provinces in Jordan. At the class level, 8, 16, & 8 classes were selected according to cluster sampling technique. Age of the participants ranged between 6.78 to 8.74 years. Originally, data were collected by Mubaidin (2008) as a part of a master thesis.

Instrument

The Test of Early Mathematics Ability (TEMA3) is a well-known aptitude test that measures both formal and informal types of mathematics. It measures children's performance in mathematics for ages of 3-0 to 8-11. In addition, it can be a useful tool for older ages with probable mathematical learning problems. TEMA3 is also a good choice for determining specific strengths and weaknesses when diagnosis is a main purpose. Furthermore, TEMA3 can be used for many other purposes like program evaluation, screening for readiness, identifying remedial guidelines for poor school performance in mathematics, and identifying gifted students. The test includes both speed and power items. The test measures Concepts and skills in different areas like: numbering skills, number-comparison facility, numeral literacy, mastery of number facts, calculation skills, and understanding of concepts. TEMA3 is a two forms teat with 72 items each. Items were divided according to six age categories (i,e,. three, four, five, six, seven, and eight years).

Data Preparation

In DIF analysis, it is usually the case that data spread sheet of the Statistical Package for Social Sciences (SPSS) program allocated items on top as variables and list persons as cases. However, For DPF analysis, the data matrix should be transposed so the variables are persons and the cases are items. Then, two variables were created: first, the variable "focalrefg" was created to represent both focal group (all items of the informal math domain) and reference group (all items of the formal math domain). Second, the variable "itemdiffg" was created by recoding items' difficulty coefficient into 5 interval groups. Interval length was computed by dividing the range by 5.

Data Analysis

Graphical procedure. The SPSS was used to create the graphs of the cases that represent the examples provided in this study. The multiple line graph was employed.

Mantel-Haenszel (MH) procedure. For DPF analysis, in MH chi-square procedure requires that all items were regrouped into 3 to 5 groups as suggested by Sceenuman's chi- square procedure since recommendations about number of groups are not widely available in the literature (O'Neal, 1991).

As phrased by Gierl, Khaliq & Boughton (1999), Mantel-Haenszel (MH) is a nonparametric approach used for identifying DIF by Holland & Thayer (1988). MH yields a chi-square test with one degree of freedom to test the null hypothesis that there is no relation between group membership and test performance on one item after controlling for ability. However, in the current research, MH was used to test the null hypothesis that there is no relation between item's group membership and individual performance on one item after controlling for item difficulty. MH is computed by matching items in each group (the focal and reference groups) on difficulty coefficient level and then designing a 2-by-2-by- K contingency table for each person, where K is the difficulty level on the matching variable of total test score. At each difficulty level j , a 2-by-2 contingency table is created for each person i . The MH - χ^2 statistic tests the null hypothesis that there is no relation between item's group membership and individual performance on one item after controlling for item difficulty. Nichols (1994) proposed a macro for SPSS that produces an estimator of the common odds ratio and MH chi-square test for the null hypothesis that the odds ratio is 1. It also produces the level of significance for the chi-square statistical test. This macro was used in this study.

Results and discussion

Data were examined for any DPF existing cases using both Mantel-Haenszel Chi-square statistics and graphic procedure. To distinguish DPF cases from other cases that present impact two example were discussed below. Those examples have helped to illustrate the difference between two persons with the same total score which make it easy to think of them as of similar abilities. In fact, those persons have performed differently on a specific test without being noticed that they are not of equivalent real abilities. Although their total scores were the same, but they were refluxing different abilities. Table1 shows the statistics of four students used to illustrate both examples.

Table 1

Four cases illustrating the difference between impact and DPF

Student #	Total TEMA3 score	Informal math score	Formal math score	Case
94	0.6389	0.8750	0.3438	DPF
10	0.6389	0.8250	0.4062	Impact
79	0.5278	0.7500	0.2500	DPF
19	0.5278	0.7750	0.2188	Impact

Example One

Student number 19 and 79 got the same mean total score on the test of early mathematics. Figure 1 represents their line graph.
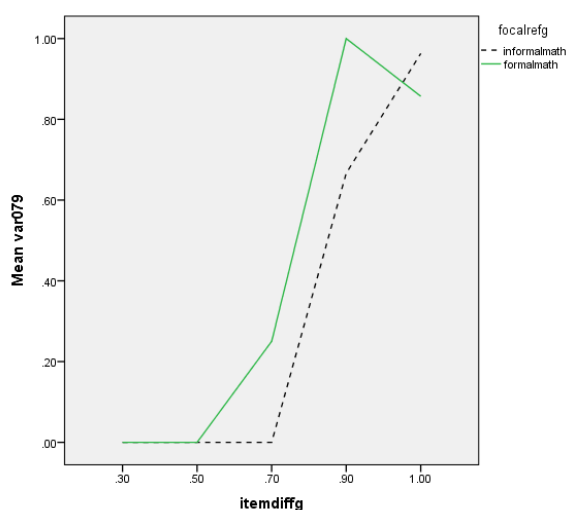

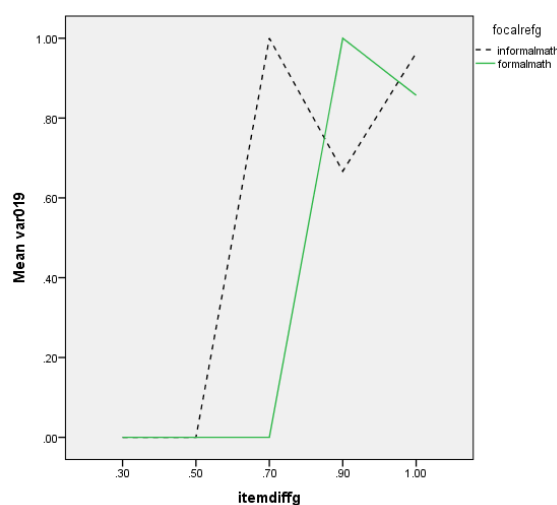*Figure 1*: case #79 presenting DPF.   *Figure 2*: case #19 presenting impact.

As presented by figures 1&2, two students with the same total test score were in fact acted in totally different manner when responding to test items of different types. It is common that a student presents a bitter overall performance on one type (i.e., informal math score 0.775) than another type of items (i.e., formal math score 0.2188), but he did well on some items and less on others from both types through different locations of item difficulty levels. That is the case of impact. That is exactly the case with student 19. For students 79, the story was different. He presented an overall bitter performance on one type (i.e., informal math score 0.775) than another type of items(i.e., formal math score 0.250), but he did well on items of one type compared to what he did on the items of the other type even when those items were of the same item difficulty level. This kind of systematic performance presents an example of DPF existence.

Example Two

As presented by figures 3&4, two students with the same total test score (0.6389) were in fact acted differentially when responding to test items of different types.
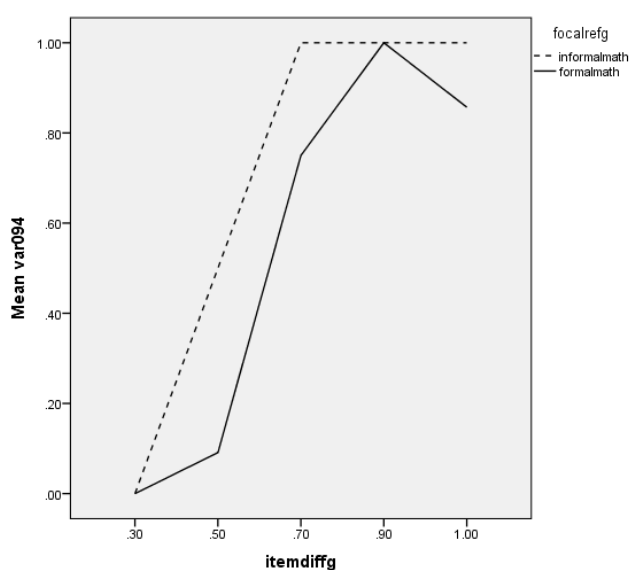

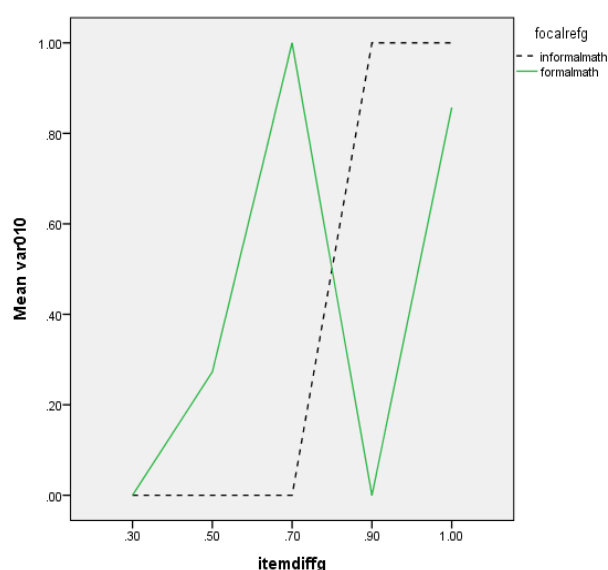*Figure 3*: case #94 presenting DPF.   *Figure 4*: case #10 presenting impact.

Student 10 presented bitter overall performance on one type (i.e., informal math score 0.8250) than another type of items(i.e., formal math score 0.4062), but he did well on some items and less on others from both types through different locations of item difficulty levels. That is the case of impact. That is exactly the case with student 10. However, students 94 presented an overall bitter performance on informal math items (0.875) than formal math items (0.250), but he presented that even when those items were controlled for the same item difficulty level. This kind of systematic performance presents another example of DPF existence.

On the other hand, student 94 is different than student 79, even though both of them were considered as DPF cases, but they represented different abilities in mathematics. Therefore they should be treated differently when exposed to learning materials, training experiences or teaching strategies.

DPF analysis is a useful approach whenever a closer diagnostic look is needed. Most of psychological, cognitive, aptitudes and educational tests and batteries required that subjects respond to items or tasks that measured different concepts or dimensions of the trait. DPF could be of great help when diagnosing performance on such tests, providing that a logical controlling criterion be set. Furthermore, since it is a matter of differential functioning style, DPF cases could be at any level of performance, which means that DPF cases may exist within high achievers, about average and learning disabled students.

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Teaching Non-Traditional MBA Adult Learners: Teaching Strategies and Techniques for a Successful Transition towards Quality MBA Graduates

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Abstract

Historically, entrance for future MBA candidates into traditional MBA programs required a certain Grade Point Average (GPA), pass rate on either the Graduate Record Examination (GRE) or Graduate Management Admission Test (GMAT), and an undergraduate degree in either the field of business or management. However, for the non-traditional adult learner, these requirements mean a barrier to higher education or re-thinking of their future career planes. However, with the onset of technological improvements, Internet, and development of online learning many non-traditional learners are seeing this invisible barrier being removed. In fact, many adult learners are moving from the traditional form of MBA enrollment and enrolling into the newer form of MBA programs with an online learning environment. The appeal of less barriers and more acceptance towards the working adults has become appealing, but not without its own set of challenges and issues. This paper will look at the challenges faced by online instructors with the admission of non-traditional business students with little or no business or management background. As a result, this paper will outline various teaching strategies and techniques used in several leading online MBA programs which cater towards the working adult with limited business/management background who desire to obtain a MBA degree and become better equipped with stronger skills sets to compete with all types of MBAs competing for their next career endeavor. However, it should be noted that the paper will also look at the issues raised in an online learning environment with a range of adult learners with mixed amounts of business/management education and demonstrate ways to encourage, motivate, and retain the attention of adult learners to help them succeed from their first course to graduation. Further, this paper will look at teaching skills need for teaching this unique group of learners to help them realize their fullest potential as a learner and contribution as part of the human capital in today's business world.

The Positive Impact on Communities in Repairing Blighted Properties: The Effectiveness of the Tenant Remedy Act

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Abstract

Blighted properties have existed throughout history. However, the Great Recession increased the number of blighted properties in communities. In turn, these communities, which often were already suffering the most economically, were even further harmed through a decrease in property values. Blighted properties have a negative economic effect on municipalities, which in turn, can result in less services being provided to its residents because of the loss in property taxes. The loss of services has economic consequences to the residents and the communities. Speculative investors played a huge role in the increase in blighted properties in communities. When the housing downturn hit, speculative investors would continue to collect rents, and not make repairs to the property. In some cases, the bank had foreclosed on the property, but the tenants were unaware of the foreclosure, and the speculative investor continued to collect the rents again without making repairs. Tenants were afraid of demanding repairs because of a well-founded fear that the landlord would retaliate and evict them. When communities are besieged with blighted properties, it is essential to both economic viability and the stability of the community for others to step in to repair the blighted properties. The solution will be explored through the use of a Tenant Remedy Action, which is a civil action in court that allows for a judge to appoint a receivership to take over the property. This act allows tenants or neighborhood organizations to repair the blighted property without interference of the owner and allows funds to be used to make repairs so that communities are positively impacted. A Tenant Remedy Action is an effective tool, and positively impacts communities when blighted properties are repaired.

Revisiting the bi-directional causality between debt and growth: evidence from linear and nonlinear tests

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*Sole Presenter: Professor Glauco De Vita, Professor of International Business Economics, Centre for Business in Society (CBiS), Faculty of Business and Law, Coventry University

Abstract:

This paper revisits the bi-directional causality between public debt and the rate of GDP growth for 10 EMU countries along with the US, UK and Japan, over a sample period from 1970 up to 2014 whilst accounting for the nonlinear properties of both the individual time series, and their causal relationship in both directions. For most of the countries in our sample, we find no robust evidence of any long-run causal effect. Bi-directional causality is detected only in the case of Austria, while for France, Luxembourg and Portugal, causality runs solely from debt to growth, but the estimated effects are very small. Robustness tests based on panel data causality tests within a SYS-GMM framework broadly confirm the validity of our main results across methods, sample periods and data measurements. Our findings carry important implications for the design of optimal fiscal policies.

Keywords: Public debt; economic growth; Granger causality; nonlinear causality; SYS-GMM

Information Asymmetry in the Korean Stock Market and the Effects of the U.S. Financial Crisis

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Abstract

This study examines information asymmetry in the Korean stock market over the period 2006 to 2013 by comparing the quality of information used by Korean institutions, Korean individuals, and foreign investors. To measure information quality, the "probability of informed trading" (*PIN*) proposed by Easley et al. (2002) and an "agreement ratio" (*AGR*) are used. Foreign investors have the highest, and individual Korean investors the lowest, information quality. The information quality of Korean institutional investors and foreign investors delivers significant positive profits, whereas that of Korean individual investors delivers losses. We also demonstrate that the information quality of foreign investors has improved since the U.S. financial crisis, perhaps because these investors have easier access to global information. Before a purchase, the "cumulative abnormal returns" (*CARs*) of institutional investors increase, while those for individual investors decrease. However, before a sell order, the *CARs* of both institutional and individual investors decrease. Finally, the "TED spread" and "volatility of the foreign-exchange market" variables are significant for both *PINs* and *AGRs*, but the "volatility of the Korea Composite Stock Price Index" is significant only for *PINs*. Overall, there is clear and convincing evidence of information asymmetry in the Korean stock market, with Korean individual investors possessing the worst information quality, perhaps due to heterogeneity amongst them.

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Knowledge-Based View and the Entrepreneurship in Strategic Management Research

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Abstract

Today in the present world, knowledge and entrepreneurship within the firm have to be develop simultaneously in order to get a better performance. This paper examines the relationship between Knowledge-based view and entrepreneurship from the concept of heterogeneity to highlight differences in explanations of the source of rent generation and the determinants of sustain competitive advantage. The analysis of the two perspectives concludes the need for effort of the firm to integrate them both in order to build strong, enduring, and profitable rents.

Keywords: Knowledge-based view, heterogeneity, entrepreneurship, performance, rent generation, sustain competitive advantage.

How Can We Establish a R&D Cooperation Strategy Under Various Technology Level and Technology Demand?

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Abstract

R&D collaboration is considered as a catalyst for innovation and a way to accumulate social capital through confidential relationship, and it among knowledge-generating entities could be identified as an important factor affecting permanence beyond their own roles/functioning (Lee et al., 2011). As part of their effort to innovate, the scope of their activities can extend under the boundary of, from R&D administration with their own capability to R&D strategy through cooperation. R&D cooperation can be explained in light of cooperation entities and contents. Under the concept of open innovation, knowledge-generating entities need to check which cooperation entities, is helpful for improved R&D performance. In this study, we set up the R&D cooperation strategy in terms of individual, institution and joint cooperation, and propose what type of R&D cooperation strategy improves performance under different situations, technology level and demand.

Key Words*: R&D Cooperation, R&D Entity, Technology level, Technology demand*

Is monetary policy in love or in conflict with financial stability?[1]

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Abstract

We explore the procyclicality of monetary policy towards different financial cycle measures (DSR, credit/GDP, house prices, stock market indices) over 1995−2016 for quarterly data from 21 countries and the euro area. Results show that potential procyclicality of monetary policy is not a wide-spread phenomenon. The average procyclicality ratios for all analysed cycles did not exceed 20% of observations. However, the results are heterogeneous across countries. The procyclicality of monetary policy was usually higher when financial cycle gaps were increasing and lower when they were decreasing. On average, central banks in several larger economies were running potentially somewhat less procyclical monetary policy than those in smaller ones. The resulting potential propensity of conflicts between achieving price and financial stability by central banks was low, as only in 10% of cases the objectives were conflicting, usually when inflation was below target and credit cycle was in a expansion phase.

Keywords: financial stability, monetary policy, financial cycle

JEL Codes: E52, E58, E61, G18

The opinions expressed herein are those of the author and do not reflect those of the associated institutions.

Marketing at the Point-of-Sale in the Function of Corporate Social Responsibility in Baby Food Category

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Abstract:

In many ways corporate social responsibility (CSR) is a mantra for our time (Schmeltz, 2012). Companies that follow the practice of CSR in their business are not achieving only a higher profit, yet they achieve a positive image in the eyes of all stakeholders. Relying on CSR, we expect from companies, apart from the highest quality of their services, the ethics of their activities and a sense of responsibility for their employees, local community and natural environment (Berens, Van Riel, and Van Bruggen, 2005). In the academic world, many theorists and researchers have contributed to the field of CSR investigating how CSR can be used for advertising, especially in products for babies. Everyone wants what's best for their baby, and that usually means the most natural available forms of care and nutrition. There has been a high level of awareness about the marketing of baby milk substitutes. The purpose of this paper is to examine a way of carrying out CSR at the point of sale in the baby food category, because when choosing products from the shelves, parents need to be confident that the brands act responsibly, in all areas of production and marketing. Nowadays, parents are increasingly looking for organic food for their babies. These are guaranteed to be free from pesticide residues, growth hormones and nitrates that can appear in conventionally-grown foods. They also contain fewer artificial additives, such as E-numbers and flavourings. One strong argument in favour of buying organic food for babies is that they are more vulnerable than adults to toxins such as pesticide residues. This is partly because they eat more food in proportion to their overall body weight than adults, meaning that they will be exposed to a relatively higher level of chemicals (Savage, Orlet Fisher, and Birch, 2007). Despite the importance of the topic, there is a lack of literature on CSR activities at the closest point to consumers - sales points and shelves in a store. As there is an increasing trend of retailers involved in product and brand management, and as they develop their own brand of baby food products (for example, DM and Interspar developed their own brands of organic baby food products), we consider marketing activities directed to consumers at the point-of-sale as very effective ones. Therefore, empirical research on marketing (related to CSR) was conducted using the observation method in ten different stores on the Croatian market from the period of May-June 2017. The results indicate that retailers offer a wide range of organic food products. Also, in their assortment, they offer private organic food labels. Retailers are communicating responsibly in terms of providing product information on declarations and shelves, and other means of CSR communication in the store, however, the results indicate that not all retailers are fully committed to CSR.

Key words: corporate social responsibility, marketing, point-of-sale, baby food

The Effect Of Macro Risk Factors And Infrastructure On Libyan Facilities Authority Performance

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Abstract

To create educational environments equipped with the world's best and latest technologies' and teaching aids'. This paper has attracted more attention in view of the important role of public service industry which is Educational Facilities Authority in Libya. Hence, we highlight risk management as an important subject in supply chain that has a significant effect on organizations performance. We show that accumulation unfinished contracts and budget deficit is associated with poor supply chain risk management performance. In addition, we make two contribution to the literature on supply chain risk management. first we provide empirical evidence to support that higher macro risk factors leads to decrease the organization performance. Second we show empirical support studies that demonstrated the beneficial of increased information resources on organizations performance. We used Delphi method to collect data, and to define the important risk factors affect on supply chain management at Educational Facilities Authority in Libya, then multiple regression model used to our empirical analysis.

Keywords: educational facilities, macro risk factors, information resources, multiple regression

1. Introduction

Using data from Educational Facilities Authority in Libya (Ly-EFA), over 3 years, we show that, the accumulation of unfinished contracts and budget deficit at supply chain management is linked to decreasing in the information resources and that affects on the organization performance. Hence, this paper shed light on the causes, that led to weakling supply chain management, that had been previously overlooked in studies of supply chain management.

This paper was motivated by 'supply chain risk management (SCRM)'. Conversation with several managers of other Ly-EFA , stories of customer experiences at various organizations, supply chain management reports, and articles in several international journals, suggested that poor supply chain risk management was common at most organizations.

A number of qualitative and quantitative methods and tools have been developed and applied to mange supply chain risks (William, 2015). Risk assessment is associated with the probability of an event occurring and the significance of the consequences (Harland, 2003).

In macro risk assessment, evaluated the salable degrees of the affected areas in destructive earthquake by the extension technique, they developed a bi-objective optimization model with the urgent relief demand time_ varying fill rate maximization and distribution time-varing window minimization to distribute supplier to the identified affected area sets. The methodology was illustrated with a hypothetical numerical example (Ji &Zhu,2012).

(Durowoju, 2012) used discreet-event simulation to investigate the impact of disruption in the flow of critical information needed in manufacturing operations on collaborating members. They revealed that the retailer experiences the most uncertainty in the supply chain while the holding cost constitutes the most unpredictable cost measure when a system failure breach occurs. In their study, a generic information technology risk was studied and no risk factors were identifier nor quantified.

The SCRM methods have been widely applied to manufacturing supply chains, (whereas service supply chains are fairly unexplored) (William, 2015). Besides, all the applications are limited to the private sector, hence, this paper is focusing on the public sector.

Our problem evidently is of considerable practical significance, especially in Ly-EFA. The majority of articles focused on a particular industry (e.g. automotive, electronics, aerospace and so on) (Wagner, 2008- Kern, 2012). This paper has attracted more attention in view of the important role of service industry, that is educational in developing country _Libya, which aims at increasing personal and national income by increasing labor productivity is an important for element of human capital at all levels of development for countries which are at the beginning of the road to economic and national development (Afsar, 2009).

In addition, our findings have substantial relevance to at least a stream of literature, that seeks to definition of 'supply chain risk and supply chain risk management', and that looks at the risk factors of supply chain management, this stream of literature in section 2, the rest of the paper is organized as follow; In the next section, we review the relevant literature and shed light the contribution of this study. In section 3, we describe the research methodology. In section 4, we present our empirical model. And in section 5, we present our results. We conclude the paper with a discussion of our findings.

2. Literature review

This paper contributes to, and draws upon, two streams of literature in SCRM. Below we describe our contributions to each of this streams.

Supply chain risk & SCRM

There is no consensus on definition of 'supply chain risk' and 'SCRM' (Sodhi, 2012). Supply chain risk is, the negative deviation from the expected value of a certain performance measure, resulting in negative consequences for the focal firm (Wagner & Bode, 2006). Supply chain risk is, the negative deviation from the expected value if a certain performance measure, resulting in negative consequences for the focal firm (Wagner, 2006). Supply chain risk, is the potential variation of outcomes that influence the decrease of value added at activity cell in a chain (Bogataj, 2007). Supply chain risk, 'An individual's perception of the total potential loss associated with the disruption of supply of a particular purchased item from a particular supplier (Ellis, 2010). Supply chain risk defined as:' The likelihood and impact of unexpected macro and/or micro level events or conditions that adversely influence any part of a supply leading to operational, tactical, or strategic level failures or irregularities' (William, 2015). Several researchers provided definitions for SCRM as, 'To collaborate with partners in a supply chain apply risk management process tools to deal with risks and uncertainties caused by, or impacting on logistics related activities or resources (Norman, 2004). The identification and management of risks within the supply network and externally through a coordinated approach amongst supply chain members to reduce supply chain vulnerability as a whole (Goh, 2007).

Supply chain risk factors

Risk factors, are various events and situations that drive a specific risk type, According to (Bogataj, 2007) the risk factors are, supply process ,production or distribution, demand control and environmental. (Manuj, 2008), found that some of the identified risk factors are vague, and it is more appropriate to consider them as risk types rather than risk factors, e.g. risks affecting suppliers and risks affecting customers. Majority of the risk factors can be classified into five categories according to(William, 2015) it is including, macro factors, micro factors: demand, supply and infrastructural: information, financial and transportation.

3. Research methodology

This section describes the research methodology. We introduce the research site then we generate the hypotheses and next we describe the dataset.

Research site: Ly-EFA

We conducted our research at Educational Facilities Authority, in Libya, independent institution administratively and financially affiliated to the Ministry of Educational specialized in the building, maintenance and equipping of educational facilities in Libya including: kindergartens, schools, an ministry's administrative headquarters. The authority headquarters based in Tripoli formed of 12 departments and bureaus and 15 branches country wide.

Mission and vision; leading national institution in the field of building, developing of attractive and creative educational facilities at the level of primary and middle schools.

The message; creating foundation of educational facilities to provide stimulating learning environment through adoption of domestic and international specifications and standards. The goal; to create educational environments equipped with the world's best and latest technologies' and teaching aids'.

Hypotheses

H1: Risk factors including; macro factors, supplier factors, demand factors, information resources and financial resources, is linked to supply chain management performance.

Consistent with theory in SCRM, we hypothesis that defects will be higher when the organization faces all that, unfinished contracts and budget deficit.

H2: Decreasing in macro risks and increasing in information resources with increasing in financial resources, lends to increasing on organizations performance, and these factors, have the most effect on the supply chain management performance at Ly-EFA.

Managers and employers at Ly-EFA have confusion about the real causes of stopping works and all that problems with unfinished contracts, as a result, we hypothesize that increasing macro risks and decreasing information resources, with financial problems at Ly-EFA , are associated with the decrease On organization performance .

Our hypothesis is consistent with studies that demonstrated the beneficial impact of increased quality on firm performance.

DATA

The Delphi method is a method to acquire grouping knowledge (M Adler, 1996)).

The Delphi method is an exercise in group communication among a panel of geographical dispersed experts (H.A. Linstone, 1975).

We tested these hypotheses using data from Ly-EFA (2012-2017). Because all our data came from the experts judgment, the Delphi method is used to determine the factors which effect on the organization performance.

In order to collect data for the multiple linear regression method, experts judgment in this field are used. After explaining the subject to the experts, the questionnaire were handed to them.

We are able to observe some establishments without needing too much worry about across firm heterogeneity. Moreover, using data from 30 experts judgment allow us to have some consistent measures in our empirical analysis.

The Delphi method steps are:

- The Delphi group consists of 30 experts of Educational Facilities Authority managers.
- The first questionnaire, which consists of the factors determined by the literature, was sent to the organization's experts with these three questions:

1. Which of the risk factors on the list have the most effect on the supply chain management performance?
2. What is the probability (as percentage) of each factor?
3. How much ,completed & achieved, SCM its requirements, these last 3 years? (probability)

- The answers of the first phase were collected, analysed and then the weights of each factor were determined.

- Based on the results of the questionnaire, another questionnaire was developed and handed to the experts.

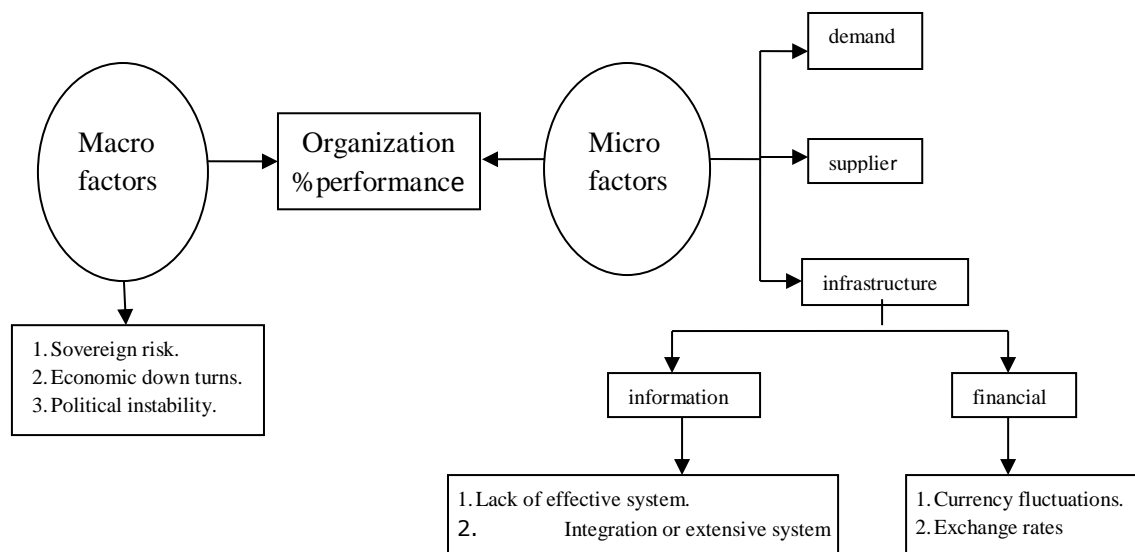- After repeating these steps three times, the important factors were determined, as can be seen in fig. (1).

Figure (1) The important factors effect on SCM performance, as found by using Delphi method.

4.Empirical model: Multiple Linear Regression

We estimate the parameters of equation (1) to test the affect of factors including; macro factors, demand factors, supplier factors and infrastructure : information and financial resources, on OP% performance.

$$\hat{Y}(OP\%) = \hat{\beta}_0 + \beta_1 (\text{macro factors}) + \hat{\beta}_2 (\text{supplier factors}) + \hat{\beta}_3 (\text{demand factors}) +$$

$$\hat{\beta}_4 (\text{information}) + \hat{\beta}_5 (\text{financial}) + \varepsilon$$

$$H_0: \beta = 0$$

$$H_1: \beta \neq 0$$

When $\hat{Y}$ represents the dependent variable (OP%= organization performance), and x1, x2, x3, x4 and x5,represent the explanatory variables, here they are: macro, demand, supplier, information, financial. The error term, ε, represents the collective unobservable influence of any omitted variables. In a linear

regression, each of the term being added involves unknown parameters, $ß^o$, $ß_1$, $ß_2$, $ß_3$, $ß_4$, $ß_5$, which

	MEAN	ST.DEVIATION	MEDIAN	MODE	Sample size

are estimated by 'fitting' the equation to the data using least squares. Each estimated coefficient $ß_k$, measures how the dependent variable responds, on average, to a change in the corresponding covariate x_k after 'controlling for' all the other covariates. The informal phrase 'controlling for' has specific statistical meaning (Daniel, 2011)

Multi regression involves a variable to be explained called the dependent variables and additional explanatory variables (independent variables) that are thought to produce or be associated with changes in the dependent variable (David, 2003). Multiple regression typically uses a single dependent variable and several explanatory variables to assess the statistical data pertinent to these theories. A correlation between two variables does not imply that one event causes the second. Therefore, in making causal inferences, it is important to avoid spurious correlation (Dolores, 1983).

Choosing multiple regression as a method of our analysis. Because it is suitable (linearity, normal distribution). There are many multivariate statistical techniques other than multiple regression that are useful in different proceedings. Therefore we explain why we choose multiple regression ,it was more suitable than the alternatives.

In this study, the level of statistical significance required to reject the null hypothesis (i.e, to obtain a statistically significant result) is set at 0.05, or 5%. The significance level measures the probability that the null hypothesis will be rejected incorrectly. In doing a statistical test, it is useful to compute an observed significance level, or p-value. The p-value associated with the null hypothesis. If the p-value were less than or equal to 5%, we would reject the null hypothesis in favor of it is essential in multiple regression analysis that the explanatory variable of interest not be correlated perfectly with one or more of the other explanatory variables. If there were perfect correlation between two variables, we could not separate out the effect of the variable of interest on the dependent variable from the effect of the other variable.

An important assumption in multiple regression analysis is that the error term and each of the explanatory variables are independent of each other.

T-test, if the T-statistic is less than 1.96 in magnitude the 95% confidence, we cannot reject the hypothesis that $ß = 0$, the estimate, whatever it may be, is said to be not statistically significant. Conversely, if the T-statistic is greater than 1.96 in absolute value, in this case, we reject the hypothesis that $ß = 0$, and calls the estimate statistically significant.

 Adjusted R-squared (R^2), is statistic that measures the percentage of variation in the dependent variable that is accounted for by all the explanatory variables (Daniel, 2011). Thus, adjusted R^2 provides a measure of the overall goodness of fit of the multiple regression equation. Its value ranges from 0 to 1. An R^2 of 0 means that the explanatory variables explain none of the variation of the dependent variables, an R^2 of 1 means that the explanatory variables explain all of the variation.

F-test is a test of the null hypotheses that all regression coefficient (except the intercept) are jointly equal to 0, that then is no linear association between the dependent variable and any of the explanatory variables. If the F-ratio is sufficiently high that mean we reject the null hypothesis with a very high degree of confidence.

5. Results

Summary statistics for all variables used in the analysis are reported in **table (1).**

Table 1: Description statistics

OP%	42	8.326663998	40	40	30
MACRO	63.63333	13.51415	66	75	30
FINANTIAL	44.33333	11.8837	45	40	30
DEMAND	16.36667	8.856197	20	20	30
SUPPLY	47.33333	11.16045	50	55	30
INFORMATION	87.26667	4.273432	87.5	90	30

Source: author's research

The correlations results between the all variables are reported in **table (2)**, it shows, no high correlation between the five explanatory (independent) variables, but there is high inverse correlation between, dependent variable (OP%, refers to an organization performance= unfinished contracts & budget deficit percentage) and Macro risk factors (-76.958%).

Table 2: Correlation matrix

	OP%	*Macro factors*	*Financial* resources	*Demand factors*	*Supply factors*	*Information* resources
OP%	1					
Macro factors	-0.76958776	1				
Financial resources	0.181907223	0.03998942	1			
Demand factors	-0.14555138	0.117262531	-0.26847575	1		
Supply factors	-0.06815218	-0.04736944	0.01172877	-0.18908395	1	
Information resources	0.153629544	0.070377799	-0.12449199	-0.262406	-0.00955175	1

Source: author's research

The summary out put are reported in **table (3)**, it shows the regression statistics, where the adjusted R^2= 0.6488 is associated with **equation (1),** this implies that the five explanatory variables explain 64.88% of the variation on organization performance. And shows that, the standard error is relatively small (ε= 5.018208766).

Table 3: Summary out put

Regression Statistics	
Multiple R	0.842278828
R Square	0.709433624
Adjusted R Square	0.648898963
Standard Error	5.018208766
Observations	30

The results of **ANOVA** is in **table (4)**, we can show that, the significant F less than 5% (8.22514× E-06) that is mean, sufficiently high, then, we can reject the null hypothesis with a 5% level with 95% degree of confidence, and 1% level with 99% degree of confidence.

Table 4: ANOVA results

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	1475.621939	295.1243877	11.71946131	8.22514E- 06
Residual	24	604.3780613	25.18241922		
Total	29	2080			

Source: author's research

, MS= Mean Square, SS= Sum of Squares, df= degree freedom

The coefficient results are reported in **table (5)**, we are confirm the first hypothesis, risk factors including: macro, information, financial, demand and supplier, associated with the organization performance, The very low p-values of the macro variables imply that is statistically significant at less than the 1%, it is highly significant results. The information and financial variables are significant at less than 5%. In contrast, the demand and supplier variables are only significant at 56% & 41% levels, implying that they are insignificant at the traditional 5% level. We can note, T- test results, where, T-statistic of demand factors and supply factors is less than 1.96 in magnitude the 95% confidence, we cannot reject the hypothesis that ß= 0, the estimate, whatever it may be, is said to be not statistically significant. Conversely, the T-statistic of macro risk factors and information resources and financial resources is greater than 1.96 in absolute value, in this case, we reject the hypothesis that ß= 0, and calls the estimate statistically significant.

Table 5: Coefficient results

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	23.1083498	22.48515288	1.02771593	0.314330549	-23.2987246	69.51542417
Macro factors	-0.50011605	0.068999521	-7.24810898	1.72934E-07	-0.64252406	-0.35770804
Financial resources	0.187501772	0.082385134	2.27591754	0.032064128	0.017467213	0.357536331
Demand factors	0.06826113	0.116893389	0.58396057	0.564695649	-0.17299497	0.309517225
Supply factors	-0.06976459	0.083903065	-0.83149038	0.413893284	-0.24293201	0.103402822
Information resources	0.510940866	0.229580355	2.225542624	0.035696104	0.037110305	0.984771428

Source: author's research

The regression results to test the second hypothesis are reported in **tables (6), (7) &(8)**, show, no high correlation between the three explanatory (independent) variables, but there is high inverse correlation between, dependent variable and Macro risk factors, we note, the adjusted R^2= 0.658636, is associated with **equation (2),** this implies that the three explanatory variables explain 65.86% of the variation on

organization performance. And they show that, the standard error is relatively small (ε=4.948138),and from ANOVA we see that, significant F less than 1% level (7.32E-07).

Table6: Correlation matrix

	OP%	*Macro factors*	*Financial factors*	*Information factors*
OP%	1			
Macro factors	-0.769588	1		
Financial resources	0.1819072	0.0399894	1	
Information resources	0.1536295	0.0399894	-0.124492	1

Source: author's research

Table7: Summary out pot

Multiple R	0.833036
R Square	0.693949
Adjusted R Square	0.658636
Standard Error	4.948138
Observations	30

Table8: ANOVA results

	Significance F	*F*	*MS*	*SS*	*df*
Regression	7.32E-07	19.65106	481.138	1443.414	3
Residual			24.48407	636.5859	26
Total				2080	29

Source: author's research

The coefficient results are reported in **table** (9), we are confirm the second hypothesis, the macro, information and financial, associated with an organization performance. The very low p-values of the macro variables imply that is statistically significant at less than the 1%, it is highly significant results. The information and financial variables are significant at less than 5% level. We can note, T_ test results, where, T-statistic of macro risk factors and information resources and financial resources is greater than 1.96 in absolute value, in this case, we reject the hypothesis that ß= 0, and calls the estimate statistically significant.

Table 9: Coefficient results of the second hypothesis

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	24.84184	19.51864	1.272724	0.21438	-15.2793	64.96298
Macro factors	-0.49059	0.067096	-7.31169	9.16E-08	-0.6285	-0.35267
Financial resources	0.170703	0.076709	2.225321	0.034945	0.013025	0.328382
Information resources	0.467624	0.213675	2.188479	0.037812	0.037812	0.90684

Source: author's research

The results show that an increase in (OP%) the organization performance is associated with a decrease in macro risks, an increase in information resources and an increase in financial resources, from the table above we can conclude the equation (2):

$$Ŷ (OP\%)= 24.84184 - 0.49059 ̂(MACRO) + 0.467624 ̂(INFORMATION)$$

$$+ 0.170703 ̂(FINANCIAL)$$

6. Conclusion

As a result of the multiple regression, the variables with the largest negative effect on organization performance, that under the study, is macro risk factors while the information resources and financial resources have significant positive effect.

Not surprisingly, the macro risks factors are had most negative effect, because which Libya these years suffered instability in political and economic phases. For Libya to take its progress, it is necessary for society to be stable to achieve the peace, and according of that we can reduce the macro factors then we can increase the organization performance, macro factors are defining by Delphi method which used to collect data in this paper as: economic down turns, political instability &sovereign risks.

Results of linear multiple regression equation in the above mentioned variables show that the information and financial resources are most in need of improvement, take more attention on infrastructure specially the information resources including: lake of effective system &integration or extensive system net work, according to Delphi method that used in this paper, it causes increasing on organization performance.

In this paper, for simplicity purposes we only used small sample size (just 30 experts judgment in this field are used), more number of experts may be consider in future research. Moreover, future researchers might consider financial risk factors including: Currency fluctuations &Exchange rates, then evaluate the effect of each factor, and select the most factor in need to improvement finally we can achieve the organization goals.

Biography

Seena Yousuf Alsuyihili, MSc. Engineering management, is an employer at Educational Facilities Authority of planning department, she was teaching mathematical &engineering subjects in high schools for 15 years &worked at radiotherapy department for 2 years, she gives lectures in courses of

mathematical, engineering management and material management. She has attention in supply chain management and that was her Magister research subject.

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